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Cambridge 02138

Gun violence, drug laws, climate change

EPIGENETICS

Professor Sarah Richardson’s research on gendered bias in scientific studies is fascinating (“The Science of Sex,” November–December 2019, page 34). I cringed, though, when I got to the part of the article stating that the theory Richardson explores in her recent book—the belief that the actions of mothers during pregnancy have long-term effects on their progeny—is “an idea that dates back to Aristotle.” The Chinese theory of “taijiao” (prenatal education) is probably at least as old as Aristotelian thought. No doubt the idea arose long ago in other communities, as well. The conceptualization of science as an exclusively European intellectual project at the heart of “Western Civilization” is a form of bias that Harvard’s historians of science have recognized and combatted for quite some time now, I believe. Still, Eurocentrism persists within the American educational system and among many journalists, skewing understanding of the world just as gendered bias does.

Kristin Stapleton, Ph.D. ’93
Buffalo

ZONING AND CLIMATE

Judicial administration of local zoning under the Mount Laurel decision has utterly failed to achieve its goals of reducing local zoning barriers to more affordable types of housing (“Land Use and Climate Change,” November–December 2019, page 15). This should come as no surprise. State courts are not equipped for this role; it is the responsibility of state legislatures.

Some states have successfully challenged local control over land-use matters because parochial local control was undermining the public interest in more equitable and environmentally sustainable outcomes. In the 1970s and 1980s, the Oregon legislature and state agencies forced local governments to rezone residential land for all types of housing—from apartments to manufactured housing to subsidized housing—and shrank minimum lot sizes down to mid-twentieth-century scale. Allowing denser housing also contributed to Oregon’s effort to curb urban sprawl, and reduces driving per capita.

In 2019, in the face of unaffordable home prices and rents, the Oregon legislature acted again, passing legislation requiring all cities in the Portland metro region and all other cities with more than 25,000 population to allow owners to

With Warm Thanks

Lydia S.C. Rosenberg, production and design manager during the past three-plus years, concluded her Harvard Magazine service in late November. An exemplary colleague, she mastered our print and digital production processes; contributed significantly to the design and look of everything we do on readers’ behalf; and then taught herself new skills to produce the first series of Ask a Harvard Professor podcasts. She debuted to rave reviews during the fall semester. She leaves with our deep gratitude and best wishes as she assumes her new responsibilities across campus, as digital media manager at the Berkman Klein Center for Internet & Society.

~The Editors
Curiosity Changes the World

Fall is always a lively time at a place like Harvard. Students are back, of course—some new and some returning. But there is another reason for the buzz of excitement around campus as the leaves start to turn and the evening air grows crisp. It is the season when many people across the University community wonder whether we will hear good news as the annual Nobel Prizes are announced. And this year, we did.

Two Harvard faculty members were honored in 2019, bringing the University’s total count of current or former Harvard faculty Nobel Laureates to 50. This year, Michael Kremer received the Nobel Prize in Economic Sciences—along with two MIT colleagues—for his innovative approach to alleviating global poverty, and William Kaelin—along with colleagues from the University of Oxford and Johns Hopkins University—received the Nobel Prize in Physiology or Medicine for his work on how cells regulate oxygen.

The Nobel Prizes recognize achievements that provide “the greatest benefit to humankind,” and it is easy to see the benefit in the work of our new Harvard Nobel Laureates. By using randomized controlled trials—experiments more commonly used in medicine—Kremer, the Gates Professor of Developing Societies in the Department of Economics, demonstrated far more effective means of delivering needed vaccines and treatment to impoverished children in the developing world. And Kaelin, the Sidney Farber Professor of Medicine at Harvard Medical School, has broken ground in our understanding of how cells, including tumor cells, adapt to changing oxygen levels. His research is already leading to new therapies for treating cancer.

Although focusing on very different problems, Kaelin and Kremer are both striving to benefit humankind through their research. The same can be said of the other 48 current and former Harvard faculty members recognized with Nobel Prizes in a variety of disciplines. And it can be said of the many members of our University community who apply their knowledge and dedication to the world’s most intractable problems every day.

But much of the scholarship pursued by our faculty and their students is not problem-focused. It is driven simply by curiosity. Often, this research leads to unexpected benefits for society years later. For example, a Harvard physicist refined a technique in 1949 to measure more effectively the frequencies of electromagnetic radiation absorbed by atoms and molecules. This technique ultimately led to the development of the atomic clock, a highly precise device to measure time, and would eventually win its creator, Norman Ramsey, the Nobel Prize in Physics. Ramsey’s curiosity-driven research profoundly changed our lives because it paved the way for other pioneering inventions like the Global Positioning System (GPS)—a technology that uses atomic clocks and is an essential part of modern life all over the world.

Profound, life-changing scholarship does not happen just in the natural and applied sciences and engineering. Our faculty in the social sciences, arts and humanities, and our professional schools are discovering, challenging, creating, and inventing as well. In every realm of scholarship represented in our 12 schools, our faculty are pushing the boundaries of knowledge. They are asking deep questions about both the origin of life and the meaning of life. They are seeking to simulate intelligence computationally while they are also examining the ethics of artificial intelligence. They are producing great literature and music while trying to understand how the brain encodes language and sound.

At a time when people are questioning the value of higher education and the role of research and scholarship in policymaking, we must understand why it is important to continue to support this work broadly. “Nobel Prize season” is a reminder of the power that universities have to illuminate the world, transform the way we live, and provide “the greatest benefit to humankind.”

Sincerely,

Harvard Magazine
build duplexes, triplexes, and four-plexes on lots in single-family residential zones. Oregon is not alone in correcting the deficiencies of local land-use control. In order to meet its greenhouse-gas reduction goals, California has reformed how local governments address traffic congestion, directing them to replace road-widening solutions with actions to reduce driving. It also passed legislation allowing accessory dwelling units (detached or internal apartments) on single-family lots across the state.

The courts’ role may be to identify the constitutional or statutory defects in locally controlled regulation—whether to address issues of social equity, the environment, or the economy—but it is up to state legislators to supply the remedy.

Robert Liberty, J.D. ’81, LF ’03
Portland, Ore.

GUNS
We do not have a gun problem (Ask a Harvard Professor podcast, “David Hemenway: Who Can Solve America’s Gun Problem?”). We have a (bad) misbehavior problem with little to no useful accountability for misbehavior. If Harvard would try to frame and solve “the problem” instead of duping itself by advancing an agenda for other purposes, we might get real improvement.

Charlie Bair, M.B.A. ’71
Valley View, Tex.

Editor’s note: For more on David Hemenway’s public-health perspective on gun-related homicides and suicides, see page 43.

CAMPUS DISCOURSE
It’s a fine thing to say, as do President Lawrence Bacow and Dean Rakesh Khurana, that respectfulness and open-mindedness further the search for truth and understanding (“The Community’s Conversations,” November-December, page 18). But what I found missing is any information about what to do when others in the conversation are trying to destroy truth and understanding. We wouldn’t be here if that’s how our ancestors had treated dire wolves, cave bears, and saber-toothed tigers. Idealism without realism is just foolishness.

There are important and fairly clear differences between those who deserve a respectful and open-minded hearing and those who will misuse such responses. I would like our leaders to address those differences, and outline practical policies to preserve and protect the respectfulness and open-mindedness that we value.

Keith Roberts ’65, LL.B. ’68
New York City

ANGELA DAVIS AND ISRAEL
Although I have no argument with most of Jonathan Turley’s criticism of Angela Davis (Letters, November-December 2019, page 4), his statement about “her strong support for the anti-Zionist BDS movement, which aims to dismantle the Jewish homeland” is off the mark. The boycott, divestment, and sanctions movement is supported by individuals such as the late Stephen Hawking, and organizations such as the Presbyterian Church and Jewish Voice for Peace, the latter advertising over 70 local chapters and 200,000 on-line supporters. At local JVP meetings, member lawyers have pointed out that basic human rights, not just civil rights, of Palestinians are routinely violated by Israel. Individuals living under Israeli control cannot appeal to constitutional rights because Israel has no constitution.

The current U.S. administration’s embrace of Israeli expansionism into East Jerusalem and Syrian land in the Golan, while sanc-tioning Russia over its occupation of Eastern Ukraine, is inconsistent, to say the least.

David Mendenhall, Ph.D. ’71
Pomona, N.Y.

CRIME AND DRUG LAWS
“The war on crime” and the War on Drugs are two of the largest policy failures in the history of the United States,” says historian Elizabeth Hinton in “Color and Incarceration” (September-October 2019, page 40). The prohibition of intoxicating liquors was a third such failure, but the nation corrected it relatively quickly.

Prohibiting drugs has long proved as futile and corrupting as prohibiting alcohol. Isn’t it finally time to

SPEAK UP, PLEASE
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Surpluses and Scholarship

A decade after the financial crisis overturned Harvard’s academic ambitions, the University has righted its financial ship, and then some: a $528 million surplus in the fiscal year ended last June 30, anchored by some $1.9 billion distributed from the endowment—fully 33 percent of revenues (see “The Black... and the Red,” page 22). That outcome represents considerable work. For example, the endowment was valued at $40.9 billion at the end of fiscal 2011; up from the severely depressed $26.1 billion in June 2009—a recovery abetted by retained earnings; The Harvard Campaign; and Corporation decisions to put academic operations on a diet by restraining distributions from the endowment. (The distributions have nonetheless totaled roughly $16 billion in the past decade, despite inconsistent investment performance.) Turning to outlays: employees began to bear higher costs for health insurance; central controls limited pay increases and hiring; and financial administrators whittled down debt and refinanced some high-cost borrowings, effecting large savings. And so on. Thus Harvard—in the news a decade ago for its $11-billion loss in endowment value, and $3 billion of additional losses—is now a paragon of probity. It has recorded cumulative $769 million. In one sense, that is a paragon of financial ship, and trim spending on executive education (a costlier operation. The new and spiffed-up buildings dotting campus increase academic operations on a diet by restraining costs—and much current research depends on renovations, expensive equipment, and junior professors). This past fall—after a decade of startling advances in data analysis, neuroscience and every branch of biology, historical and social-science inquiry into diverse societies and newly accessible archives with digital research tools—it reported...724 members. The composition has changed (hiring has tilted toward engineering and applied sciences), but this is not strong evidence of keeping up with the growth in knowledge and the opportunities to acquire more. Nor—despite the intellectual prowess of the many new faculty members who have succeeded retirees and others—does this admittedly crude metric suggest much greater capacity to address today’s urgent challenges of inequality, technological change, etc.

Which brings us to the specter of climate change. Whatever doubts may be harbored in some circles, most people in the University think global warming is inexorably under way, prompting the need for breakthrough research and enormous efforts to protect Earth’s habitats. For most of the past decade, much of the debate on campus has focused on the near-at-hand question of whether the University should divest any investments in fossil-fuel producers held by the endowment. The recent intensification of faculty, student, and alumni divestment advocates’ efforts is described at page 19. The Corporation and the past and present presidents have opposed divestment, and still do. They have rightly emphasized that this institution has the intellectual resources—in science, business, design, education, engineering, government, law, public health, divinity, economics, philosophy, and else-where—to make matchless contributions toward combating global warming. These might be discoveries in energy and battery technology; innovations in law, incentives, enterprises, and civic institutions to accelerate the adoption of needed changes, and ease the transition of those whose lives are or will be disrupted; or campaigns to change public understanding, opinion, and behavior. In his first remarks as president-elect in February 2018, Lawrence S. Bacow highlighted the breadth of Harvard’s expertise across all its schools as a singular strength—and the opportunity to enhance its impact by combining forces to address global problems. This surely is one. At the November FAS meeting, Bacow emphasized focusing “not on points of disagreement but on points of agreement”: that climate change demands action. “Whatever people may believe about divestment,” he continued, “we all need to agree that as a faculty, we need to confront this issue through our scholarship and teaching.” Divestment advocates, meanwhile, described it as only a first step—before reinvesting endowment assets in sustainable technologies, and stepping up scholarship and teaching.

There’s plenty of common ground. What’s lacking, so far, is the commitment to bring schools and professors together; to shape a program that draws on Harvard’s strengths to address unmet challenges; and to secure the resources needed to proceed. Is this the right way to use some of Harvard’s surplus? Not necessarily: its scholars may be better positioned to address poverty and inequality; the challenges of digital-era privacy and misinformation; or strains on democratic governance. Might it be a sound way to proceed? Given the risks of runaway climate change and the University’s intellectual riches, possibly so. A coherent, visible program on climate change is certainly consistent with the institution’s mission. Moreover, it would demonstrate the real (but deferred) promise of One Harvard—and give some hope of moving beyond the deadlocked debate over divestment. A decade hence, if the campus remains mired in that confrontation, while the world has grown hotter and more endangered, those retained surpluses will look pound-foolish indeed.

~John S. Rosenberg, Editor
repeat the laws that criminalize drugs, subject those drugs to life-saving quality controls, and use the sales taxes they will generate to treat and wean addicts and educate people against doing drugs?

During five weeks that I spent in a public defender’s office in Manhattan’s Criminal Courts in 1966, the majority of the cases that I watched or worked on involved heroin or larcenies to support a heroin “habit.” I concluded then that logic and humanity require all drugs to be decriminalized.

Soon, though, the nation got Richard Nixon’s War on Drugs; and prison populations burgeoned, sucking increasing millions of years out of Americans’ lives—disproportionately Americans of color. Decriminalizing drugs would not end our savage level of incarceration, but it would put a serious dent in it.

As Hinton has recorded, inequalities in policing, prosecution, and imprisonment have long been elements of the racism that infects the nation. Decriminalizing drugs would not end racism either, but at one stroke, it would eliminate a destructive result of racism.

Perhaps because I live on a remote mountainside, I haven’t heard much about the hypocrisy of keeping heroin criminalized, while legal killers like OxyContin merely present a medical problem that neither makers nor marketers go to prison for pushing beyond their legitimate use. It is those pushers who need to be prosecuted, not under anti-drug laws, but under state reckless-murder statutes.

Richard merlo ’57 shocked by asking “Are we to believe that the black community bears no responsibility for its behavior?” (Letters, November-December 2019, page 4). An Asian man in my wealthy community killed his wife this year. Neither I nor the Asians in my community (from many different countries) bear responsibility for his behavior. We dump our poor in communities far from transportation and jobs. Single parents (or couples) who work can lose control of their kids in an environment wracked by crime and drugs. Data show when they move to our wealthy suburbs, the kids and families thrive. But our wealthy suburbs fight against low-income migrants from the city, blocking off this escape avenue. Perhaps, Richard, you and I bear responsibility for the murder rate among young black men.

Kathryn Roy, M.B.A. ’85
Lexington, Mass.

CLIMATE CHANGE

I was struck by a startling contrast in your recent issue. On the one hand I read with interest your (in my view apt) celebration of Sarah Richardson’s skeptical, questioning approach to great swathes of sex and gender research, which has uncovered “hype” and “bias” due to the unacknowledged or unconscious personal agendas of the researchers.

On the other hand I read your curt dismissal of the letter from William Jones ’60 (page 10), who dares to imply that there may be some hype and bias in much of the voluminous research on climate change.

I think it is safe to say that climate researchers are no less likely to have unacknowledged or unconscious agendas than researchers into the biology of sex.

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nomena Richardson describes resulted from a rush to change human behavior based on some (clearly untenable, in retrospect) conclusions. Might some of us not be allowed to express concern about similar potential dangers from the “climate change consensus”?

Richard Schneider, M.B.A. ’75
Bedford, N.Y.

JEFFREY EPSTEIN

The news item about Harvard’s financial involvement with convicted sex offender Jeffrey Epstein in the November-December 2019 issue (page 25) opens with the following: “... Jeffrey Epstein—accused of being a serial sexual predator who continued to prey systematically on underage women even after a 2008 plea arrangement for sex offenses...”

There is no such thing as an “underage woman”—an underage woman is by definition a child; Epstein is accused of preying systematically upon children. And, I must add, an adult having sex of any kind with a child is by definition rape. Words matter tremendously; their misuse can, as in this instance, result in a great deal of harm. To promote the idea that there can be “underage women” is to defang the true meaning of the words; to imply that preying upon them is somehow less harmful than preying upon children. Such a turn of phrase is akin to another one which continues to make the rounds in political circles: the notion of “nonconsensual sex.” “Nonconsensual sex” is rape.

I ask that the staff of Harvard Magazine choose their words more carefully.

Christine Staples
Berkeley

WILLIAM MONROE TROTTER

I greatly appreciate the magazine’s high-profile recognition of Kerri Greenidge’s excellent paean to the activist cum journalist, William Monroe Trotter (Vita, November-December 2019, page 40). This article offers much more than revelatory insight into the tragic life of a lesser-known figure in African-American history. It also manages to cast a hagiographic glow around the enduring importance of remembering civil-rights activism as early black leaders and scholars practiced it.

As pioneering editor of the Boston Guardian, besides causing quite a stir in 1914 while visiting the White House, Trotter is also remembered for boldly lecturing President Wilson against the moral evils of segregation in the federal workforce. This was characteristic of Trotter’s passion for social justice, never shrinking from a responsibility to raise his voice unapologetically on behalf of all black working-class Americans, and do so in print in the Guardian. Much to Greenidge’s credit, her article delivers a revealing view of the murky underside of the ideological rifts between radicals like Trotter and the accommodationist racial views held by many conservative black and white progressives who sought to diminish the role of black dissents in order to promote a much narrower view of what could pass as racial respectability.

Even more compelling, Greenidge establishes a direct connection to the historical trend by moderate whites to muzzle black radicalism, which did not stop with Trotter’s death. Acting as an intermediary while striking a conciliatory posture between the white-controlled Carnegie Foundation and the American Association of Adult Education in 1935, Howard University philosopher Alain Locke [A.B. 1908, Ph.D. ’18; see “Art and Activism,” March- (please turn to page 74)]
Provincetown in the Off-Off Season
A guide to art, culture, food, and community

Reflecting on the Opioid Epidemic
The Fuller Craft Museum

Gloria Steinem, Writ Large
American Repertory Theater

A Winter Retreat
The cozy Harvard cabin on Mount Washington

Eat, Drink, Read
Checking out the Boston Public Library's restaurants

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Extracurriculars

Events on and off campus during January and February

SEASONAL

Amherst College LitFest 2020
amherst.edu/go/litfest

Jesmyn Ward, a National Book Award-winner, headlines the fifth annual event. Also featured are authors Susan Choi and Laila Lalami, memoirist/political commentator Ben Rhodes, a Spoken-Word Slam, and free tours of the illuminating Emily Dickinson Museum. (February 27-March 1)

From left: T. M. Nicholas, Old Harbor, Gloucester, at the Cape Ann Museum; a still from Jean Renoir’s La Chienne, at the Harvard Film Archive; an elaborate Syrian ceramic and brass coffee pot, adorned with glass beads, at the Peabody Museum of Archaeology and Ethnology.

E X H I B I T I O N S  &  E V E N T S

Carpenter Center for Visual Arts
carpenter.center

Tony Cokes: If UR Reading This It’s 2 Late, Vol II spotlights new works by the video and installation artist, well known for his eviscerating cultural critiques, especially of capitalism. (Opens January 31)

Johnson-Kulukundis Family Gallery,
Byerly Hall
radcliffe.harvard.edu

In The Lily League, Los Angeles artist EJ Hill, RI ’19, envisions a counterpoint to the
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Ivy League, recasting “the visual language of academic heraldry to reckon with educational institutions that are not designed for all.” (Opens January 31)

Harvard Museum of Natural History
hmmh.harvard.edu
Meet scientists who investigate fossils, microbes, and carnivorous plants at the annual, all-ages festival I Heart Science. (February 8)

Peabody Museum of Archaeology and Ethnology
peabody.harvard.edu
Resetting the Table: Food and Our Changing Tastes explores the history and science behind American eating habits, and features a recreation of a formal dinner served to Harvard freshmen in 1910.

Harvard Art Museums
harvardartmuseums.org
Painting Edo: Japanese Art from the Feinberg Collection. More than 120 works—from colorful landscape paintings and scrolls to ornate fans and monochromatic inkwork—highlight artistic lineages and studios active from 1615 to 1868. (Opens February 14)

Cape Ann Museum
capeannmuseum.org
The region’s communities and coastal beauty shine in Tom and T.M. Nicholas: A Father and Son’s Journey in Paint. (Opens January 11)

Mystic Seaport Museum
mysticseaport.org
J.M.W. Turner: Watercolors from Tate offers nearly 100 works by the influential (and unfathomably prolific) British artist, all drawn from the Tate Museum's Turner Bequest. (Through February 23)

LECTURES
Radcliffe Institute for Advanced Study
radcliffe.harvard.edu
Ayodele Casel, RI ’20, shares aspects of her theatrical work-in-progress Diary of a Tap Dancer. (February 11)

T H E A T E R
Lyric Stage Company
lyricstage.com
The Treasurer, by Max Posner, is a “darkly funny” portrait of a son and his aging mother, and what money can signify within strained family relationships. (February 21-March 22)

Musical Visions of the Opioid Crisis

Last year, a group of artists met with clients at the High Point Treatment Center in Brockton, Massachusetts, for frank conversations about drug abuse. The 11 sculptures on display in “Human Impact: Stories of the Opioid Epidemic” at the Fuller Craft Museum reveal in stark and poignant terms what they learned. Eva Camacho-Sanchez created Corrosive Epidemic, a hanging textile incorporating silk chiffon, wool, embroidery, and imprints of rusted objects. Like an unfolding scroll, she explains, it conveys a visual story of the “highs and lows endured by a person suffering addiction.”

In Profits Over People, David Bogus’s ceramic, hand-sized, white prescription tablets, each stamped with the name—and birth and death dates—of an opioid casualty, lie laid out within a forensic chalk outline of a body.

Just as pointed, John Christian Anderson’s Sacrificial Lamb features a sculpted male head upended above hundreds of drug containers, and wires erupting from the neck contain a primitive bomb. “The hunger to get high overrides everything else,” the artist writes. The wires stand in for “interwoven veins where chemicals replace rational thought, emotional stability, and spiritual awareness.” And the bomb? Anderson intends it as a warning: “This crisis could be nothing compared to what lies ahead.”—N.P.B.

MUSIC
An Evening with Sutton Foster
boxoffice.harvard.edu
The magnetic Tony Award-winning actress, singer, and dancer performs Broadway tunes, and other songs from her album Take Me to the World. Sanders Theatre. (February 1)

Boston Philharmonic Orchestra
boxoffice.harvard.edu
The program includes Franz Liszt’s Piano Concerto No. 2, and Zoltán Kodály’s Dances of Galanta. Sanders Theatre. (February 20 and 23)

Harvard Group for New Music
hgmn.org
A concert of new works by Harvard composers features the international Schallfeld Ensemble, based in Graz, Austria. Paine Hall. (February 22)

NATURE
Arnold Arboretum
arboretum.harvard.edu
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As seen in HARVARD MAGAZINE

“Photo Revolution: Andy Warhol to Cindy Sherman,” at the Worcester Art Museum through February 16, explores the seismic impact of the modern art form. “Beginning with the rise of Pop art in the late 1950s and especially after its explosive take-off in the 1960s,” the exhibit notes, “it was photo-based media that drove much artistic innovation.” More than 225 works—like Tom Wesselmann’s mixed-media collage Great American Nude #36, above—contribute to an illustrated history of the later twentieth century. Diane Arbus and Garry Winogrand shaped novel views of “ordinary” people. Warhol and Roy Lichtenstein inverted traditional painting and print-making, mimicking “real” images and mining commercialism. John Dominis’s Black Power Salute, Mexico City Olympics (1968) and John Paul Filo’s Kent State (May 4, 1970) document actual events. Later, artists like Sherman and Nan Goldin would play with such concepts of “reality,” highlighting questions of personal/iconic identity. Through the 1980s, “The growth of photography as a consumer medium began to carry over into and influence the artists of the time,” notes Nancy Kathryn Burns, the museum’s Stoddard associate curator of prints, drawings, and photographs, becoming “the dominant form capable of delivering the real—or seemingly real—images that both artists and consumers now desired.”

- Lucy Pelham, Admissions Director

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Provincetown in the Off-Off Season

Just enough art, culture, good food—and conversation—“to keep you fully engaged”

by NELL PORTER BROWN

January in Provincetown can’t promise the carnival sizzle of summertime. But with the population whittled to around 1,000, and only 20 or so restaurants and bars open, the tip of Cape Cod offers, instead, “a wonderful, quiet romance,” says David Drake, artistic director of the Provincetown Theater—and no need to cope with the Commercial Street throng.

The theater itself hosts play readings, a weekend of “24 Hour Plays,” and The Mosquito Story Slam. Elsewhere, there are also art exhibits, films, a smattering of live-music performances, free community classes, and cozy lodgings for intrepid visitors. “And if it snows?” Drake adds. “It’s Disney—ridiculously beautiful.”

The natural drama of the ocean and the historic heart of the town are on full, bare-bones display. If the wind isn’t threatening to blow you down, it’s wonderful to bundle up and walk on the jetty and the beaches, or take some of the trails in and around the Cape Cod National Seashore. “You could be the only ones enjoying some of the most beautiful coastlines in the world,” says year-round resident Mike Miller, founder and publisher of the community media hub ptownie. There’s “a running joke in town that ‘Hey, I’ll see you at the Stop & Shop with your pajamas and slippers on.’ And I hate to say it—but it’s true!” he adds, laughing. “The supermarket is a very social place in January and February.”

Stopping to chat in the frozen-food aisle, in a community with so many creative people, can prove surprisingly illuminating. But, he assures, there are other, more formal activities and “just enough going on to keep you fully engaged—if you want to be.”

Ptownie’s seasonal guide highlights “year-round heroes”—the establishments that help keep the town’s fiery, artistic spirit alive during the fiercest months—plus communal gatherings that mitigate that otherwise ghostly feel of the Outer Cape, when the weather and remoteness can make it
YOU NEVER ACTUALLY OWN A PATEK PHILIPPE.
YOU MERELY TAKE CARE OF IT FOR THE NEXT GENERATION.

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productions in Manhattan. From the
time arts colony and vibrant haven and
time every other time of the year, they are
busy here. To delve into Provincetown's il-
tections, looms large—and poignantly so.
Steinem the character (played by Patricia Kalember, of the
pioneering feminist's iconic and personal journey to tell the wider, collective story of the modern
women's movement.

The play, based on Mann's research and interviews with Steinem, now 85, was first
produced off-Broadway in late 2018. Its text touches on Steinem's journalistic ex-
ploration—New York magazine columnist, co-founder of Ms. magazine—and the chal-
enges, like family instability and sexism, that she faced and has chronicled. Her rise
during the 1960s and '70s as the glamorous spokesperson for women's rights, how-
ever, is not spelled out. Steinem the character (played by Patricia Kalember, of the
Manhattan production) appears on stage more to illuminate and punctuate a story that
includes a cast of other landmark figures who rotate through scenes, animating his-
story—among them former New York congresswoman and crusader for liberal causes
Bella Abzug, radical African-American activist Angela Davis, and constitutional lawyer
and antifeminist conservative leader Phyllis Schlafly, A.M. '45. (Their presence may
make the play especially useful for younger women.) Steinem's mother, Ruth, a fragile,
mentally ill woman whom Steinem has said was instrumental in shaping her views on
social injustices and anti-women prac-
tices, looms large—and poignantly so.
Steinem has promoted the "talking
circle" as a method for airing volatile is-
issues. In the play's second act, a talking
circle actually takes place on stage, and
audience members are invited to par-
ticipate. In many ways, Mann's play can
be seen as a talking circle writ large, re-
fecting not only institutionalized femi-
nism, but the organic, continuous move-
ment of women. —NELL PORTER BROWN

Tuck into hot pastrami at Far Land
Provisions, or eggs Benedict at Chach. On
Monday nights, head to the "Coffeehouse
at the Mews" for dinner and local singers,
musicians, poets—anyone willing to share
their talents and performing passions.

Miller also points to evenings of live mu-

Gloria: A Life, at the American Repertory Theater January 24-March 1, is not a bi-
opic. Instead, playwright Emily Mann '74 and director Diane Paulus use the pioneering
feminist's iconic and personal journey to tell the wider, collective story of the modern
women's movement.

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From the
New York City
production
The protected harbor has historically sheltered boats and visitors from the elements—and nurtured creative spirits. By the mid 1700s, Provincetown was an established fishing community that grew exponentially, following the American Revolution, into a prime commercial port, with a large Portuguese population. In November 1898, however, the Portland Gale struck the coast and destroyed wharves and other fishing infrastructure, effectively wiping out the industry, prompting area leaders to rethink and rebuild the local economy through tourism. The influential Cape Cod School of Art—the nation’s first outdoor school of figure painting—was founded in 1899, and the town was soon attracting artists, along with performers, intellectuals, and other bohemians, notably from Greenwich Village. The New York–based Provincetown Players produced two seasons, mounting shows at a fish house on the town’s Lewis Wharf. The second season, in 1916, featured a debut play by a young writer named Eugene O’Neill—later hailed as the father of modern American drama.

Fast-forward to the 1960s, when Provincetown saw an influx of hippies, head shops, and free-wheeling lifestyles, and then to the 1970s, when it became home to a growing gay population, such that in 1978 the Provincetown Business Guild was established to promote gay tourism.

Learn more about local history at the Provincetown Public Library. It’s housed in what was originally an 1860 church, and has since been an arts center and the Heritage Museum, before the town overhauled the interior and opened the library there in 2005. The grand and airy space has sunlit nooks for reading and writing, and displays of items from the heritage collection. A half-scale model of the Rose Dorothea, an “Indian head” schooner (the original boat was built in 1905 at a shipyard in Essex, Massachusetts), stands stalwart in the children’s room. The library is a vital community resource; check the website for public events.

Anyone can also join in Winter Wednesdays (February 5–March 25), a program of free, drop-in classes sponsored by several town agencies. Last year, classes ranged from woodworking and cake-decorating to drumming, Humphrey Bogart Movie Nights, and a very well-attended series of candid, open-ended discussions on “The Art of Dying.” The classes bring people together to learn something new: combating the urge to stay home alone and hibernate. “I learned to sew last winter!” Miller says. “It’s like going to summer camp again.”

The Provincetown theater ends its official production season with the December 20–22 performance of “Townie Holiday Extravaganza,” but the free “Winter Play Dates”—full-length readings of new works—start on January 28 (and are held every other Tuesday—February 11, 25; March 10, 24, April 7). Author, playwright, and educator Gary Garrison, former executive director of The Dramatists Guild of America, leads the effort, organizing writers and readers from Cape Cod, Boston, and New York City. There’s a Q & A with the playwrights following each reading, and a cash bar in the lobby.

Also on tap, during President’s Day weekend (February 14–16), are the “24 Hour Plays.” Licensed under the New York City-based 24 Hour Play organization, these impromptu productions are written, directed, staged, and performed, in a flurry of intensive collaboration, from Friday to Sunday. Typically, a few props—like a pair of fog glasses, a bucket, and a blow horn—must be incorporated into the play, Drake explains: “So these tend to be comedies and they’re fun, and the quality is varying—but that’s all part of the fun of it.”

The Mosquito Story Slam, started about seven years ago, is a live event and podcast produced by Boston-based filmmaker and educator Vanessa Vartabedian. It will take place at the Provincetown Theater every second Saturday from January through April. Story themes are announced in advance, and on the night of the performance, participants sign up at 6:30 p.m., and start slaming a half-hour later. “There are no judges, no prizes,” Drake says. “Just ‘come on down’ when your name is called.”

Before or after any show, head to restaurants and bars. Closest is Fanizzi’s Restaurant by the Sea—more like in the sea, separated by pilings. Sit at the large, well-stocked bar or in the dining room; meals center around traditional Italian-style entrées, like chicken parmigiana. The place provides its own theater during a storm, or when the waves are running high, and the ocean churns right outside, or water slams against the windows.

Mac’s Fish House, as implied, is all about fresh seafood—from swordfish curry and lobster fra diavolo to fried scallops and sashimi. It tends to hold “foodie evenings and specials,” Miller notes, “like sooodle-bowl nights and wine-pairing dinners.” But The Canteen—walk-up counter, wooden tables, and basic nautical décor—has, arguably, the best lobster roll in town, along with crispy Brussels sprouts, fish and chips, a meatball melt, and falafel salad: something for everyone, and all cooked fresh, with care. For finer dining and more traditional classics, like caesar salad, lemon chicken, and beef stroganoff, head to the Landing Bistro & Bar, at the Pilgrim House hotel. Events and entertainment are also planned this winter,
ALL IN A DAY:
Harvard’s White Mountain Cabin

In 1962, a group of hard-working, eager Harvard Mountaineering Club members with limited construction skills and tools managed to erect a log cabin on the eastern slope of Mount Washington. It’s still there—and anyone who wants to can trek two miles up through snow, ice, rain, or fog and use the place between December 1 and April 1. “Most of the people are ice-climbers and back-country skiers,” says club president emeritus Vladislav Sevostianov ’19. “It’s the only full structure on the mountain where you can stay in the winter, which is part of what makes it so special.”

It’s certainly a unique place to spend time in nature—and off the grid. There’s solar-powered lights, a wood stove, propane for cooking, and an outhouse. Water is lugged in, or collected from a stream. About 16 people fit in the sleeping loft, and several nearby tent sites accommodate winter campers. To stay there, visitors merely check availability and sign up for space at the Pinkham Notch Visitor Center, adjacent to the Tuckerman Ravine Trail that leads to a cut-off route to the cabin. (The cabin’s on-site caretaker also has a radio for emergencies.)

The warnings aren’t intended to scare off visitors. Newcomers are always welcome, provided they learn to adapt to winter conditions. Ted Carman ’63, among those who led the cabin-building brigade, has hiked and ice-climbed throughout the White Mountains—and beyond. A few years ago he celebrated his seventy-fifth birthday at the cabin, scaling the 500-foot South Gully: “It’s the easiest of the snow and ice climbs, but I got a big kick out of it!”

As undergraduates, Carman and fellow club members requested permission from the U.S. Forest Service, which owns the land, to build a new structure in early 1962 after a preexisting Harvard cabin fell into disrepair. Approval was granted, but only, Carman learned years later, because “they thought there was no way college students” would succeed. But that June, having identified a likely site near Huntington Ravine, and hauled in supplies from Tuckerman Ravine—boards, nails, roofing, and at least a tone of Sakrete for the foundations—the students got to work.

Robert B. Redmayne ’65 captured the rookie exploits in amusing terms for the May 1963 Harvard Mountaineering Journal. “Clean healthy expectations of hard work in a spring-scented forest were dulled into a dirty depression wrought by hours of clawing into the wet, sticky half-soil that covers the middle of slopes on the mountain,” he wrote. “And there is the procession of eager Harvard friends and acquaintances lured up by Ted Carman from weekend to weekend, shocked and appalled by the dirt and the work, exhausted and mute after two days.”

“We really didn’t even know how to get the trees, for the logs, down,” Carman recalls. “We’d cut them through and they’d tip, then just lean there, held up by adjacent trees.” Despite all that, after a few weeks of arduous 12-hour days, the neophytes had cleared the site, built nine foundation piers, bolted on the base logs, and installed the floor joists. Still, upon reflection, the group concluded it was time to hire professional help, which arrived in September in the form of an omni-talented local builder and woodsman, Freeman Holden. He transformed the students into productive underlings, and by October, the cabin was finished. “That December, we put in the wood stove, and the cabin’s been in use ever since,” Carman adds. “And really, the most remarkable part is that over the last 57 years, undergraduates at the club have taken care of this cabin. Someone has always stepped up and said, ‘I will take this on,’ and they do.”

—NELL PORTER BROWN

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residencies at Provincetown’s Fine Arts Work Center. The nonprofit center helps keep the local arts vital, and each season selects 20 emerging artists and writers for seven-month fellowships. It also hosts its own winter series of readings and solo exhibitions of fellows’ work, along with events with other guests artists and writers. “Energetic and intimate,” says Lydia Marie Hicks, the visual-arts fellowship coordinator, these gatherings are “an exciting way to see the future of the art and writing worlds unfold.” Check the website for schedule details.

Varying accommodations are open in January and February. Besides Pilgrim House, ptownie’s Miller cites the Aerie House, Anchor Inn Beach House, Benchmark Inn, Reverie Guesthouse, and Gifford House. The lovely Carpe Diem Guesthouse and Namaste Spa is also open (except for the last three weeks in January), and Eben House and Stowaway (both closed for January) re-open February 1. Also note that both the Crowne Pointe Historic Inn (and its Shui Spa) and the Crown and Anchor re-open for the 2020 season on Valentine’s Day weekend. Although the usual spas and massage studios are not officially open, visitors can always find bodywork professionals and recommendations through the Provincetown Community Space on Facebook, Miller explains.

The off-season best suits city dwellers seeking a slow-moving, peaceful time, anyone immersed in creative projects, those who want to sit by a fire and read a book—and people eager to get outside and enjoy the volatile weather. “There are only about a thousand local people here, but they are some of the most interesting people you will ever meet,” he adds. “That’s what’s amazing about this place. There’s all this beauty—and people who appreciate that beauty; and art, and acceptance, people who appreciate everyone for their misfit qualities.”

Settle in for sunset views at Provincetown mainstay Fanizzi’s Restaurant by the Sea.

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Eat, Drink, Read

Checking out the Boston Public Library’s cozy winter hideout
by Nell Porter Brown

If you agree with C.S. Lewis that “eating and reading are two pleasures that combine admirably,” then head straight to the Map Room Tea Lounge, at the Boston Public Library.

The amber-toned room with a vintage feel opened last year in the landmark Copley Square building, and offers a homey hideout—especially during the winter. “People who want to get together after work, relax, and have drinks,” says Michael Colford, director of library services, “now they just come to the library.”

Sit at the bar or café tables to order beer, wine, or literary-themed cocktails like the Olive ‘r’ Twist and Tequila Mockingbird. A shareable charcuterie board and tartines (open-faced sandwiches) top the “bar bites” menu; or try the traditional afternoon-tea fare: savory crust-less sandwiches and sweets.

The place draws a diverse, quiet crowd. One late afternoon, Newbury Street boutique-shoppers, local lunchers, and scholars shared the lounge, or chose the adjacent, more formal, Courtyard Tea Room. Young couples, tourists, and others taking the library’s terrific tours of the historic 1895 McKim, Mead, & White building drifted in for drinks or deserts. “We’ve seen a huge change here since the 2016 renovation of the [modern] Johnson building,” reports Colford. “An upswing in the desire for, and use of, public space that’s open and welcoming.”

The American Renaissance-style main building, inspired by the Sainte-Geneviève Library in Paris, was designed by architect Charles F. McKim (recipient of an honorary master’s from Harvard in 1890). During the cornerstone-laying, Boston’s revered author Oliver Wendell Holmes, A.B. 1829, M.D. ’36, L.L.D. ’80, proclaimed: “This palace is the peoples’ own.” The attached 1972 building is the work of architect Philip Johnson ’27 (’30), B.Arch. ’43; it was restored and renovated by William Rawn Associates, Architects, Inc. (founding principal William L. Rawn III is J.D. ’69; read a profile at harvard-
mag.com/rawn-09). The McKim building tours cover art and architecture—statues, inscriptions, decorative motifs, and the interior courtyard. Inspired in part by that of Rome’s Palazzo della Cancelleria, the courtyard is a calm haven with sunny nooks, even in the winter—and just steps away from the lounge and tea room.

The lounge fills a fairly cavernous space once reserved for rare and other archival maps. The vaulted tiled ceiling, designed by architect and builder Rafael Guastavino, who based it on the Catalan arch, is now dramatically lit. Reproduction vintage maps of Boston hang on the walls. Add to that the old-fashioned, Edison-style light bulbs, desk globes, and an antique bicycle, and you get what Salvatore J. DeGeorge, general manager at the The Catered Affair, which operates the library’s restaurants, calls a “rustic, industrial-revolution vibe and style.” The place is comfortable and theatrical, as if you’re drinking and dining on a stage set.

Shelves at the host station hold a hodgepodge selection of books: Yukio Mishima’s Thirst for Love and Frederick the Great, by Thomas Carlyle, along with Windjamming to Fiji, by Viola Irene Cooper. But the bookcase behind the bar is clearly meant for bottles, which are put to good use by friendly bartenders in signature tea-infused drinks (s12). “The Dickens” (so listed) offers Earl Grey-flavored gin and pineapple juice; “Of Milk and Men” blends chai bourbon with splashes of vanilla and bitters. Combine drinks, or a pot of tea, with anything on the bar menu. Truffle-oil-fried kettle chips with onion dip are rich and filling (s6); assorted soups with bread (s9), less so. Dollops of honeycomb and quince jam come with the fine charcuterie board, along with olives and grapes (s14-28). The prosciutto and fig (s12) and “avocado mash” (s9) tartines are especially tasty. Reservations are not taken for the “bar bites” menu, but are required for the more elaborate tea-service menu (offered either in the lounge or the tea room).

The latter, a gracious wedding-cake of a room, suits an afternoon indulgence, special occasions, or any time an injection of old-world romance is warranted. But it lacks the cozy atmosphere of the lounge—and the chocolate torte with espresso sauce (s9).

Both dining spaces are relatively quiet, unlike the buzzy hive of activity at and around the Johnson building’s Newsfeed Café. That casual grab-and-go venue—drinks, sandwiches, salads, and pastries—is located in the wide-open lobby near the intersection of Boylston and Exeter Streets. People of all ages and backgrounds fill the tables, reading, writing, listening, and talking. A glassed-in WGBH studio, with live broadcasts, anchors a corner, enabling people to tune in—or not. Along one bank of windows facing the street, patrons can sit and work while people-watching. “We’re finding that people like the energy, and want to be in communal, public spaces,” says Michael Colford—even if they’re headphoned and immersed in screen work.

What would C.S. Lewis have made of all this? “Of course not all books are suitable for meal-time reading. It would be a kind of blasphemy to read poetry at table,” he asserted in Surprised by Joy: The Shape of My Early Life. “What one wants is a gossipy, formless book which can be opened anywhere—Bo-swell, and a translation of Herodotus, and Lang’s History of English Literature. Tristram Shandy, Elia, and the Anatomy of Melancholy are all good for the same purpose.” Feel free to grab one such volume from BPL’s stacks, and proceed to the lounge, tea room, or café—with Lewis’s blessings.

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CLASSIC TURN-OF-THE-CENTURY TWO-FAMILY COMING SOON!

Ways to Support Your Well-Being in the New Year

The gifts are tucked away, the wine bottles have been corked, and you’re ready to start fresh for the new year — likely with some resolutions in mind. Whether your clean slate involves financial, emotional, or physical well-being, there are plenty of opportunities right in Cambridge to keep you motivated and serene.

If you’re hoping to get your budget on track after holiday splurges, look no further than the Harvard University Employees Credit Union, which offers several personal finance workshops in January for community members. Enroll in courses including “Personal Finance Summit: Reach Your Money Resolutions in 2020” and “Financial Independence: Why Managing Your Finances Matters.” Find more details at huecu.org/workshops.

Redoubling your efforts to pay down student loans? Visit the First Republic Bank’s Brattle Street branch to learn more about their in-house refinancing options; it’s one of their primary focuses. Visit firstrepublic.com/student-loan-refinancing for more information.

If too much revelry has you craving a slice of Zen, drop into the Harvard Center for Wellness and Health Promotion. New in January 2020, Blue Cross Blue Shield of Massachusetts (BCBSMA) members, along with Harvard University Group Health Plan members, receive coverage for up to 20 acupuncture visits per calendar year—no referrals needed. Or simply try a tai chi or Pilates class. Go to wellness.huhs.harvard.edu for details.

Also in January, the Harvard Dance Center partners with the Harvard Office of Sexual Assault and Prevention to offer a free “Yoga for Restoration” course, beginning on January 27. Recalibrate with one hour of yoga, including conscious breathing exercises, low-to-moderate-intensity physical movements, and guided meditation. Learn more at harvarddance.asapconnected.com.

If you’re hoping to work off some holiday indulgence, drop into Harvard Recreation for a full 30-minute fitness assessment. A certified personal trainer provides a comprehensive look at your body mass index, body composition, weight, endurance, and upper body strength, so you can exercise with confidence. Find details at recreation.gocrimson.com.

Finally, if expanding your mind tops your list, enroll in a Harvard Division of Continuing Education course. Coming up this spring: “Introduction to Lifestyle Medicine,” focusing on nutrition, stress management, sleep, and more; and “The Good Life: Learning From Classical India,” examining how South Asian intellectuals defined happiness, pleasure, and fulfillment. See more courses at dce.harvard.edu. For an artsier spin, try the Cambridge Center for Adult Education’s “Intuitive Painting for Non-Artists” course, focusing on painting for stress relief and mindfulness—absolutely no skill required. Enroll at cae.org.

KARA BASKIN
BRAIN BIOMARKERS

A Blood Test for PTSD?

When soldiers returned from the Vietnam War with symptoms such as flashbacks, nightmares, and hypervigilance, researchers began calling the condition post-traumatic stress disorder (PTSD), a diagnosis that was viewed by some with skepticism. The doubts and stigma made many veterans hesitant to report their symptoms. Now, decades later, a new blood test shows promise in diagnosing PTSD by spotting genetic and cellular changes that accompany the disorder, suggesting that this condition is not just “all in the head.”

That test reflects nearly a decade’s study of PTSD by more than 75 researchers, including Frank Doyle, Armstrong professor of engineering and applied sciences and dean of the Harvard Paulson School of Engineering and Applied Sciences (SEAS), and graduate student Kelsey Dean. Hailing from institutions including New York University, the University of California, San Francisco, and the U.S. Army, the scientists analyzed blood work and other biological data from men who had served in combat in Afghanistan and Iraq, in an effort to identify indicators strongly linked to the condition.

One focus of Doyle’s lab is systems biology. That field often involves processing giant quantities of diverse data types to identify connections and understand how systems function, so Doyle and Dean oversaw much of the data and systems analysis for this project. In this case, the data included biomarkers such as genes, metabolites, hormones, proteins, cell-aging indicators, and immune-cell counts. Researchers began by collecting blood samples and other readings, such as resting heart rate, from 83 combat veterans with a PTSD diagnosis, and 82 who experienced combat but did not have PTSD. The resulting data yielded more than a million data points to analyze per person.

The consortium of labs then scrutinized the data using a “wisdom of crowds” approach (also employed in economics and finance), which values collective wisdom over individual insight. “We challenged all the labs involved to use their own methodologies, to bring their own insights to the problem,” Doyle explains. “We wanted to really benefit from this massive brain trust that we had assembled and see what the union of all possible biomarkers would be.” Pooling all those findings narrowed the million indicators down to 343. The researchers then used additional statistical techniques to pinpoint a set of 28 indicators highly predictive of PTSD.

When those 28 were tested on a new group of 29 male veterans with PTSD and 29 without, and the results compared to those from the questionnaire clinicians currently use to diagnose PTSD, the researchers found the blood test had accurately diagnosed the disorder 77 percent of the time. The 28 markers include immune signatures, stress signatures, and mark-
ers of cardiovascular health—all of which made sense based on previous research on PTSD. For example, “Evidence suggests links between PTSD and Type 2 diabetes and cardiovascular disease,” Dean says, “so it’s really interesting that we see these markers come up and show that linkage.”

Achieving a positive blood test for PTSD could identify people who need additional assessment and treatment, but more research is needed before these findings can be applied in the field. Not only must the panel be tested on a much larger group of veterans, but more work is required to understand what PTSD looks like in women and when caused by scenarios other than combat. “We’re not declaring victory—game over—that these 28 are the magical 28 markers for men, women, civilians, firefighters, police, military, veterans,” Doyle says. “This is just the beginning. We don’t talk about one type of diabetes; we don’t talk about one cancer. One might expect that there’s not necessarily one stress disorder.”

Doyle and Dean theorize that their results mark the beginning of new approaches for a variety of psychiatric illnesses. The diagnostic surveys that practitioners currently use are sophisticated and effective, but require that patients accurately report their symptoms. Blood tests could help identify more people who are suffering. “We’re starting to evolve in the way we think about mental-health disorders: treating and analyzing them in a way that’s more similar to how we think about problems like cancer,” Dean says. “To think that a disease that people associate with mental health and the brain could actually have a signal that gets into blood, that could be used to diagnose it and identify new drugs to treat it—this is a huge paradigm shift.”

FRANK DOYLE GROUP WEBSITE

doyle.seas.harvard.edu

Could College Be Free?  

GETTING AHEAD—or getting by—is increasingly difficult in the United States without a college degree. The demand for college education is at an all-time high, but so is the price tag. David Deming—professor of public policy at the Kennedy School and professor of education and economics at the Graduate School of Education—wants to ease that tension by reallocating government spending on higher education to make public colleges tuition-free.

Deming’s argument is elegant. Public spending on higher education is unique among social services: it is an investment that pays for itself many times over in higher tax revenue generated by future college graduates, a rare example of an economic “free lunch.” In 2016 (the most recent year for which data are available), the United States spent $91 billion subsidizing access to higher education. According to Deming, that spending isn’t as progressive or effective as it could be. The National Center for Education Statistics indicates that it would cost roughly $79 billion a year to make public colleges and universities tuition-free. So, Deming asks, why not redistribute current funds to make public colleges tuition-free, instead of subsidizing higher education in other, roundabout ways?

Of the estimated $91 billion the nation spends annually on higher education, $37 billion go to tax credits and tax benefits. These tax programs ease the burden of paying for both public and private colleges, but disproportionately benefit middle-class children who are probably going to college anyway. Instead of lowering costs for those students, Deming points out, a progressive public-education assistance program should probably redirect funds to incentivize students to go to college who wouldn’t otherwise consider it.

Another $13 billion in federal spending subsidize interest payments on student loans for currently enrolled undergraduates. And the remaining $41 billion go to programs that benefit low-income students and military veterans, including $28.4 billion for Pell Grants and similar programs. Pell Grants are demand-side subsidies: they provide cash directly to those who pay for a service, i.e., students; supply-side subsidies (see below) channel funds to suppliers, such as colleges. Deming asserts that Pell Grant money, which travels with students, voucher-style, is increasingly gobbled up by low-quality, for-profit colleges. These colleges are often better at marketing their services than at graduating students or improving their graduates’ prospects, despite being highly subsidized by taxpayers. “The rise of for-profit colleges has, in

SUBSIDY SHUFFLE

Illustration by Adam Niklewicz

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some ways, been caused by disinvestment in public higher education. Our public university systems were built for a time when 20 percent of young people attended college,” says Deming. “Now it’s more like 60 percent, and we haven’t responded by devoting more resources to ensuring that young people can afford college and succeed when they get there.” As a result, an expensive, for-profit market has filled the educational shortage that government divestment has caused.

The vast majority of states have continuously divested in public education in recent decades, pushing a higher percentage of the cost burden of schools onto students. Deming believes this state-level divestment is the main reason for the precipitous rise in college tuition, which has outpaced the rest of the Consumer Price Index for 30 consecutive years. (Compounding reasons include rising salaries despite a lack of gains in productivity—a feature of many human-service-focused industries such as education and healthcare.) Against this backdrop, Deming writes, “at least some—and perhaps all—of the cost of universal tuition-free public higher education could be defrayed by re-deploying money that the government is already spending.” (The need for some funding programs would remain, however, given the cost of room, board, books, and other college supplies.)

Redirecting current funding to provide tuition-free public-school degrees is only one part of Deming’s proposal. He knows that making public higher education free could hurt the quality of instruction by inciting a race to the bottom, stretching teacher-student ratios and pinching other academic resources. He therefore argues that any tuition-free plan would need to be paired with increased state and federal investment, and programs focused on getting more students to graduate. Because rates of degree completion strongly correlate with per-student spending, Deming proposes introducing a federal matching grant for the first $5,000 of net per-student spending in states that implement free college. “Luckily,” he says, “spending more money is a policy lever we know how to pull.”

Deming argues that shifting public funding to supply-side subsidies, channeled directly to public institutions, could nudge states to reinvest in public higher education. Such reinvestment would dampen the demand for low-quality, for-profit schools; increase college attendance in low-income
TIGER NOW

David Deming, if the state is better able to measure the worth making Deming, that’s a trade-off funding for private, four-year degrees. But, a supply-side subsidy system would take cause buyers (students) often don’t have of Kalamazoo, Michigan. Including the state of Tennessee and the city of effects has surfaced in some of the areas that er. Early evidence of these positive feedback. Quality feedback is difficult to scale well without hiring more teachers and ramping up student-support resources. That’s why Deming thinks it’s high time for the public higher-education market to get a serious injection of cash.

~ Cherone Duggan

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GREAT WAVE

The Coming Eldercare Tsunami

20 years from now, Japan will become the first society in the world in which more than 40 percent of the population will be older than 65. China, after 36 years of a “one-child policy,” will soon follow. There the absolute numbers are staggering: the count of those over 65 is already larger than the combined elderly populations of Japan, Germany, the United Kingdom, France, and Australia. By 2040, a quarter of China’s population—more than a third of a billion people—will be over 60. “We’ve never seen societies like this,” says Rabb professor of anthropology Arthur Kleinman, who is also a professor of psychiatry and medical anthropology at Harvard Medical School (HMS). But there will be plenty of them in the decades ahead.

Such impending demographic distortions are often framed in economic terms. In China, for example, four workers currently support each retiree; by 2040, there will be fewer than two. But the social question that engages cross-disciplinary scholars like Kleinman (he helped introduce the modern concept of depression to China in 1983) is how societies will care for all their elderly.

Four years ago, the leaders of the Jiangsu Industrial Technology Research Institute (JITRI), an organization in Nanjing that bridges research and commercialization (it drills for oil in the South China Sea, builds the software that runs China’s rapid trains, and develops biotechnology), “foresaw an enormous issue of frail elderly not being able to care for themselves,” says Kleinman. They approached him to see “if there might be a way in which technology could come together with anthropology and other social sciences to help elderly populations who are frail, isolated, or suffering from dementia.”

Kleinman has been skeptical of technological solutions to social problems—they rarely take social and cultural mores into account, he points out—so bringing an anthropological perspective to the deployment of technology intrigued him. And he has experienced personally the physical and mental challenges of caring for elderly patients (see “Find My Real Husband,” an excerpt from The Soul of Care, his book about tending his wife as she succumbed to Alzheimer’s disease, September–October 2013, page 58). With funding from JITRI, he assembled a transdisciplinary group of researchers from Harvard’s schools of engineering, design, medicine, business, and public health and three Chinese universities to develop “socially and culturally appropriate technological solutions to improve care for frail and demented elderly in China.”

At the same time, then-Harvard president Drew Faust funded a student research program, led by HMS assistant professor of psychology Hongru Chen, in which students of engineering, medicine, anthropology, and other social sciences could collaborate with each other locally and with Chinese students to develop eldercare solutions. How could they make robots, sensors, cellphone apps, and exoskeletons (see below) effective in practice for elderly Chinese? And what could they learn from each other and their faculty advisers?

Kleinman, who co-led that program, says the first year was deeply engaging and pedagogically effective because the inter-disciplinary nature of the work pushed the participants to think differently. Daria Savchenko, a postdoctoral fellow who studied the anthropology of technology, explains that the anthropologists were trained to observe and interview patients to discern their most important needs, the “medical students knew more about physiology and the healthcare system,” and the engineers brought an “understanding of technologies like exoskeletons” that the others didn’t have. Yidi Wang, whose M.D./Ph.D. studies in the HMS Pathways program bridge clinical medicine, research, and policy, and who

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* The Yard Ventures 4 is expected to hold between 25 and 35 investments.
“From an anthropological perspective, the issue for frail elderly is really their isolation and loneliness, and desire for mobility.”

was raised by her grandparents in China until she was 10 (a common practice there), joined the program because she wanted to understand the perspectives of engineers, anthropologists, and designers. Jessica Ding ’20 recalls that the business students always wanted to know, “What’s the deliverable?” That really kept us accountable.” By the end of the year, the students had developed a kit of 10 low-cost physical interventions (from alert dongs and medication-reminder aids to raised toilet seats) to improve the lives of senior citizens.

The faculty group, meanwhile, focused on the results of a needs assessment performed by Jing Jun, Ph.D. ’94, a former Kleinman student who is now a professor of anthropology at Tsinghua University. “From an anthropological perspective, the issue for frail elderly is really their isolation and loneliness, and desire for mobility,” says Kleinman, “because it turns out that a fair number of Chinese elderly would prefer to be in assisted living or nursing homes with people their own age.” Why? “Picture yourself in a small apartment in Shanghai, living with husband, wife, and child. The husband and wife leave for work, the child goes to school, and you are left alone from breakfast to dinner time. And after school the adolescent child plays music and video games that are completely out of the experience” of the elderly person. “So you have this paradox, because it is adult children who feel a stigma.

“We found if we could do things to help people who feel isolated,” he says, “that would speak to both the mobility problems and cognitive problems of not being able to get together socially.” To that end, they showed Chinese seniors a remarkable exoskeleton for the legs designed by McKay professor of engineering and applied sciences Conor Walsh that enables people with the festinating gait of Parkinson's disease, or are weak or recovering from a stroke, to walk again (see “Wearable Robots,” January-February 2014, page 14). The elderly Chinese responded that they would never use such a device. In China, where “crosswalks are a notional thing,” and even a stop light may be ignored, Kleinman explains, the seniors worried that walking would be too dangerous. An exoskeleton for the arms, however, that would help an aide or partner lift a patient into a wheelchair or a van to visit friends, he continues, showed how “technology and social science could come together to improve people’s lives.” He envisions effective, appropriate deployment of technology that is built directly into social systems: making such empowering devices and systems available even to low- and middle-income seniors who couldn’t otherwise afford them, and letting people use them in groups.

Kleinman says the programs’ work ties to many other important questions about how people live the last portion of their lives. What should the state provide for eldercare, and what should be provided by families, or even employers? He is exploring the possibility of extending the study beyond China to existing eldercare collaborations in Thailand and Vietnam. But his interest also extends to the United States, where 16 percent of the population is already older than 65, and where he sees an opportunity for community-health workers to provide low-level psychotherapeutic interventions critical for responding to depression among the elderly. “My feeling,” he says, “is that what we learn in the Chinese setting may very well have an application here.”

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Grad Students Strike

At press time, two days before the beginning of winter reading period, the Harvard Graduate Student Union—United Auto Workers (HGSU-UAW) began a strike, with day-long picket lines planned during the first week of December in Harvard Yard and at the Longwood medical campus. “We’re disappointed that we haven’t been able to make headway in discrimination and harassment protections,” said Aaron Bekemeyer, a sixth-year Ph.D. candidate in the history department, one of several hundred union members picketing in the Yard. Harvard and the 5,000-member union have reached some agreements since negotiations began more than a year ago, but they’ve remained at an impasse on some of HGSU-UAW’s key demands. In October, more than 90 percent of voting union members elected to authorize a strike, and little progress has been made since then on either compensation or the union’s demand for an independent investigation process for harassment and discrimination.

“We definitely see striking as a last resort, but we’ve run out of alternatives to address some of our core demands,” said Ege Yumuşak ’16, a Ph.D. candidate in philosophy and member of HGSU-UAW’s bargaining committee, in an interview in November. A strike “will neither clarify our respective positions nor will it resolve areas of disagreement,” University provost Alan...
Shawn Kinew is interested in how early modern sculptors pushed the boundaries of what sculpture should be able to do. “Even though they’re carving in hard marble,” explains the assistant professor of the history of art and architecture, “they’re making it look like fur or flesh that’s so soft that it looks like you could poke it and it would spring back. ...It’s been created to make you stop in your tracks and go, ‘Wow, meraviglia, it’s marvelous.’” Kinew remembers a similar feeling from her days as a child ballet dancer: That was “the first aesthetic experience I had where I was just completely enraptured by what I was seeing.” As a child, she split her time between Winnipeg and her home community, an Anishinaabe reserve in northwestern Ontario. Her father, an “intellectual force,” participated in dialogues between academic scientists and Native American knowledge keepers on physics and cosmology. “That was the milieu that I grew up in,” Kinew says; it helped lay the foundation for her curiosity about ideas and the human experience. In college at the University of Toronto, she was immediately captivated by art history. “The best course I took was a six-person class on Caravaggio where we didn’t read any secondary literature—only biographies from the seventeenth century.” After a Ph.D. from Harvard and postdoc at Stanford, she returned to Cambridge in 2018, in art history and as Shutzer assistant professor at the Radcliffe Institute. In her course “Old Masters in a ‘New’ World,” Kinew challenges students to think about how canonical European artists fit into the new landscape of art history. “Michelangelo has a lot to teach us about gender and sexuality,” she says. “Titian and Van Dyck have a lot to say about race and colonization. We just weren’t asking the right questions before.”

—MARINA N. BOLOTNIKOV

Garber, who is Harvard’s lead negotiator for this contract, said in an email to the campus community. Harvard has notified students that it will make “every effort” to ensure that semester grades and exams are not disrupted, and has sent faculty members guidance on completing grading and instructional work during the strike.

In an email to its members, the Harvard Union of Clerical and Technical Workers, which includes workers in the University’s libraries, museums, labs, and elsewhere, said: “One very meaningful way you can show support for striking HGSU-UAW workers is by turning down work you are asked to do that would normally be done by striking graduate students.” Local and state lawmakers, including the Massachusetts congressional delegation, have also expressed support for the student workers.

Harvard has offered HGSU-UAW pay raises of 8 percent over three years for salaried students, and 7 percent over three years for teaching fellows. It has also proposed raising minimum hourly pay for all student workers to $15, and to $17 for instructional workers. Currently, hourly workers may make substantially less: “There are people on this campus who are making minimum wage [$12 per hour],” Yumusak said.

Student workers’ main compensation concern, said bargaining committee member Justin Bloesch, a Ph.D. candidate in economics, is that it keep up with the cost of living. “Two years ago, in response to underperformance of the endowment, stipends were raised 1.5 percent, but Harvard housing was increased by 3 percent,” he pointed out.

Students are also concerned about how “top-up” payments will factor into raises. When Ph.D. students begin teaching, typically in their third year, a portion of their pay comes from that work, but not enough to equal the living stipends they received in their first and second years. The top-up, which amounts to $3,825 per semester this year, makes up the difference. But Yumusak noted that Harvard considers this money financial aid, not pay, so it may not be included in any pay raises in the final contract. The University is effectively “refusing to negotiate over total compensation,” she said.

Benefits are at issue, too. Graduate students don’t automatically receive dental insurance, nor are spouses or children covered. “It’s $7,000 to insure a spouse, $4,000 to insure a child” for healthcare, Bloesch said. The University has offered the union some help
to cover some of these expenses, including a fund of $300,000 per year to defray the cost of spousal and child health insurance, and a fund of $100,000 for students’ dental costs. HGSU-UAW has argued that the costs of health care are too high for these funds to make much difference: $100,000 would be enough to defray each Ph.D. student’s annual dental cost by about $25.

Arguably the most contentious sticking point in the negotiations is the handling of sexual-harassment and discrimination cases. HGSU-UAW has proposed an independent, third-party arbitration process, similar to that used for other violations of the contract, whereas Harvard wants to investigate these cases through its Title IX Office and Office of Dispute Resolution, where University sexual-harassment cases are usually handled.

Discrimination and harassment became a core focus for HGSU-UAW in 2018, Yumusak said, after the case of former professor Jorge Dominguez came to light (see harvardmag.com/dominguez-18). “Eighteen women were harassed over three decades with no institutional accountability whatsoever,” she explained. “Students have lost trust in the institution’s ability to address these cases.

“The union’s proposal would carve out student workers as having a separate process from all other students, which we do not believe meets the requirements of current or proposed federal Title IX regulations,” University spokesman Jonathan Swain noted in a November statement. “The University has proposed significant opportunities for HGSU-UAW members to have an ongoing role in making recommendations on how to strengthen policies and processes aimed at preventing and addressing harassment and discrimination.” At the Faculty of Arts and Sciences’ November meeting, Alan Garber acknowledged the importance of these issues—but he disagreed outright with the union proposal.

The negotiations themselves are taking place in an uncertain landscape for the rights of student workers. In September, the National Labor Relations Board (NLRB) proposed a rule that would revoke the right of private university students to form labor unions. But whatever the fate of graduate students’ rights under the NLRB, Bloesch said, a key lesson of the unionization process has been that student workers can exercise power by withholding their labor: “Really, the power that we have is in the ability to strike.”

For more detailed coverage of the issues, see harvardmag.com/hgsu-uaw-strike-plan-19. Updates on the strike will be posted at www.harvardmagazine.com.

—Marina N. Bolotnikova

Divestment Debate, Overseer Slate

The debate over whether the University should divest any investments in fossil-fuel production from the endowment, begun nearly a decade ago, has reached a new level of intensity in recent months. In the fall, faculty advocates of divestment, who had long sought an open forum for airing the issue with the president and some representative of the Corporation, got their wish, with extensive discussions at the three regular Faculty of Arts and Sciences (FAS) meetings. Alumni and student activists maintained their campaign. And in early November, a nonprofit focused on youth engagement, led in part by two members of the College class of 2018, unveiled Harvard Forward: an effort to nominate a slate of petition candidates for election to the Board of Overseers this spring, to pursue governance reform and fossil-fuel divestment.

The Faculty Divestment Forums According to the Harvard Faculty for Divestment website, 385 members have signed on to the cause (the University Fact Book suggests there are about 2,300 faculty members in all)—a goodly number of them within FAS. The advocates’ presentations emphasized the urgency of acting, and the moral and political reasons for doing so. Opposing views focused on the potentially adverse political fallout; critiques of symbolic actions; and appropriate academic responses to climate change—in teaching and research. In other words, there was an informative airing of diverse perspectives on critical issues.

At the October discussion, with President Lawrence S. Bacow away for Rosh Hashanah, Vuilleumier professor of philosophy Edward Hall introduced the presentations, saying, “What we need is a shift on the part of the University as a whole, one that will…show the world and our peer institutions what it means to take a position of true leadership in addressing the most dangerous calamity humanity has ever faced.” Weld professor of atmospheric chemistry James G. Anderson outlined the science on the effects and risks of climate change, and said, “The analogue of ‘peace in our time’ from the 1930s, today is ‘climate denial and inaction in our time.’” And remarks were presented for Naomi Oreskes, professor of the history of science, who was ill, reflecting her scholarship on the energy industry’s deliberate efforts to obfuscate the science and frustrate policymaking attempts to address climate change.

In the subsequent discussion, responding to a question about the efficacy of divestment, Hall emphasized that it is a political statement: a signal that would “change the public discussion.” A full account of the proceedings and speakers’ statements appears at harvardmag.com/fas-divestdebate-oct-19.

The faculty reconvened on November 5.
Yesterday’s News
From the pages of the Harvard Alumni Bulletin and Harvard Magazine

1920 The Harvard football team, playing its first and last postseason game, defeats Oregon, 7-6, in the Rose Bowl.

1925 Five hundred students appear on January 10 for a final dinner in Memorial Hall before the University reluctantly closes the 50-year-old “Commons,” a money-loser since the end of World War I. Plans for the hall’s future employment, say the Bulletin’s editors, will be “awaited with a lively interest.”

1930 Applications from members of the class of 31 for places in Dunster and Lowell Houses (still under construction) far exceed the 168 spaces available.

1945 Harvard’s plans to help veterans complete their education include setting up a three-term calendar with 15-week semesters for the Law and Business Schools and one 12-week and two 16-week semesters for the Law and Business Schools.

1970 As experimental co-residency begins in some undergraduate Houses, the Faculty of Arts and Sciences decides to defer a vote on the merger of Harvard and Radcliffe Colleges pending fuller investigation of the implications for both institutions.

1975 Construction of Pusey Library, which is intended to house rare books, maps, and manuscripts, has been completed after 20 months of excavation work in the south Yard. The cost of the building totals $7 million.

1980 The Corporation approves a 12.6 percent increase in tuition, room, and board, raising the total fee to $9,170, and making the cost of attending Harvard College second only to that of MIT.


1995 Undergraduates and other Harvards returning from their winter breaks discover that Elsie’s, the unpretentious Mount Auburn Street eatery that dispensed definitive roast-beef sandwiches for 39 years, has gone out of business.

2005 In a speech addressing the possible reasons for women’s underepresentation in fields including mathematics, science, and engineering at elite research universities, President Lawrence H. Summers sparks a furor that goes global.

Illustration by Mark Steele

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with Bacow presiding, accompanied by former Corporation member Jessica Tuchman Mathews, who has a broad background in environmental and global affairs. Bacow promised they would jointly report to the Corporation on the proceedings.

Professor of astronomy Charlie Conroy, the first of three pro-divestment speakers, described the scale of climate change, and the imperative of acting not only individually, but institutionally: “The degree of action and change required to avoid the worst-case scenarios is far larger than anything we could hope to accomplish on our own, even as teachers and researchers...[D]ivestment...is...perhaps our best opportunity to catalyze action and change far beyond these walls.”

Phillips professor of early American history Joyce E. Chaplin then unspooled a pointed history of Harvard’s decisions about divestment, citing a case from the civil-rights era, the campaign to end apartheid in South Africa, and tobacco enterprises. “This danger,” she concluded, “demands that we end our complicity with the industries that deny their responsibility in creating our current state of emergency.” Barker professor of economics Stephen A. Marglin reviewed studies of divestment, concluding that the financial impact on the endowment would be nil—and that as the economics of energy change, it might be riskier to retain fossil-fuel investments.

In response, Hooper professor of geology Daniel P. Schrag (who is also professor of environmental science and engineering, and director of the University’s Center for the Environment) opposed divestment as symbolism. He lamented Harvard’s decision not to make academic work on climate change and energy a major priority for The Harvard Campaign, and advocated doing so now, on a massive scale.

Burbank professor of political economy James H. Stock—the member of President Barack Obama’s Council of Economic Advisers who worked on plans to reduce power-plant carbon-dioxide emissions, and stop leasing for new coal exploration on federal lands (initiatives the current administration is reversing)—cast divestment...
Jobs Well Done

We salute four outstanding contributors to Harvard Magazine for their work on readers’ behalf during 2019, and confer a $1,000 honorarium on each.

Our awards for distinguished writing happily recognize a veteran graduate and a recent one. The McCord Writing Prize (honoring David T.W. McCord ’21, A.M. ’22, L.H.D. ’36, and his enduring prose and verse, composed for these pages and the Harvard College Fund) justly goes to Chad M. Oldfather ’90, for “Throw Your Fastball,” his deft, self-knowing essay about coming to terms with being a freshman (September–October, page 46)—one of the nicest surprises we’ve ever received over the transom. And Lily Scherlis ’18, a former magazine Ledecky Undergraduate Fellow, applied different kinds of knowledge (about art history, and Harvard history) to fine effect in “What a Human Should Be” (March–April, page 44), extending beyond the Art Museums’ Bauhaus exhibition to the wider University. It is fitting to recognize the result with the Smith-Weld Prize (in memory of A. Calvert Smith ’14, former secretary to the governing boards and executive assistant to President James Bryant Conant, and of Philip S. Weld ’36, a former president of the magazine), it highlights thought-provoking articles about Harvard.

Illustrator Taylor Callery, a second-time honorand, did a superb job rendering the ideas explored in “Artificial Intelligence and Ethics” (January–February 2019)—one of the most important and widely read articles we published during the year. He reappears on page 9 in this issue.

And at the risk of repeating ourselves, we again recognize contributing editor Jim Harrison for imaginative, precise, and demanding photographic portraits and other assignments, from the physicians featured in “The Opioids Emergency” (March–April, page 36) and Nobel laureate Jack Szostak in the lab (“How Life Began,” July–August, page 40) to the synthetic-biology innovators, beginning on page 38, and athletic trainer Brant Berkstresser, on page 35, of this issue.

We are delighted to work with, and to thank, these superb professionals.

~The Editors

Chad M. Oldfather
Lilly Scherlis
Taylor Callery
Jim Harrison

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fessors as they arrived at University Hall for the November faculty meeting. “Today, we are asking you to advocate for us,” their flier read. “As FAS debates this critical question, we hope you keep in mind how important this issue is to us as students who will live through the increasing dangers of the climate crisis. We need a just, rapid transition to a decarbonized economy, which is why Harvard must cut its financial ties to the fossil-fuel industry....”

The alumni correspondents have apparently found a way to tap that energy. They informed Bacow and Lee that “we are working to engage a broad coalition of alumni who, like us, recognize the urgency of now. We have hired organizers to help us reach and communicate with alumni”. Canyon Woodward ’15 and Chloe Maxmin ’15, veteran undergraduate Divest Harvard leaders, have been retained, for 30 and 10 hours a week, respectively.

That focus on organizing aligns with the correspondents’ final point: “We think that the University should use its existing institutional resources such as the Board of Overseers and its range of alumni councils to help the University adjust to and target its financial resources to the growing climate crisis.” Although 3,000-plus supporters is just a percent or so of the alumni at large, it is a significant slice of potential voters in a Board of Overseers election, where participation is typically a low-teens percentage of those eligible.

An Overseers Challenge Slate
And there may well be such a contest this year. In early November, Harvard Forward announced a campaign, organized by Nathàn Goldberg ’18 and Danielle Strasburger ’18, advocating changes in University governance—and fossil-fuel divestment. Strasburger, the campaign manager, and Goldberg, strategist and policy adviser, are broadly interested in youth engagement. They have formulated a platform that would reserve six seats on the 30-member Board of Overseers for recent graduates of the College and the graduate schools; limit voting on those seats to younger alumni; and promote formal interactions between Overseers and the Undergraduate Council (UC) and the Harvard Graduate Council (HGC). One perspective the younger Overseers might inject, if petition candidates make the ballot and are elected, is fossil-fuel divestment.

Their effort brings with digital-era communications and campaign savvy. Within days of the announcement, Harvard Forward had secured UC and HGC endorsements, a high-profile Boston Globe op-ed in favor of the campaign, and times and venues for a baker’s dozen in-person meetings around the United States and in Mexico to talk about the initiative and advance the proposed slate of candidates’ petitions to get on the ballot. With the advent of online voting last year, the potential exists to galvanize a significantly higher turnout than during the last campaign by a petition slate, in 2016—and begins obviously, by building on a base of motivated divestment advocates.

For full background on Harvard Forward, the slate of petition candidates, and alumni and student divestment statements, see harvardmag.com/overseers-challenge-slate-19. Given wide agreement on the urgency of addressing climate change, and sharp disagreement within the community over how to do so, the issue promises to resonate. It will be equally interesting to see whether, at the same time, the University and the faculties find their way toward a more concerted effort, across the institution, to support research and teaching on climate change and sustainable forms of energy.

—JOHN S. ROSENBERG

The Black…and the Red
Harvard achieved its sixth consecutive budget surplus—some $308 million, up from $196 million in the prior year—according to the University’s annual financial report for the fiscal period ended June 30, 2019, published in late October. The surpluses realized from fiscal 2014 through the most recent year now total $769 million—the happy result of the proceeds from the $9.62 billion Harvard Campaign, a continued benign U.S. economic environment, and internal spending restraint. That cushion—surely the envy of other institutions of higher education—provides some protection against economic or financial adversity, and creates flexibility in paying for the continuing campus construction boom. It may also serve as a bridge during the multiyear effort to strengthen the performance of the endowment, the foundation of the University’s economic model. The accompanying report from Harvard Management Company (HMC) indicates both the magnitude of underperforming endowment assets, and the time it will take to reinvest the portfolio in pursuit of hoped-for enhanced returns.

Budget Highlights
Revenue increased nearly $300 million to about $5.5 billion (up 5.7 percent), in part reflecting slightly less stern restraints on distributions from the endowment, Harvard’s largest source of revenue (35 percent of the total). Expenses rose by almost $200 million, to $5.2 billion (3.9 percent). President Lawrence S. Bacow’s introductory letter acknowledged the evident strength, but cautioned that “we, along with all of our colleagues in higher education, must be conscious of the challenges of our current climate,” including an inevitable end of the economic expansion; the new federal taxes on university endowments (for which Harvard made an estimated $50-million provision in fiscal 2019); and uncertain federal funding for research.

Digging a bit deeper, student income totaled $1.2 billion. Given continued torrid growth in executive- and continuing-education revenues (up 12 percent), this is now a half-billion-dollar business, a distinguishing feature of Harvard’s operations compared to peer institutions. Those fees now essentially equal revenue (net of financial aid) from all undergraduate and graduate degree programs. The endowment distribution rose nearly $90 million (4.7 percent), to a bit more than $1.9 billion: a Corporation-approved 2.5 percent increase per unit owned by each school,
The Faculty of Arts and Sciences’ (FAS) annual financial statement revealed that it has been authorized to spend $960 million so far on House renewal, a sum that will apparently take it through perhaps one-third of the Adams House work. Extrapolating, completion of Adams might bring the bill to $1.1 billion to $1.2 billion, for about 1.05 million gross square feet of space: an indication of just how costly it is to do high-quality renovation, in tight quarters, in Boston’s pricey construction market. FAS is incurring substantial new debt to pursue the work—with the enormous Eliot and Kirkland House projects potentially looming over its budget later in the decade, posing hard choices about investing in faculty growth and new research priorities. Inevitably, that points to future fundraising (not least, to repurpose and re-equip the spaces SEAS will quit in Cambridge).

In that vein, Harvard continues to enjoy astonishing philanthropic support. Beyond the continued strength in current-use giving, even after the end of the campaign, pledges for future current-use gifts increased nearly $200 million. And even as past pledges for endowment gifts continue to be fulfilled, the balance for such pledges receivable increased by nearly $600 million in fiscal 2019, suggesting several major gifts in the pipeline, at least. An accounting change somewhat bolstered this year’s report, but the salient fact is that total pledges receivable increased by more than $900 million—after the Harvard Campaign.

On balance, the surpluses and pledge pipeline are obvious strengths in an uncertain, volatile world. Harvard’s costs will rise as expensive new facilities open, financial aid increases, researchers need more equipment and computing to conduct their work—and the Graduate Student Union negotiations likely result in enhanced compensation for that large cohort of workers. And of course University leaders are mindful that the endowment, now valued at $40.9 billion, represents little, if any, appreciation in inflation-adjusted terms from the pre-financial-crisis level of $36.9 billion in 2008—representing little, if any, appreciation in inflation-adjusted terms from the pre-financial-crisis level of $36.9 billion in 2008—a period during which Harvard’s expenses have increased by about $1.5 billion.

The Endowment
In his report, HMC chief executive N.P. Narvekar explained the substantial deployment of endowment assets that has taken plus growth reflecting earnings and distributions from new gifts (emanating from The Harvard Campaign and subsequent philanthropy). A similar 2.5 percent increase per endowment unit owned is budgeted for the current fiscal year, plus incremental distributions from gifts and other additions to the endowment. Sponsored research revenue rose modestly to $937 million, with federal grants weaker than those from foundations, corporations, and individuals.

In part, Harvard got lucky in fiscal 2019. Continuing and executive education was more robust than anticipated. Current-use giving, expected to tail off after the campaign, in fact increased modestly, as a large payment to fulfill a pledge came in at year-end. And there was a large royalty payment for the use of intellectual property.

About half of expenses are for compensation. Wages and salaries rose 4.9 percent, accelerating from fiscal 2018, reflecting pay increases and additional employees—many of them on term agreements related to research funding, or in growth areas like continuing and executive education. Employee-benefits costs appear to have decreased. In fact, benefits for active employees are being constrained by higher deductibles and coinsurance put in place in recent years; retiree costs have been lower than expected; and an annual accounting adjustment this year had the effect of reducing the reported expense.

Capital spending totaled $903 million—on pace with the record $908 million in fiscal 2018 and $906 million the prior year. The University expected to have to borrow to pay for all the large projects under way (Lowell House renewal is complete, and Adams House is under way; the Allston science and engineering complex comes into use by the fall semester of 2020), but the large, cumulative surpluses (and depreciation, now nearly $400 million per year) may provide sufficient room to stave off any resort to the debt markets. That is especially so if the building boom subsides: many current projects stem from the capital campaign, which is now well in the review mirror.

But not every faculty is in equally favorable circumstances. The School of Engineering and Applied Sciences (SEAS) faces substantially higher operating expenses in occupying the huge Allston quarters next year, raising questions—as yet unanswered—about how that burden will be divvied up between the University and the school. And the Faculty of Arts and Sciences’ (FAS) annual financial statement revealed that it has been authorized to spend $960 million so far on House renewal, a sum that will apparently take it through perhaps one-third of the Adams House work. Extrapolating, completion of Adams might bring the bill to $1.1 billion to $1.2 billion, for about 1.05 million gross square feet of space: an indication of just how costly it is to do high-quality renovation, in tight quarters, in Boston’s pricey construction market. FAS is incurring substantial new debt to pursue the work—with the enormous Eliot and Kirkland House projects potentially looming over its budget later in the decade, posing hard choices about investing in faculty growth and new research priorities. Inevitably, that points to future fundraising (not least, to repurpose and re-equip the spaces SEAS will quit in Cambridge).

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The Endowment
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News Briefs

Sexual Assault Rates Unchanged

On October 15, Harvard released the results of a survey estimating the prevalence of sexual assault and other sexual misconduct among its undergraduate, graduate, and professional-school students. The data (with 8,300 of 23,000 students surveyed in the spring of 2019 responding) echoed those from the 22 other private and public Association of American Universities (AAU) institutions that participated—and showed that sexual assault and harassment remain serious problems. At Harvard, the prevalence of sexual assault (12.4 percent) was essentially unchanged from that in a 2015 survey. Harassment was reported by 39.3 percent of respondents, and 17.7 percent indicated that it interfered with their academic or professional lives. As with allegations of assault, most harassment was perpetrated by other students.

The vast majority of nonconsensual sexual contact among undergraduates is student to student (82.5 percent), occurs in on-campus housing (more than two-thirds overall, and 79.4 percent in incidents of penetration or sexual touching by physical force and/or inability to consent), and involves alcohol (75.6 percent), according to the survey. Lead-up locations to these incidents are primarily on-campus housing and social events, secondarily local commercial establishments such as restaurants and bars. Although the rates at which students disclose these incidents have been climbing rapidly, the majority of students do not disclose incidents to the University, the survey showed. For a full report, see harvardmag.com/assault-survey-19.

Athletics Director to Retire

Robert L. Scalise, Nichols Family director of athletics since 2001, and previously a Harvard coach since 1974, will retire at the end of this academic year. In an October message to the community, Faculty of Arts and Sciences dean Claudine Gay praised his thoughtful leadership of the largest Division I athletics program in the nation, recounted the many athletic successes of his tenure—including “22 national team championships and 144 Ivy League titles”—and singled out his role as “a leading voice in national discussions of the student athlete experience.”

The announcement came during a study of the athletics department, launched by Gay in September. Scalise, a member of the advisory committee for that study, discussed in an interview some of the long-term changes in the student-athlete experience since his arrival at Harvard, including a one-sport focus for most students, and greatly intensified recruiting amid fierce competition for qualified candidates. “Valuable life lessons” such as how to persevere “when things don’t go well,” he said, can be learned through sport. And he raised the question of how to better integrate men and women in the “key educational experience of athletics”: creating “shared experiences where people need to work together to accomplish common goals...because that will serve society in the best way.” On November 14, Gay announced a nationwide search for his successor, led by Finley professor of engineering and applied sciences and former FAS dean Michael D. Smith. Read more at harvardmag.com/scalise-19.

~J.S.
Preparing for a Profession

Last summer, especially ambitious students enrolling for a Harvard professional education could have begun work simultaneously on their M.B.A., J.D., and Ed.M. degrees while the University was out of session. That possibility is, thankfully, impractical—and contrary to the intent of what is in fact a promising advance in post-college education. Several schools have deployed online instruction during the months before matriculation to introduce managers-, lawyers-, and teachers-to-be to the vocabulary, skills, and teaching styles they will encounter in the classrooms at the business, law, and education schools.

These summer experiences hold the potential for at least two significant educational gains central to the University’s mission. First, they equip students to learn from day one: an investment in their intellectual productivity, as they embark on expensive professional degrees. Second, they assure that increasingly diverse student cohorts—from different socioeconomic backgrounds (and increasingly, countries), college concentrations, and prior work—embark on their learning with some common preparation: a commitment to more fully inclusive schooling at Harvard. Over time, such instruction may be introduced by other University faculties, adopted by other institutions, and even offered for sale (the three-course business sequence already is).

• CORe. Harvard Business School (HBS)
was first out of the gate, adapting its online Credential of Readiness (CORe) program, the flagship offering from Harvard Business School Online, for summer instruction of entering M.B.A. candidates who need to acquire or refresh certain foundational skills to prepare for the first-year required curriculum. CORe involves demanding courses in:

- Business analytics, taught by Phillips professor of manufacturing Jan Hammond, covering data, sampling and confidence intervals, hypothesis-testing, linear regression, and multiple regression—the basic statistical toolkit;
- Economics for managers—on customers’ willingness to pay and demand, ways to influence demand, supply and cost, markets, competition, and product differentiation—taught by Byers professor of business administration Bharat Anand (who as vice provost for advances in learning oversees University online learning); and
- Financial accounting, taught by Casserly professor of business administration V.G. Narayanan, who introduces accounting, financial statements, accruals and deferrals, cash-flow analysis, and forecasting and valuation—the basic language for understanding an enterprise’s performance and status.

By one estimate, serious engagement with the three-course sequence requires 170 hours. Along the way, the online learning system introduces the new students to the texture of HBS’s instruction method, with technological features emulating company case studies (how a ticket reseller figures out customers’ willingness to pay, and its pricing); frequent quizzes to test understanding of the material; ways to consult in real time with online classmates (as in a class discussion); discussion prompts and timed cold calls; and final examinations.

Christensen professor of business administration Jan W. Rivkin, who became chair of the M.B.A. program in July 2018, noted that CORe in a sense was simply a different way of delivering preparatory materials to students who need them. But, he said, HBS’s investment in such summer experiences and academic preparation had been “extraordinarily well received by students and faculty” members—anecdotal evidence, at least, that the program’s hefty time demands are worthwhile.

Although its effects have not been rigorously tested in a controlled experiment, he said, “The one thing we do know is that those who do better on the CORe final diagnostic do get higher exam grades on the required accounting and technology and operations management courses. Something big is learned there.” Exposure to the contents and case-method pedagogy “gets you used to it” and “gets you excited about it.”

Cohen recalled his own 1L experience as the most intellectually stimulating year of his life—but also the “most overwhelming,” a “baptism by fire.”

Because today’s HBS M.B.A. students are internationally diverse, from many different undergraduate traditions, and arrive in Allston with “broader backgrounds” in academic and prior business experiences, compared to past cohorts, CORe’s acculturating effects are, at a minimum, likely important for their comfort with and academic productivity in their first classes.

- Zero-L. Harvard Law School (HLS) aims explicitly at making students feel comfortable and at home through its puckishly named online program, run for the second time this past summer. The introductory module opens with a photo of an expressway on-ramp, and the 10 hours or so of short videos mix lectures and conversations with a wide array of faculty members, all of them at pains to speak personally and even humorously. Artwood and Williams professor of law I. Glenn Cohen, who led the faculty development team, jokes about his favorite federal statute (your pig wanders into fenced-in public areas: look it up); and in perhaps the bravest performance, Story senior lecturer on law Susan M. Davies introduces federal legislation by singing the Schoolhouse Rock lyric about how a bill becomes a law.

Although there is plenty of legal content, the focal points of the program are not so much substantive as instructional. An 11-module sequence shows how to read and brief a case (students are reassured that, specialized though it may seem, such close reading is not “discontinuous with what you’ve been doing your entire academic career”). And an eight-module mock classroom, conducted by Cohen and four upper-class students, illustrates the Socratic method. In the previous unit, Watson professor of law Jeannie Suk Gersen tells Cohen that being called on to speak out in class “was definitely one of my sources of anxiety,” before going on to explain that the intent, nowadays anyway, is to be “nurturing and supportive,” not imperious.

In the final module, Cohen talks with John F. Manning, who started the program shortly after becoming dean in mid 2017. Recalling his own nervousness as the first member of his family to graduate from college and go to law school, the dean said the best advice he got about his own sense of insecurity came from his mother, who told him, “[D]on’t compare your insides to other people’s outsides.”

Assessing the program’s aims and early results, Cohen recalled his own 1L experience as the most intellectually stimulating year of his life—but also the “most overwhelming,” a “baptism by fire.” Explaining everything from the structure of the U.S. legal system (one-sixth of entering J.D.s are from other countries) to varieties of professional practice—and embedding the contents in HLS’s pedagogy—enables students to acquire a sense of their forthcoming curriculum. And all 1Ls know that their peers have been exposed to the same material in the same way—which helps some overly wound-up matriculants relax and learn more naturally. An analysis of student comments yielded “prepared” and “excited” as the top descriptions.

- HPL. The Graduate School of Education (HGSE) is two summers into pilot-testing How People Learn (HPL), an entry-level, online program for master’s students. It aims to produce “a common core experience for all incoming master’s students at HGSE. The course will focus on connecting the science of learning and human development to professional practice in education across roles.”

This is an ambitious project, and one in which the school itself is the student. “Education” encompasses many possible professional paths, and there is far more disagreement on what an educator—as compared to, say, a law student—needs to know. Indeed, the definition of the profession, and how best to prepare HGSE degree candidates, are the subject of considerable work within the school now, as it considers its 13 Ed.M. tracks and determines what core competencies (in,
**Allston Options**

In mid November, Harvard’s Allston Land Company announced that it had winnowed the list of developers seeking to create the first, 14-acre phase of the Enterprise Research Campus on Western Avenue from nine to three, all with local experience: Tishman Speyer/Belco, HYM, and Alexandria/National. The first developed Pier 4 on the Boston waterfront, and is pursuing a laboratory project in South Boston. HYM is involved with mixed-use projects at the downtown Boston Government Center garage, and the huge site of the former Suffolk Downs race track. And Alexandria, a national developer of life-sciences facilities, is a powerful force in Kendall Square; it is working with National Development on a life-sciences project in Boston. A final selection is expected by year-end. See harvardmag.com/erc-partner-update-19 for details.

**Taking Harvard’s Pulse**

The University’s Pilot Pulse Survey on Inclusion and Belonging, published in late October (https://pulse.harvard.edu/results), found that 77 percent of respondents agreed that “I feel like I belong at Harvard” (15 percent strongly, 37 percent agreeing, and 25 percent “somewhat” agreeing). Among the self-identified groups where less than 70 percent agreed were, according to the executive summary, “Genderqueer and Nonbinary respondents (53 percent), Muslim respondents (66 percent), Middle Eastern respondents (68 percent), Black or African American respondents (69 percent), and Bisexual respondents (69 percent).” Among student respondents, the sense of belonging, of authenticity, and of comfort in expressing one’s opinions was also inversely related to parents’ level of educational attainment, suggesting the opportunity, or need, to improve the Harvard experience of first-generation matriculants and those from under-resourced K-12 educations. In releasing the study, President Lawrence S. Bacow pointed to the 23 percent of the community who reported not feeling a part of it, and said there was “much room for improvement.” Among other efforts, he announced the search for a Chief Diversity and Inclusion Officer to lead such efforts.

**Building Boundaries**

As Harvard proceeds with academic and commercial development in Allston, as outlined in its master-plan agreement with Boston, its West Coast peer, Stanford, has encountered difficulties securing permission to grow from its regulator. That institution on November 1 withdrew its application to Santa Clara County for a long-term land-use permit, filed in 2016, that would have covered more than 2,000 units of housing, 2.3 million square feet of new academic space, and hundreds of millions of dollars in transit spending and community benefits during the next 16 years. But given differences of opinion on housing, traffic, and open space, no comprehensive agreement was forthcoming, so the university pulled its application ahead of a Board of Supervisors hearing.

**Upping Financial Aid**

Yale has liberalized its undergraduate financial-aid package, raising the income threshold at which families are expected to make no contribution to their children’s education from $65,000 (Harvard’s standard) to $75,000. It simultaneously altered its expected student contribution, from $4,450 during their first year at Yale College, and $4,950 in subsequent years, to $3,700 for all four years. Harvard College maintains a first-year term-time work expectation of $3,000, plus a $1,600 summer contribution; in the subsequent three years, students are expected to make a $3,500 term work contribution, and the summer contribution grades up from $2,400 (sophomore year) to $2,600 in the final two years.

**On Other Campuses**

The four Lord Foundations established by

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**Brevia**

**NOBEL DUO.** Harvard scholars received the highest accolades this October, when Farber professor of medicine William Kaelin was announced as co-winner of the Nobel Prize in physiology or medicine, and Gates professor of developing societies Michael Kremer became co-winner of the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel (as the economics encomium is known). Kaelin, Sir Peter J. Ratcliffe, of Oxford, and Gregg Semenza ’78, of Johns Hopkins, were recognized for their research on “how cells can sense and adapt to changing oxygen availability. They identified molecular machinery that regulates the activity of genes in response to varying levels of oxygen,” fundamental discoveries that underpin understanding of cellular metabolism and physiological function. Kremer ’85, Ph.D. ’92, and his fellow honorands—Abhijit Banerjee, Ph.D. ’88, Ford Foundation international professor of economics at MIT, and Esther Duflo, Abdul Latif Jameel professor of poverty alleviation and development economics at MIT (the fifth married couple to have shared the prize in the same field)—were cited for “their experimental approach to alleviating global poverty.” Kremer’s field work, much of it in Africa, formed the basis for many of their joint breakthroughs; links to prior coverage of some of his work appear at harvardmag.com/nobels-19.
the late entrepreneur Thomas Lord have, upon the sale of his eponymous corporation, distributed $260 million in unrestricted funds (a development officer’s dream) each to long-time beneficiaries Duke, MIT, the University of Southern California, and the Cleveland Clinic. Indiana University’s school of informatics, computing, and engineering received a $60-million naming gift from its alumnus, Fred Luddy, to establish a multidisciplinary artificial-intelligence initiative. As Harvard investigates gifts from Jeffrey Epstein (News Briefs, November-December 2019, page 25) and considers, along with other institutions, whether previously named buildings or programs should be renamed, Brown has published its revised policies governing both subjects.

Provost Alan Garber, who chairs Harvard’s gift-policy committee, has declined to make that group’s membership—or University policies, which are under review—public. Brown also announced a plan to double enrollment of veterans by 2024, by extending need-blind admissions, increasing financial support, and making standardized tests optional for veterans who are applying. The University of Pennsylvania now has a Carey Law School, reflecting receipt of a $125-million naming gift from the W.P. Carey Foundation. The gift is the largest ever made to a law school.

Gen Ed, Virginia Style
As the College rolls out its General Education course offerings this academic year (see harvardmag.com/new-gen-ed-19), the University of Virginia has adapted its New College Curriculum. First-year students will be required to take seminar-format courses covering “engagements” with aesthetics, differences, empirical and scientific subjects, and ethics—and must also satisfy a writing requirement, achieve proficiency in a second language, and demonstrate quantitative and computational fluency. They can do so through a variety of courses, but the architecture more nearly resembles the structure described on other campuses in “An Educated Core” (July-August 2017, page 47) than Harvard’s broader requirements.

Nota Bene
Medical academy members. Ten of the 90 regular members elected to the National Academy of Medicine this October are faculty affiliates: Anthony P. Adams, lecturer in ophthalmology; Elizabeth C. Engle, professor of neurology and ophthalmology; Daphne Adele Haas-Kogan, professor of radiation oncology; Mehmet Toner, associate professor of medicine; Scott L. Rauch, professor of psychiatry and president of McLean Hospital; Peter L. Slavin, professor of health care policy and president of Massachusetts General Hospital; Benjamin D. Sommers, professor of health policy and economics; Beth Stevens, associate professor of neurology; Benedict Toner, professor of surgery; and Catherine J. Wu, professor of medicine.

Honor Roll I. The Welch Foundation, which underwrites basic research on chemistry, has conferred its Robert A. Welch
Award on Friedman University Professor Charles M. Lieber and Armand Paul Alivisatos, executive vice chancellor and provost of the University of California, Berkeley, for their pioneering work in nanoscience and nanomaterials. They shared a $500,000 honorarium. Some of Lieber’s work, with important biomedical applications, was reported previously at harvardmag.com/lieber-17.

Addressing autism. Harvard Medical School will lead a University research program on the biological causes of autism-related disorders. The work is funded by a $20-million gift from K. Lisa Yang and Hock E. Tan, M.B.A. ’79, CEO of Broadcom; the initiative will be named in their honor. Pusey professor of neurobiology Michael E. Greenberg, chair of the department of neurobiology, will be the inaugural faculty leader. The Harvard program expects to collaborate with a similar center, funded by the same donor.

Honor Roll II. Higgins professor of molecular and cellular biology Catherine Dulac (see “The Mr. Mom Switch,” May-June 2015, page II) and Pusey professor of neurobiology Michael E. Greenberg—chair of the department of neurobiology, and inaugural faculty leader of the new autism program—were jointly awarded the Society for Neuroscience’s Ralph W. Gerard Prize for lifetime achievement in neuroscience...Eni, the Italian oil and gas company, has conferred its Energy Frontiers award, for research on renewable energy sources and storage, on Sykes professor of materials and energy technologies Michael J. Aziz and Cabot professor of chemistry and professor of materials science Roy G. Gordon for work on an innovative battery technology.

Landscape laurels. The Cultural Landscape Foundation has established a biennial $100,000 prize in landscape architecture, named in honor of Cornelia Hahn Oberlander, B.L.A. ’47—a graduate of the Design School’s second cohort of women. It will be conferred beginning in 2021, the centennial of her birth.

say, data analysis, cognitive and learning science, management and leadership, and policy—the students enrolled in future master’s programs may need to acquire.

In this sense, HPL and HGSE’s curriculum are simultaneously being built anew, shaping each other. Enrolling master’s candidates may be even more diverse in background and interests than those headed for HBS and HLS, and so may especially need common preparation for their Cambridge studies—which are compressed into a single year on campus, rather than two and three at HBS and HLS, respectively. What could be more appropriate than their doing so at a place that is itself demonstrably a learning organization?

An in-depth report on these programs and their possible application elsewhere at and beyond Harvard appears at harvardmag.com/on-ramps-19.

~J.S.R.

THE UNDERGRADUATE

Working at Beauty

by DREW PENDERGRASS ’20

One of the more frustrating things about learning math is that professors insist it is beautiful. Imagine not just asking toddlers to eat their vegetables, but demanding they appreciate the subtle interplay between asparagus and a balsamic glaze, and you will have some sense of how I felt when I enrolled in my first college math course. After a long night of writing proofs, fueled by off-brand cereal and stale coffee, beauty was too high a concept for me. I came to see aesthetics as a kind of bragging. Saying math is beautiful is like riding a bike with no hands—it implies total mastery. I found it very annoying.

Just before Thanksgiving my freshman year, a friend and I were struggling to prove an abstract theorem about convergence—the way patterns of numbers fall together at infinity. We were frustrated, tired, and the Doritos stocks were running low. It felt like we were fiddling with tiny loops of yarn in a knitted tapestry, working endlessly on fine motions of logic. Suddenly, we both stepped back from the blackboard in astonishment. In the scribbles of chalk appeared a deep connection, fusing completely different ways of thinking about convergence into a united picture.

The novelist Marilynne Robinson sees beauty as intimately related to a sense of wholeness, a way of holding a complex system in the palm of the hand without crushing it into something simpler. To a pair of young math students, the proof was staggeringly beautiful, connected and branching like a tree. Math, I’ve realized, is like wandering through an art museum flooded with maple syrup. It takes all my strength to trudge from painting to painting, hours of hard work behind every proof. After all that effort, after I’ve slogged to the next piece of art, I usually don’t feel anything beyond a vague appreciation. But, just as I’m about to give up, I see something that kicks me in the stomach. I don’t know where those moments of beauty come from, what snaps and lets unrelated ideas suddenly fall together into something transcendent. The mathematician Alexander Grothendieck said that the perfect proof is like a nut submerged underwater—after weeks and months of letting the shell soften, suddenly it peels open as naturally as a flower. Something that extraordinary must be shouted from the rooftops.

The most beautiful thing about beauty is its resistance to capture, its fluidness. Beauty cannot be owned, not even linguistically, which is why great art leaves us breathless. “Human speech is like a cracked kettle on which we beat out tunes for bears to dance to, when we long to move the stars to pity,” writes Gustave Flaubert. With description gone, the only response to beauty that remains is duplication. Beauty demands to be shared, copied, and imitated—so social media fills with photos of sunsets, Monet paints multiple haystacks, and mathematicians organize conferences.

After soaking in the moment of convergence that November night, my friend and...
I excitedly texted our group chat and told them to come see for themselves. “Mathematics is in some ways most real when communicated from one person to another,” says Cabot professor of mathematics Curtis McMullen, chair of the department.

A professor once told me that humanists and mathematicians are the only people left in the academy who are driven primarily by beauty. For an ambitious university like Harvard, ideas and actions have come to be valued in material terms: money made, lives saved, patents filed. But culture and pure math are not useful in ways that can be measured. No one can show that art saves lives. When mathematicians write abstract proofs, they don’t make an obvious advance in algorithms or circuit boards. Everyone may be drawn to beauty, but in an age of cost-benefit analyses it has taken on an aura of unseriousness.

“It’s really hard to argue for beauty. That might actually be an inherent quality of beauty,” my friend Daniel Frim told me one night in the dining hall. “It’s really easy to argue for utility, and I think that is an inherent quality of utility.”

During sophomore fall, with the concentration decision deadline looming, I found it impossible to escape the logic of usefulness. The previous summer, I’d worked on campus in a lab, studying how smog rapidly forms on some winter days in Beijing. I spent all day with the data, writing reams of code and trying to break down how weather and pollution interact, and how that might shift with climate change. I liked the work, and felt like a useful part of the fight against our current environmental crisis. At the same time, I was drifting away from those moments in the math department chasing rare glimpses of the transcendent, or those times poring over books in Widener searching for wisdom. Smog, simply put, is an ugly thing to think about. As I tried, as I saw it, to decide between a life dedicated to beauty or to usefulness, I could not help but ask: How could I look for beauty in the face of global disaster? How could I choose the path that saves fewer lives? The pursuit of beautiful things seemed not just impractical, but wrong.

I’m not the only one stuck in this mode of thinking. Undergraduates today have been raised on quantification: on standardized test scores and the shadow of a financial crisis. Applied math concentrators at Harvard have tripled since 2008. English has shrunk by almost 50 percent while statistics has grown tenfold. Many of those students are pursuing investment banking and high-powered tech jobs, which require increasingly sophisticated math skills. But this shift is about more than money. On the scale of Wall Street, money becomes more a yardstick for success than a material necessity.

As the concentration deadline drew closer, I started to feel as if my decision had been made for me. Although on some level I believed that beauty mattered for its own sake, when I asked pure mathematics to make its case, it remained silent. So I did the rational thing and concentrated in physics, jumping headlong into research on the atmosphere.

My math friends and I still gather on some Saturdays in the Science Center, in empty classrooms a short walk from the math department coffee machines, and try to pull beauty out of a pile of preprints. But we’ve mostly scattered to labs across campus, spending our days fiddling with data and clunky algorithms, dispassionately taking problems apart, considering the pieces, and putting them together again. Applied science can be quite beautiful, revealing the hidden complexity in something as simple as wrinkled clothes, but for me and my friends, it is about finding solutions, answers as practical and ugly as duct tape on a broken car bumper. So at those rare times when we can get together and think through a surprising and entirely inconsequential paper, appreciating the ways a beautiful proof shows that what we thought was separate has always been together, I am reminded of why I started doing mathematics in the first place.

Because science is slow going, I have spent most of my college years finishing the project on Beijing smog. As the months unspooled, I tried tool after tool to decipher the data, doing my best to break down the strange behavior of polluted air. Late one night in the Leverett dining hall, as I scrambled to get a report ready for my adviser, I made a graph that clarified everything: I could predict smog just by looking at wind and humidity. A bit of clever statistics—discovered after long nights of trial-and-error—could describe
the behavior of this bit of air better than a supercomputer model. The insight was, in a word, beautiful.

The cliché that beauty is in the eye of the beholder is, like most clichés, completely true. Beauty is not a property that something has, but is more a way of seeing, an orientation. During that night when I first realized math could be beautiful, convergence didn’t change: I did. This, I think, is the saving grace for the applied sciences. Environmental degradation is very ugly, but it can be studied in a way that yields beautiful insights into how systems work and fail, and those discoveries have the side effect of helping people.

As I worked on the smog project, I began to realize that, at least for me, beauty is not an option, but a necessity. Before I could study the effects of climate change, or come up with a clever new policy, I had to understand the interlocking systems at play in the environment. And before I could understand the complex dynamics of the world, I had to stare long enough to see the entire picture. Because beauty is intimately related to a sense of wholeness, to see something all at once is to see it as beautiful.

Strangely, in my quest to be useful, to optimize, I’ve had to slow down and look again for beauty. I’ve found that the danger of busyness, besides burning out, is that beauty is awfully hard to schedule. By the end of each semester, the space I’ve tried to leave for beauty—the creative-writing classes, the deliberate thinking through research problems, the math puzzles with friends—gets compressed as piled-up problem sets and meetings take more and more of my energy.

Beautiful things take their own time. Mathematics is stunning only if it is allowed space, if problems can go days on end without a solution. Otherwise it is a chore. I cannot even read if my mind is too heavy with things to do; focus scatters like startled birds.

I have trouble believing in something called human nature. But if there is a universal, I think it is the desire to be like other people, to take in what we admire about our friends and family and make it a part of ourselves. I worry about this, because numbers are much easier to copy than subtle things like a sense of curiosity or compassion. And we are absolutely flooded in numbers. Most great scientists have lots of papers and citations, CVs that stretch for pages. I know I fixate on the long lists of metrics that appear next to the names of people I admire on Google Scholar, and I get the urge to speed up my work to match.

The solution to the flood of numbers and metrics, I think, is to take beauty seriously—not to treat it as ornamentation to be added on top of some base level of measurable achievement. I worry that if I don’t focus on deep understanding, I’ll end up attempting to produce flashy papers and stylish achievements as quality falls away. It’s the scholarly equivalent of reaching to the test, of numbers polluting the way we learn.

After months of guiding the Beijing smog research through revisions and peer review, we finally published earlier this year. I’ve moved on to a new project, studying how deforestation has changed the monsoon rains in India. It’s another ugly problem, a small example of how we are unintentionally reshaping Earth for the worse. But there is also the opportunity for understanding a complex system, appreciating its beauty, and maybe even restoration.

Berta Greenwald Ledecky Undergraduate Fellow
Drew Pendergrass ’20, a physics and mathematics concentrator living in Pforzheimer House, has stopped to smell the roses.

SPORTS

Failure to Finish

Dreadful defeats—and a heartbreaking Game—produced the Crimson’s first losing season of the century.

At approximately 4:05 P.M. on November 2, the 2019 Harvard football season began unravelling. Until that moment, the campaign was proceeding in the style to which coach Tim Murphy’s teams had been accustomed for two decades. With six seconds remaining in the game at Harvard Stadium, the Crimson led Dartmouth 6-3. If Harvard could knock down a long Big Green pass into the end zone, its record would move to 5-2 overall and 3-1 in the Ivy League, positioning the team for an Ivy title run.

Four score: With Yale’s Melvin Rouse II in vain pursuit, Harvard’s Aidan Borguet heads for the goal line. Against the Elis, the Crimson freshman back rushed for a series single-game record 269 yards and amassed four touchdowns on only 11 carries, a performance that helped earn him the Ivy League Rookie of the Year award.

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from quarterback Derek Kyler, the Big Green's prayers were answered. The ball was grabbed by receiver Masaki Aerts, giving Dartmouth a miracle 9-6 victory. It was the most ghastly defeat in the 146-year history of Harvard football—for three weeks, anyway, until it was equaled, arguably, by a 50-43, double-overtime loss in The Game at Yale that nevertheless featured (besides a halftime interruption) a record-setting performance by an unheralded freshman Harvard running back. In between, the Crimson would lose in overtime to Columbia and by four points to Penn. Each Saturday drove another stake through the heart. The final record was 4-6—Harvard's first loss since 1998.

This five-game losing streak, which began with a 30-24 loss at Princeton, was a nightmare of spotty play, gambles that backfired, and horrendously unlucky bounces. Amid the miasma, the team competed ferociously. Harvard could have won all five games—and should have won three. But when someone needed to make a play in crunch time, it was the opponent who made it.

After the Penn loss, Murphy pinpointed the problem. "Somehow," he said, "we have a failure to finish." Following the Yale game, he elaborated: "We played really hard every single game. At times we played really well. Statistically we were not as good an offensive team as we were a year ago. We were not as good a team overall. We didn't have as many senior starters. The sum total of that was we had to just give everything we possibly had, just to be in the game in the fourth quarter. And I think that's a testament to our kids. They never gave up. But there was just no margin for error in almost every game."

The early season gave little hint that such epic calamity was on the horizon. A squad featuring a number of unproven players seemed to be gradually rounding into form. After a rocky 31-23 opening loss at San Diego, More rugged opposition—the better Ivy teams—remained. The first true test came the following week at Princeton. The defending Ivy champion Tigers were riding a 15-game unbeaten streak and were scoring points in droves. Harvard gave them all they could handle. The Crimson actually led at halftime 14-10 after a 73-yard Smith-Cook touchdown connection late in the second quarter. But Smith also threw three inter-

Harvard had started solidly, approaching Week Six with a 4-1 record. Had the first half provided a false sense of security? More rugged opposition—the better Ivy teams—remained. The first true test came the following week at Princeton. The defending Ivy champion Tigers were riding a 15-game unbeaten streak and were scoring points in droves. Harvard gave them all they could handle. The Crimson actually led at halftime 14-10 after a 73-yard Smith-Cook touchdown connection late in the second quarter. But Smith also threw three inter-

Jarring: As Harvard sophomore defensive lineman Truman Jones (90) sacks and strips the ball from Dartmouth quarterback Derek Kyler, Crimson senior defensive lineman Brogan McPartland prepares to make what appears to be the game-sealing recovery. McPartland led the Ivy League in sacks with 9.5 and was named to the All-Ivy first team.

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After the Penn loss, Murphy pinpointed the problem. "Somehow," he said, "we have a failure to finish." Following the Yale game, blocking a pair. (All season long Harvard would be among the nation's leaders in blocked kicks, finishing with nine.) Another freshman, DeMarkes Stradford, blocked a punt and recovered it for a touchdown. Stradford also carried the ball six times for 108 yards and another touchdown. Junior back Devin Darrington, playing a little more than a half, amassed 115 yards and three touchdowns on 12 carries.

To finish the three-game homestand, Ivy rival Cornell came to the Stadium. The Big Red had upset the Crimson the previous two seasons. Not this time. Harvard won 35-22, and the stars were, improbably, its punters: friendly rivals sophomore Jon Sot and junior Sean McKeogh. On this day, both would excel, with Sot, last season's All-Ivy punter, averaging an eye-popping 56.3 yards on three punts and McKeogh an excellent 42.4 on four. Senior defensive lineman Brogan McPartland had two sacks. Junior linebacker Jack McGowan had the Crimson's first interception of the season. Harvard also forced three fumbles. Junior quarterback Jake Smith was solid, going 18-for-28 passing for 217 yards with touchdowns to four receivers. Among the quartet were seniors Jack Cook and Cody Chrest, who were emerging as a reliable long-distance tandem. Chrest, who had played intermittently before this season, would finish as the Crimson's leading receiver, with 45 catches. "Cody came out of nowhere," said Murphy. "He had been fighting injuries his entire career. He finally got healthy and showed what he can do."

Cook and Chrest also figured in the scoring the following week, a 31-21 victory at Holy Cross. Cook caught an 18-yarder from Smith in the back of the end zone, and Chrest and Smith hooked up for a 68-yard pass-and-run touchdown. There were other standouts, including McPartland, who had three quarterback sacks. He would end the season as the Ivy sack leader, with 9.5. "We knew he had that potential," said Murphy. "Brogan gave us great energy and great leadership."

But what had Holy Cross's homecoming crowd really buzzing was the 76-yard punt Sot lofted in the third quarter, which flipped the field from the Harvard 14 to the Holy Cross 10. On the day, Sot and McKeogh dropped six punts inside the Crusader 20. "I feel like we're in an alternate universe, the way our guys are punting the ball," said Murphy. "Brogan gave us great energy and great leadership."

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Harvard traveled to New York City to face www.gocrimson.com.

Aerts. Touchdown! Game over! Dartmouth bounced, unfathomably, into the hands of bounces. We wanted it to bounce down scrimmage. It looks like Kyl —

The same could not be said about the following week’s soul-sucking loss to Dartmouth. A crowd of more than 20,000 at the Stadium witnessed an old-fashioned defensive slugfest. It looked as if two field goals by McPartland would hold up—especially when McPartland recovered a Big Green fumble on the Dartmouth 10 with 1:31 remaining. In the ensuing Crimson possession, Darrington made a fatal tactical error by going out of bounds after a run, allowing Dartmouth to preserve a precious timeout. A touchdown would have put the game away, so on fourth-and-goal from the six, Murphy elected to go for it rather than settle for a field goal.

“At the end of the day, they’re gonna need a touchdown to win the game,” he explained. “So mathematically you’re looking at the clock. They’ve got 59 seconds to go how many yards?” On the next play, Darrington was stopped for no gain. Dartmouth ball.

Using medium-length passes, Big Green quarterback Derek Kyler maneuvered his team to the Harvard 43. Six seconds remained. Time for one play. Kyler took the snap and desperately evaded several Harvard rushers. Finally, he threw the ball up high, all the way into the end zone. At the goal line, Harvard junior defensive back Isaiah Wingfield had a bead on it. He leaped—and was jolted by teammate Wes Ogsbury, who also was going for the ball. “We had a bunch of guys deep ready to knock the ball down,” said Ogsbury, the team captain. “We’re all looking down to the line of scrimmage. It looks like [Kyler] got sacked twice. He heaves one up. We’re all trying to make a play on it. It takes the wrong couple of bounces. We wanted it to bounce down but it bounced up, for whatever reason.” It bounced, unfathomably, into the hands of Aerts. Touchdown! Game over! Dartmouth 9, Harvard 6.

The season trudged on. The next week Harvard traveled to New York City to face Columbia, which hadn’t beaten the Crimson since 2003. That would change, again in disheartening fashion. Murphy pulled quarterback Smith after a 6-for-16 passing performance, replacing him with sophomore Luke Emge. Early in the fourth quarter McIntyre ripped a 25-yard field goal to put the Crimson ahead 10-7, but the Lions came back to tie with 1:45 left. In the overtime Columbia scored to make it 17-10. When Harvard tried to answer, Emge threw a pass to the right, intended for junior wideout James Batch, but the Lions’ Ben Mathiasmier made a brilliant diving interception to end it.

Could the nightmare continue? The final home game, against Penn, showcased another way to lose. In the third quarter the Crimson took a 20-17 lead on a nifty double reverse that finished with Chrest sailing 18 yards into the end zone. But the Quakers ri pusted with an 82-yard drive that culminated in a sensational diving, ball-tipping catch by wideout Rory Starkey, one of several superhuman touchdown grabs by opponents this season. After Penn repulsed two promising Harvard opportunities—one that reached the Quakers’ seven—the 24-20 margin stood.

After what had transpired, you could have pardoned Harvard fans for looking to The Game with dread. Yale entered with an 8-1 record and a high-powered attack spearheaded by quarterback Kurt Rawlings, who was clicking with a pair of fellow seniors (and fellow previous Crimson killers), receivers JP Shohfi and Reed Klubnik. But on this brisk, sunny day, nobody had reckoned with young Mr. Aidan Borguet.

The score was 3-3 in the second quarter when Wingfield made a sensational diving interception at the Yale 27. Two plays later, Smith flipped to junior wideout B.J. Watson on a bubble screen to the right. Watson dashed all the way into the end zone. But McIntyre’s extra-point try was blocked. Harvard 9, Yale 3.

Then it was time to unleash Borguet. With a little under two minutes left in the half, at the Yale 47, he took a handoff from Smith and ran to the right through a huge hole created by the Harvard offensive line, all the way into the end zone. This time Harvard tried to get that extra point back by attempting a two-point conversion, but it failed. At the half it was Harvard 15, Yale 3.

Halftime was a game in itself. After the two bands performed, a group of students emerged from the stands and sat down around midfield. Some held signs reading “Yale and Harvard United for Climate Justice.” They were protesting inaction on climate change, specifically demanding that both schools divest their holdings in fossil-fuel investments. As the minutes ticked by, more students—from both schools—came down from the stands. Several dozen police officers kept wary watch. Eventually the protesters left the field. Fifty were arrested. The game had been delayed by about 30 minutes past the prescribed second-half starting time (see harvardmag.com/game-protest-19).

When the game resumed, Harvard appeared to take command, courtesy of Borguet. On the fifth play of the first series, from the Yale 41, he ran to the left, cut upfield, and scammed the remainder of the 59 yards into the end zone. McIntyre kicked the extra point. Harvard 22, Yale 3.

Yale rebounded, partly thanks to a punt fumbled by Crimson freshman Gavin Sharkey. An Eli touchdown and a field goal brought the score to Harvard 22, Yale 13. But Borguet was just warming up. On the next series, from the Yale 40, he swept to the right, turned upfield, and just kept run-
McKeogh, pinned the Elis at their four. Needing two scores, Yale was 66 yards from the first one (similar to where Dartmouth had been three weeks previously). Rawlings got that score by completing seven passes. The last reception was a circus catch—yet another one!—by wideout Mason Tipton. Tuckerman again kicked. Harvard 36, Yale 29.

Only 1:28 remained. Everyone in the Bowl knew an onside kick was coming. Tuckerman, a left-footed kicker, banged it to the right. Chrest, one of the Crimson’s surest-handed wideouts, was on the kickoff-receiving team expressly for this circumstance. But the ball skittered past him. Klubnik jumped on it, at the Yale 47.

For Kurt Rawlings, 1:28 was an eternity. He moved the ball down to the Harvard 11. Here came the final small moment—a big one this time—that turned the game. Rawlings ran up the middle—smack into Harvard junior linebacker Jordan Hill at the five. The ball came loose. Several Crimson players jumped for it, but somehow—and it’s almost impossible to see how—it ended up in the hands of Yale linemen Cameron Warfield at the seven-yard-line. On the next play and with 18 seconds left, Rawlings threw over the middle to Shohfi for a touchdown. Tuckerman tied the game with his point after. Harvard 36, Yale 36.

The result of the overtime seemed almost foreordained. It went two rounds. On the first play the Crimson drew blood. Smith found Chrest wide open for a touchdown. McIntyre kicked the point. Harvard 43, Yale 36.


Darkness was rapidly falling. In round two, the Elis had the ball first and quickly capitalized. Two Rawlings-to-Shohfi passes brought the ball down to the four and back. Zane Dudek took it in from there. Tuckerman again converted. Yale 50, Harvard 43.

Now Harvard had to answer. Smith threw an incompletion. Then Borguet, out of miracles, ran for five. On third down, Smith threw to Watson for no gain. Fourth down. Smith threw again to Watson. The diminutive wideout squirmed to make the first-down marker, but fell short.

Game over. Season over. Mercifully.

For the Crimson there were heroes. Borguet of course. On only 11 carries he had amassed 269 yards—most ever by a runner in the Harvard-Yale series—as well as those four scintillating touchdowns, one more than he had scored in nine previous games. Borguet entered The Game with a solid season total of 398 yards and an excellent average of 4.8 yards per carry. “We’ve all been very impressed with his development as a freshman,” said Murphy. “He has a natural sense of where the hole is and how to be patient. And his overall football IQ was beyond our expectations. He’s an exceptional talent and a really great kid.”

On defense, Wingfield led with eight tackles, plus that magnificent interception. Hill was next with seven tackles. McPartland capped a marvelous senior season with two sacks.

Despite the bitter ending, Murphy aims to rebound, using as a nucleus his returning running backs and promising defensive linemen. “At the end of the day I’m very disappointed for our kids, but they gave us everything they had and that’s all we can ever ask,” he said. “We had a tremendous streak, the longest streak of winning seasons in Ivy League history, but no streak is linear. We’re proud of that and we look forward to the opportunity of starting a new streak next year.”

* * *

TIDBITS: With Yale’s victory, the series now stands at Yale 68 wins, Harvard 60 wins, and eight ties. Jordan Hill ’21 was elected the 147th captain of Harvard football. Hill, a linebacker from Silver Spring, Maryland, is a resident of Adams House and an economics concentrator....Freshman Aidan Borguet was named Ivy League Rookie of the Year. In addition, five Harvard players were named to the All-Ivy first team: senior offensive lineman Liam Shanahan, senior defensive lineman Brogan McPartland, junior linebacker Jordan Hill, junior defensive back Isaiah Wingfield, and sophomore punter Jon Sot. Junior running back Devin Darrington and junior offensive lineman Eric Wilson were named to the second team. Five more were Honorable Mentions....The 147th season of Harvard football will kick off on Saturday, September 19, 2020, at Harvard Stadium against Georgetown. ~DICK FRIEDMAN
Sports Medicine Man

At around 14, Brant Berkstresser realized he wasn’t much of an athlete. “I grew up in a large high school,” he says, “and I was very small.” His goal was to graduate weighing more than 100 pounds. “I started my senior year at 98,” he says. “I graduated five-foot-seven, 105 pounds.”

And his stature never kept Berkstresser—now Harvard’s associate director of athletics for student-athlete help and performance—away from sports. “I came from a musical family, not an athletic background,” he says, “but I just naturally loved it.” Growing up in State College, Pennsylvania, the home of Penn State, certainly contributed. He loved football, but stuck to baseball, soccer, basketball, and cross-country.

As his athletic career ended during freshman year, Berkstresser discovered an adjacent path: sports medicine. In the mid 1980s, he volunteered with his high school’s athletic trainer and saw the position’s value in keeping athletes healthy and strong. “The way I looked at it, this was a way I could still be involved in athletics,” he explains. His skills in math and science, unhelpful in dunking a basketball, were well suited for sports medicine.

After earning a bachelor’s degree in education, with an emphasis in athletic training, from athletic-powerhouse West Virginia University, Berkstresser looked for a graduate program where he could have an immediate impact. He picked Kansas State partly because of the head athletic trainer’s reputation, and partly because it was severely understaffed. “I knew I would have more responsibility as a graduate assistant than I would elsewhere,” he says. “It worked out beautifully. I was a 23-year-old working men’s basketball and helping out with football in the Big 12 Conference, which is pretty rare.” He spent five years at Kansas State, and five more at Georgia Southern University, before receiving an offer in 2008 to run the sports-medicine program at Harvard: “Too great of a challenge to pass up.”

Berkstresser enjoys the challenge of sports medicine, the constant adjustments a program must make to keep current as the science and practice advance. He says the best thing about athletics and medicine is that they’re always evolving. “If you look at what we do from a sports-medicine perspective now, compared to 10 years ago, it’s just night and day,” he points out. “A lot of that has to do with technology advances, research advances.”

One example: concussions. Twenty years ago, the connection between symptoms—headaches, blurred vision, and difficulty concentrating—and head injuries was hazy. Now, it’s clear. Before the season starts, students undergo baseline testing through the Micheli Center for Sports Injury Prevention (a Waltham-based research center that seeks to reduce risk of athletic injury) to measure processing speed, visual and verbal memory, and reaction time. If a student sustains a concussion, she or he gets back on the field only after these levels return to normal. “We’ve found out that cognitively, and from a balance standpoint, our brain is taking longer to recover from a concussion episode than what we may have thought 15 years ago,” Berkstresser says. Harvard’s athletics department partners with the Micheli Center, Boston’s Children Hospital, and Harvard Medical School on a longitudinal study that tracks students who have sustained concussions. The results, though preliminary, have already changed the way trainers perform the balance assessment in baseline and post-concussion testing, allowing staff to judge when specific indicators of balance and vision have returned to normal levels. At student athletes’ subsequent reunions, they hope to follow up, looking for certain biomarkers in urine, among other factors, that would help elucidate concussions’ long-term effects.

The athletic department, along with Aaron Baggish of the Massachusetts General Hospital Heart Center, are also studying the impact of anaerobic activities, like heavy weightlifting and short sprints, on the heart. They’re studying football linemen, whose role makes them especially susceptible to conditions like high blood pressure and hypertension. “Most of what they do is within 10 yards,” Berkstresser explains. “It’s a whole lot of power and press and strength” (as opposed to cardiovascular conditioning). A current hypothesis is that a few brief aerobic sessions per week on a stationary bike could greatly decrease heart remodeling changes that result from high-intensity, quick-burst activities. They’ve tested it out, with encouraging preliminary results. “You may be implementing something that could have a pretty significant change in their quality of life moving forward,” Berkstresser says, adding that potential conclusions could also help non-athletes. “That’s a pretty incredible find.”

Nor is the program focused solely on physical health. When Berkstresser arrived at Harvard, there were no mental-health counselors who focused on athletes. Now there are two. Students are free to meet with the dedicated counselors individually, or coaches can decide to invite a counselor to speak to a whole team to discuss an issue like work-life balance. “I think it just completely changes an individual’s outlook and how they process themselves,” he explains. “It changes how they process information, how they compartmentalize feedback they are getting, so that information becomes...
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“If you look at what we do from a sports-medicine perspective now, compared to 10 years ago, it’s just night and day.”

The push for mental-health resources falls under the new “Crimson Mind and Body Performance Program,” launched by the athletics department and the University Health Services’ counseling and mental health services. The program coordinates the services of physicians, athletic trainers, and strength and conditioning coaches, as well as mental-health clinicians and a sports dietitian. It’s Berkstresser’s job to make sure each unit works in tandem. “It’s somewhat of a big moving piece,” he says, “but it works.”

The program is especially effective for issues that require the help of different specialists. For athletes with body-weight goals, for instance, the training staff, strength and conditioning coaches, and the sports dietitian work in tandem. This kind of coordination wasn’t possible when Berkstresser arrived, when there was only a quarter-time nutritionist on staff. Students with eating disorders—especially common among women student-athletes—can now seek help from a team that focuses on that particular issue, which includes mental-health professionals.

As Berkstresser walks through the athletic training room on an autumn afternoon, much resembles what he likely saw as a skinny high-schooler. Student-athletes lie on tables, awaiting taping, stretching, and massaging from a team of athletic trainers. Powerade® coolers, stretch bands, and rolls of athletic tape are splayed across the room. What Berkstresser couldn’t have predicted was the increasing importance of nutrition and mental health to the success of student-athletes. As he looks at how often students use these services, he knows the demand will only grow. “The great thing is, if you build something and have good things coming, people will come,” he says. “And people are coming.”

—Jacob Sweet
SYNTHETIC BIOLOGY, or the application of engineering principles to the design of life, presents world-changing prospects. Could components of a living cell function as tiny switches or circuits? How would that allow biomedical engineers to build biological “smart devices”—from sensors deployed inside the body to portable medical kits able to produce vaccines and antibiotics on demand? Could bacterial “factories” replace the fossil-fueled industries that produce plastics, foods, and fertilizers? Will the secrets of living creatures that enter suspended animation during periods of drought and extreme cold be harnessed to keep human victims of trauma alive? And is the genetic information preserved in long-frozen or fossilized extinct species, like woolly mammoths, sufficiently recoverable to help save living species?

These ideas, once the stuff of science fiction, are now the stuff of science. Some aren’t yet functioning realities, but others have launched business applications, whether in medicine (such as hospital gowns that signal exposure to infection) or in land remediation (where bacterial “factories” powered by the sun capture nitrogen from the atmosphere to help plants grow). Someday, engineered forms of life that store carbon may even be one of the solutions to Earth’s climate-change problem.

“Most of biology, historically, has been analyzing how nature works,” says Donald Ingber, director of Harvard’s Wyss Institute for Biologically Inspired Engineering. Systems biology is the culmination of that effort to deconstruct natural processes. Now, with synthetic biology, he points out, scientists “are at the point where we know enough that we can actually engineer artificial and natural biological systems.” Researchers today can build things from biological parts, and even create hybrid systems by linking them to non-living machines.

Propelling the science forward are scores of innovations in biological science, with new discoveries coming every month. Among the most important are advances in genetic editing, including improvements in accuracy, and the ability to make hundreds of changes at once. Another is computer-aided design, widely used to model biological systems, and to build new proteins by combining amino acids in ways never seen in nature. Advances in molecular engineering are driving the construction of ever-more complex circuits made from biological materials. And the ability to freeze-dry cellular transcription machinery outside the confines of cells has enabled scientists to easily manufacture proteins at will, at any time and place.

Most synthetic biology today centers on single-celled organisms, such as the bacterium Escherichia coli. In the spring of 2019, for example, researchers at the University of Cambridge announced that they had synthesized an entire E. coli genome—the bacterium’s complete set of genetic material—and swapped it into living E. coli cells. Their version, which at four million base pairs (the building blocks of the DNA double helix) was then the largest synthetic genome created to date, was nevertheless a pared-down variant that eliminated redundancies, thereby simplifying the biological complexity evolved over millennia and making the organism easier for human engineers to understand and manipulate. Although the bacteria with synthetic genomes were not as robust as their natural counterparts, and reproduced slowly, they survived.

The scientists who do this work know that they are operating in a new domain, with transformative possibilities. James Collins, a core faculty member at the Wyss Institute who 20 years ago created one of the first biological circuits, believes this synthetic, engineered biology “will be a defining, if not the defining, technology of the century.”

Snapshots of the evolving technologies follow.

Switches, Sensors, and Medicines on Demand
In January 2000, Collins and a team at Princeton, working separately, simultaneously published in Nature the first designs for switches made from biological parts. That innovation arguably marked the beginning of modern synthetic biology. Collins had engineered a switch, like the push button on a desk lamp: press once, the light turns on; press again, it turns off. Collins’s simple mechanism was not built from metal and plastic, but from two genes that flip-flopped between on and off states when stimulated by chemical signals or changes in temperature. It was a simple circuit.

The simplicity of what Collins had created belied its potential.

Engineering Life

Synthetic biology and the frontiers of technology
by Jonathan Shaw
The ability to engineer biological circuits in this way meant that cells could represent binary states such as the zeros and ones that are the basis of computer systems. They could perform simple logic. And because they could be programmed to die after a certain number of cell divisions, they enabled the creation of the first kill-switch safety mechanisms to prevent organisms with synthetic parts from escaping into the environment.

Many of the earliest biological switches were crude and prone to accidental triggering. The inside of even a single-celled bacterium such as *E. coli*, where engineered synthetic circuits are often introduced and tested, is very busy. There are “many molecules, large and small, interacting in a very small space,” explains Collins, who teaches in the Harvard-MIT Program in Health Sciences and Technology. All this activity can lead to what engineers call “crosstalk,” instances when a stray signal can accidentally flip a simple switch. Such unpredictable behavior would be anathema in biomedical applications.

But biological switches have become much more robust since 2000, allowing them to be used in laboratory animals as reliable detectors that signal the presence of pathogens. In applications in the gut, for example, RNA-based switches have been designed to release appropriate probiotic therapies. Such an RNA-based switch takes advantage of the fact that the bases on a single strand of RNA want to pair with opposite bases, just as “A[denine] goes to T[hymine] and G[uanine] goes to C[ytosine]” in DNA base pairing, Collins explains. This means that an RNA probe can be designed to combine systematically with an opposite RNA strand associated with a bacterial pathogen. That opens the switch, which then releases a fluorescent particle that reveals the presence of the pathogen.

To effect this, researchers must engineer biological circuits and insert them into living bacteria: a process that sounds formidably complex. But scientists know that different kinds of bacteria, in the course of evolutionary history, have routinely exchanged whole “cassettes” of many genes, such as those that control metabolism. This swapping of genetic material is called “horizontal gene transfer.” Within these cassettes that control particular biological functions, researchers have devised ways to alter specific genes, and then reinject the whole functioning circuit into a cell.

These genetic circuits control what proteins the cell produces. Since the 1960s, biologists have known that the protein-synthesizing machinery of a bacterium can even be plucked from within the cell’s protective outer membrane, placed in a laboratory test tube or petri dish, and still function.

In October 2014, the field took another leap forward when the Collins lab published a serendipitous discovery that advanced the practicality of using RNA-based switches as detectors in the field—and even as therapy-producing agents. While working to develop encapsulated cell-free genetic networks for cellular reprogramming, postdoctoral student Keith Pardee discovered that a cell’s transcription and translation machinery (the parts that build proteins from DNA instructions) could be spotted onto a piece of paper,
The lab’s first deployment of the technology was to create a detector for Ebola, a rare but deadly disease that has killed thousands of people in West Africa.

freeze-dried, and then restored to full function when rehydrated. The lab’s first deployment of the technology was to create a detector for Ebola, a rare but deadly disease that has killed thousands of people in West Africa. Subsequent testing revealed that their Ebola detector remained viable for a year or more—without the need for refrigeration. This was significant, because Ebola often strikes in remote regions poorly served by healthcare facilities.

The lab has subsequently used the same techniques to make diagnostics for the Zika virus, for gut microbiome analysis, and for detecting antibiotic resistance. “We now have efforts underway looking at Lyme disease, HIV, TB, HPV, and hepatitis C,” says Collins. “It has provided us with a whole new diagnostic platform.”

Because these paper-based tests contain no living cells, he points out, there are neither biocontainment safety concerns nor problems of storage and distribution. “You have marvelous sensors made from ‘biological components that are incredibly inexpensive, easy to use, and rapid’—providing results in less than an hour.

Collins’s lab went on to demonstrate that this transcription-translation machinery could be spotted and freeze-dried into fibers used to make clothing, and is now completing work on wearable synthetic biology: suits that could show first responders or military personnel whether they have been exposed to a nerve toxin; johnnies that could tell whether a patient has a bed sore or an antibiotic-resistant infection; and lab coats that could signal whether a physician has been exposed to dangerous MRSA (methicillin-resistant Staphylococcus aureus, an antibiotic-resistant form of staph) or Clostridium difficile pathogens. (The lab recently won a Johnson & Johnson contest to design the lab coat of the future.)

Collins has also expanded the uses of freeze-drying to portable therapeutics. Just as the cellular machinery of a bacterium can be made to detect a pathogen, it can be engineered to produce a vaccine or an antibiotic such as vancomycin.

Most antibiotics are products of soil-dwelling bacteria. To make a therapeutic such as vancomycin, Collins takes existing circuits (or bits of DNA) that “are found naturally or have already been produced by others,” that will “make the molecule of interest.” He uses gene-editing tools such as CRISPR to insert these circuits into cells, and then freeze-dries these circuits together with the machinery for transcription and translation—the parts that enable that modified DNA with its associated genes to be “turned on and express the relevant proteins.” In the case of diagnostics, the rehydration that activates protein production might be a patient’s blood, urine, or sputum. In the case of therapeutics, adding water is enough to revive the machinery for making vaccines or antibiotics. This has enabled his lab to develop field kits the size of a small cellphone that could be carried “by soldiers or hikers or astronauts, athletes, or healthcare workers in global healthcare settings” to make their own medicines when needed. The individual would take the freeze-dried contents of a cell (its protein-manufacturing apparatus), add water to restore the bacterial machinery’s ability to synthesize proteins, and then add the freeze-dried engineered circuit containing the DNA instructions for making “a vaccine or an…antibiotic”—and within a couple of hours at body temperature, the therapy “is there to be used in the field.”

Taking advantage of the diversity and power of biology in this way, Collins says, “enables you to move synthetic biology out of the lab.”

Bacterial Factories of the Future

Pamela Silver, a founder of the field of synthetic biology, runs one of Harvard’s most prolific labs, with dozens of projects in train at any time. Among the most important questions she faces, therefore, is what to do next. For a long time, says the Adams professor of biochemistry and systems biology, synthetic biology was producing “toy systems. But now we’re at a point where we’re saying, ‘Forget this. We actually need to solve real-world problems.’”

Agriculture is one area of critical need: a growing world pop-
ulation must be fed. Silver and her long-term collaborator Daniel Nocera, Rockwood professor of energy in the department of chemistry and chemical biology, have therefore devised a process to manufacture inexpensively one of the most energy-intensive products farmers use: fertilizer, which provides the nitrogen that plants need to grow.

The work builds on an artificial leaf invented earlier by Nocera, a device that harnesses solar energy to split water (H₂O) in order to produce hydrogen, an energy source. To create fertilizer, Silver helped Nocera and members of his lab connect the artificial leaf to a strain of bacteria that can “fix” both atmospheric carbon dioxide and nitrogen, converting them to organic forms that can be used by living organisms. Provided with an unlimited supply of hydrogen from the artificial leaf, the bacteria combine the hydrogen with carbon pulled from the atmosphere to create a solid fuel that the bacteria store internally, as a long-term energy supply. “You can imagine this as making the bacteria fat,” explains Nocera: “obese, solar-fed bacteria” that are up to 30 percent stored energy by weight.

The bacteria are then mixed into the soil, where some remain, and others form associations directly with plant roots. Drawing from their stored energy reserves, they begin fixing atmospheric nitrogen, thus fertilizing the plants. (Because the carbon in the bacteria remains sequestered in the soil even after the bacteria deplete their energy stores and die, the process has the added advantage of being atmospheric carbon-negative.) On test fields, Nocera reports “big increases in crop yields” with almost no run-off, an environmentally poisonous side effect of water-soluble chemical fertilizers.

Turning bacteria into plant food that can be applied to fields “has huge implications,” Silver explains, “because you can produce the bacteria locally and do so in a completely ‘green’ production cycle.” The system has been spun off to a company, Kula Bio, that produces low-cost, organic fertilizers.

Silver’s latest, “craziest,” venture, as she puts it, is a project to study suspended animation—biostasis—as part of a DARPA-funded (Defense Advanced Research Projects) research program. Her team, one of four, received more than $14 million to develop ways to slow metabolic processes in order to lengthen the time a trauma victim, whether soldier or civilian, can survive without medical help. To do so, she is studying tardigrades: water-loving creatures roughly two-thousandths of an inch long that live everywhere from oceans to mountaintops. Sometimes called moss piglets, these organisms can withstand extreme temperatures, drought, and even cosmic radiation, achieving extraordinary feats of survival by entering a state in which they shut down metabolism almost entirely. This trick, known as cryptobiosis, conjures images from science fiction of suspended animation during human flights to distant colonies on other planets.

Extremophiles like the tardigrade, Silver explains, commonly carry what early researchers called “intrinsically disordered proteins,” possessing a structure that appears to be mutable and gel-like. When facing desiccation, tardigrades use these proteins, mixed with sugars, to form a protective glassy film that fills their cells and encapsulates their organs. Silver seeks to engineer a synthetic version well suited for use with human cells. To achieve this, she
“How do you make a world for 10 billion people? The only way you are going to do that is by engineering biology.”

has teamed up with associate professor of systems biology Debora Marks, a computational biologist and co-principal investigator on the project, who will use a machine-learning algorithm to suggest candidate protein designs that might work in human tissues.

Intrinsically disordered proteins could eventually help reduce the severity of heart attacks by limiting heart-muscle damage, or the impact of a stroke by slowing the death of nearby neurons. They might also extend the viability of human eggs stored for use in fertility treatments, or lengthen the usable life of organs harvested for transplant. For now, though, Silver acknowledges, “It’s early days.”

And when asked about the biggest challenge for synthetic biology, Silver replies bluntly that the true challenge is “How do you make a world for 10 billion people? The only way you are going to do that is by engineering biology”—work that is just beginning.

Applying Ancient DNA to Contemporary Conservation

Could synthetic biology save one elephant species by reanimating at least a portion of the biodiversity of an extinct species? George Church, perhaps the preeminent genome technologist in the world, believes so.

Church does basic-science research as well as fundamental technology development, working at the nexus of Internet technologies, computing, and biotechnology. Broadly speaking, he says, synthetic biology is molecular engineering: whether it utilizes biology to simulate logic circuits, probe the origins of life (a topic covered in depth in “How Life Began,” July-August 2019, page 40), manipulate metabolism, manufacture products, or enhance biological imaging. As an engineering discipline, says the Winthrop professor of genetics, “biology affords you the use of very sophisticated parts. Way more sophisticated than the piston in a car or the transistor in a phone. Biological parts have been through billions of years of debugging—trial and error.”

In synthetic biology, this trial and error process is even better than the real thing because it can be accelerated, he explains. “We can make a trillion prototypes and then design a system that will select the best” (see “Harnessing Evolution,” January-February 2017, page 15, for a description). Church’s lab runs on a similarly accelerated pace, he explains: Church’s lab runs on a similarly accelerated pace that frequently puts his forward-looking projects in the public domain.

News accounts often report that he wants to revive the woolly mammoth, a cold-adapted elephant that roamed Siberia as recently as 10,000 years ago. In fact, Church is undertaking a multi-pronged conservation project—with synthetic biology at its core—that he hopes will benefit living Asian elephants, humans, the Arctic, and perhaps the planet.

Asian elephants carry endotheliotropic herpesvirus (EEHV), which kills up to 80 percent of newborns that contract it. The virus has caused hemorrhagic bleeding and death in numerous Asian elephants held in captivity, and recent testing in Southeast Asia points to it as the cause of documented wild-elephant deaths there as well. To help save this endangered species, Church plans first to edit its genome to make it resistant to EEHV or to all viruses.

Doing so will require multiple edits in several parts of the elephant genome. But that part won’t be difficult, he says. Church’s team (Eriona Hysoli, Bobby Dhadwar, and Jessica Weber) has perfected the ability to engineer virus-free mammalian genomes as part of a virology program for breeding pigs whose organs can be safely transplanted into humans. The hard part is the real-world problem of how to respond to the elephants’ shrinking habitat. “It’s not just the herpesvirus that’s putting them at risk,” he explains, “it’s their proximity to human beings. An elephant will innocently stamp on farmers’ gardens and destroy a year’s crops, and so the farmers, correctly according to their own ethics, say, ‘Well, that elephant owes us some food.’ And they kill the elephant that night.”

He has a genetic solution to that problem, too. He proposes further edits to the elephant’s genome that would introduce woolly mammoth genes into Asian elephants in order to confer cold resistance.

Church’s team began the process by comparing the genomes of Asian elephants to those harvested from the remains of woolly mammoths, which are about 99 percent similar, he says. By focusing on the differences, he can home in on those that enabled woolly mammoths to survive in places like the Siberian tundra. Like all genes, those that allow organisms to survive in inhospitable environments are largely conserved across species, making it possible to determine the function of most genes without having to start from scratch. As for the (please turn to page 74)
YOU’VE JUST BEEN HANDED ASIA.
DON’T DROP IT.

GO.

With every new role comes the need for new skills that must be honed and mastered. Harvard Business School Executive Education helps senior executives from all over the world, and across all industries, transition into their next opportunity and propel their life’s work.
The United States has far higher rates of firearm death than any of the more than two dozen other high-income countries (among them Australia, Canada, Germany, Italy, Japan, Norway, Spain, and the United Kingdom). In 2015, for example, children in the United States between the ages of five and 14 were 21 times more likely to be killed with a firearm—29 times more likely to be firearm-homicide victims, nine times more likely to kill themselves with firearms, and 20 times more likely to be killed unintentionally with firearms—than their peers in all the other high-income countries combined.

I teach at a public-health school with many international students. They are appalled that Americans seem content to do little to reduce this carnage.

For decades, other injury-prevention experts and I have emphasized that gun violence in the United States is a major public-health problem as well as a public-safety problem, and that the country should use a public-health approach to help reduce the problem. These two claims have been fought by the gun lobby.

In the 1950s, motor-vehicle manufacturers promoted the idea that if only drivers never made mistakes and never disobeyed the law (e.g., drove fast or drove drunk), there would be hardly any crashes or traffic deaths. And they were right. They were thus able to focus public policies on the driver: promoting mandatory drivers’ education and enforcing traffic laws.

Fortunately, public-health physicians began asking a different question: not “Who caused the crash?” but “What caused the injury?” Drivers were being impaled on unyielding steering columns; their faces were being ripped apart by windshields not made of safety glass; they were being thrown from their cars, their heads hitting the car hood or the street; or vehicles that left the road hit trees and lampposts deliberately placed along the sides of highways. The public-health physi...
ians asked why the cars and roads couldn’t be made safer, why the Emergency Medical System (EMS) couldn’t be improved. Fast forward half a century: no one thinks that drivers overall are any better today than they were when I first learned to drive. (They are better about drunk driving, but worse about distracted driving.) But the cars and roads are much safer, the Emergency Medical System is better—and fatalities per mile driven have fallen more than 85 percent. This is a major public-health success story.

Today, the gun lobby wants policy to focus solely on the shooter. After all, if no one ever got angry, scared, or depressed, if no one ever made a mistake or acted irresponsibly or criminally, there would be hardly any gun injuries. Just as the twentieth-century motor-vehicle lobby wanted to deflect public attention from the motor-vehicle industrial complex, so the gun lobby today wants to keep policy attention away from the firearms industry.

The public-health approach to problems focuses on harm reduction. Public-health practitioners assumed, for example, that motor vehicles would be widely used into the foreseeable future, so their goal was prevention—how to reduce the number of serious injuries and deaths. As is usually the case, it turned out that the most cost-effective measures for prevention occurred far upstream, and that it was—and is—a terrible mistake to focus exclusively on the single individual with the last clear chance for prevention: the driver (or the shooter).

Too often the first thought of most people, when injury occurs, is to determine whom to blame. But blame is often counterproductive for prevention; if someone else is at fault, there is little reason for others to help in prevention efforts.

Rather than rely on the blame game, the public-health approach to reducing gun violence seeks to bring people and institutions together to get to work on the problem. It invites everyone to join the effort as part of the solution. It wants all groups—including law enforcement, medical providers, the faith community—to continue to perform their regular duties in helping prevent firearm injuries, but it also wants them to focus more on prevention in their routine activities, and to go outside their comfort zones. For example, public-health practitioners want police not only to enforce laws, but to enforce them in ways that are most likely to prevent future problems. Practitioners also applaud police officers who go out into the community to promote better law enforcement-community relations. Boston police, for example, have social workers in most precincts, and an ice-cream truck that provides treats for city residents. The faith community in Boston not only preaches about morality, but played a direct role in the 1990s “Boston Miracle,” when youth firearm deaths fell more than 60 percent. Religious leaders united, worked together with law enforcement and the community, and were often conspicuously present on the streets where and when the worst violence occurred.

There are so many things that institutions (and individuals) can do to reduce the nation’s firearm-related public-health problems. Firearm manufacturers could reduce gun accidents by ensuring that semi-automatics cannot shoot when the magazine is removed; they could reduce gun theft, gun accidents, and gun suicides by producing “smart” guns that can be used only by the owner and others authorized by the owner. All gun shops could begin using “best practices” for preventing straw purchases (as some alcohol retailers have done to reduce underage alcohol purchase). Gun owners could store their firearms safely to reduce accidents and theft: it is estimated that more than 300,000 guns are stolen each year, a main way these weapons get into the wrong hands.

Focused conversations can be helpful. Even though members of gun-owning households are about 50 times more likely to commit suicide with a firearm than to die from an unintentional shooting, and far more likely to die in a firearm suicide than in a firearm homicide, most firearm instructors never even mention suicide. My colleague Cathy Barber has had success working with gun shops, gun ranges, and gun trainers to reduce suicides by promoting the message that, just as “Friends don’t let friends drive drunk,” friends should offer to “babysit” the guns of someone going through a rough patch, until things get back to normal. This is one way to reduce suicide without any new laws—or even attempting to change anyone’s mental health.

Many other groups could help as well. Healthcare providers could help families get guns out of a home when someone in the household is at risk for suicide. Insurers could offer lower premiums to gun owners who store guns safely. Consumers could boycott companies that engage in practices that most endanger public safety, such as promoting firearms and accessories, like bump stocks, that increase deaths in mass shootings. Media in metropolitan areas could focus less on individual shooters and more on how and from where their guns were brought into the city. Foundations could again financially support firearm research and data collection (two decades ago, foundations provided the funds to create the pilot for the National Violent Death Reporting System). Once these groups, and many others,
Far more households own motor vehicles than own guns. Yet firearms kill about the same number of civilians as do motor vehicles....We need to do a much better job of learning to live with our firearms. Currently, far too many people are dying.

are energized to help tackle U.S. gun violence, they almost always find innovative and effective approaches for reducing the problem.

The federal government itself has many ways to help reduce firearm injuries. For example:

- **Data and funding:** In the motor-vehicle arena, the National Highway Traffic Safety Administration created excellent data systems (for example, the Fatality Analysis Reporting System that provides detailed information on the circumstances of every motor-vehicle fatality) and provides funding for research. As a result, investigators know the types of policies that should reduce motor-vehicle injuries, and can evaluate whether they are in fact working. But for firearms, there have been deliberate and successful attempts to reduce data collection and data availability, and to limit government funding of research. It has thus been difficult to determine what is actually going on regarding firearms, and whether existing policies are effective. The lack of data and research allows non-scientific claims to gain standing, because there is little science to support or disprove them.

- **Research and purchasing:** The Air Force built the first major motor-vehicle safety-testing facilities in the United States, providing crucial scientific information on car safety. The General Services Administration purchase of airbags for its fleet was instrumental in demonstrating that airbags save lives—allowing for the mandating of airbags in all automobiles. Similarly, government research on, and its purchase of, “smart guns” that help prevent unauthorized firearm use could reduce gun theft, gun accidents, and gun suicide.

- **Standards:** The research on and promotion of standards by the National Institute of Standards and Technology (NIST) for the fire-safety of cigarettes enabled states to mandate that cigarettes meet designated performance standards, thus reducing the incidence of cigarette-caused fires. Similarly, NIST could help write safety standards for firearms—leading to requiring, for example, child-proof firearms that, like child-proof aspirin bottles, could reduce unintentional deaths among toddlers. (Unlike other age groups, toddlers typically shoot themselves; indeed, the unintentional firearm death rate for toddlers is currently higher than that for five- to 10-year olds.)

- **Knowledge dissemination:** The U.S. Surgeon General reports on the dangers of cigarettes helped reduce smoking and thus the cancer, heart disease, and other health problems it caused. Similarly, Surgeon General reports on the overwhelming scientific evidence demonstrating the connection between a gun in the home and completed suicide could help reduce firearm suicide, and the overall suicide rate.

- **Taxes and subsidies:** Cigarette taxes have helped reduce smoking among youth, and taxes on sugar-sweetened beverages can reduce obesity. Differential taxes on different types of firearms (e.g., “assault weapons”) could help reduce the stock of those firearms most effective in killing large numbers of victims quickly.

- **Regulations, monitoring, and enforcement:** Licensing of drivers and registration of motor vehicles have helped reduce motor-vehicle injuries and thefts. Laws regulating the purchase of cigarettes and where smoking is permissible have helped reduce cigarette-caused illness. Similarly, federal, state, and local governments write and enforce many types of firearm regulations pertaining to background checks, training, storage, gun carrying, and where guns can be fired.

  The scientific evidence indicates that, all other things equal, places with stronger firearm laws have fewer gun problems and suffer fewer violent deaths than places with weaker laws. The existing evidence about which of the many individual laws are most effective is less compelling, but I believe that national firestorm-licensing laws, handgun registration, and a requirement of strict liability for firearms owners would substantially reduce firearm violence. (Virtually every gun in the United States begins as a legal gun: manufactured legally and sold to someone who did not fail the federal background check. Yet many guns get into the hands of people who almost everyone agrees should not have them, often through theft. By shifting the burden of proof, strict liability would provide better incentives for owners to protect their guns from improper access.)

  Motor-vehicle injury prevention is many-faceted, involving pedestrian, bicycle, and motorcycle injuries; injuries from roll-overs and from side-impact and head-on collisions; and deaths from vehicle fires. Thus, not surprisingly, the successful reduction in the motor-vehicle death rate per mile traveled did not come from one or two policies or programs, but from many. For example, collapsible steering columns helped reduce injury to drivers in frontal collisions, but did nothing to protect passengers, pedestrians, cyclists, or even drivers in side-impact crashes. Similarly, firearm policies, such as a standard to prevent dropped guns from firing, could reduce accidental injuries, but would do little to reduce homicide or suicide. We need many reasonable policies and programs to help reduce our firearm-related public-health problem.

  There are hundreds of millions of motor vehicles in the United States, and hundreds of millions of firearms. Motor vehicles (cars and trucks) are crucial to our economic well-being, and far more households own motor vehicles than own guns. Yet firearms kill about the same number of civilians as do motor vehicles. Historically we have had some success in learning to live with motor vehicles. We need to do a much better job of learning to live with our firearms. Currently, far too many people are dying.

Professor of health policy David Hemenway directs the Harvard Injury Control Research Center and the Harvard Youth Violence Prevention Center.
On November 28, 1977, Calvin Tomkins’s biographical word-sketch of artist Romare Bearden appeared in The New Yorker. Prompted perhaps by his gallery, Bearden then decided to cast his own life as a sequence of collages. A 1979 exhibit displayed 28 works, accompanied by titles and short captions co-authored by the artist and his friend Albert Murray, the novelist. A 19-collage sequel followed in 1981. Bearden inscribed the captions on the gallery walls in looping letters echoing his signature.

To draw out the New Yorker connection beyond a mere title, “Profile Series,” Bearden avoided a tell-all history in favor of a concise ironic and anecdotal recall from an oblique angle—from a “profile” perspective, one might say—with a wink. What, he asked, did it take for an African-American boy born in 1911 to begin to find his way as an artist? He offered one answer during the filming of a documentary, Bearden Plays Bearden, while reminiscing with his friends Murray, Alvin Ailey, and James Baldwin over drinks in a midtown apartment where his new work was displayed. Baldwin asserts the total absence of intellectual and artistic encouragements in the Harlem of his youth: “Everything said no to you. You were taught to despise yourself.” The idea of an Ailey, a Bearden, or a Murray was impossible. “There were no traditions.” “But we did have traditions,” Bearden puts in, quietly. “We had Bessie Smith and Duke Ellington, we had Louis Armstrong. And Jimmy, you and Alvin drew on the King James Bible. You had the rituals that went with them. We all did.”

These traditions affected Bearden long before he saw art as a career. In the Profile series, they afford us glimpses into the black, semi-rural Mecklenburg County of North Carolina, the industrial Pittsburgh, and the vibrant Harlem that so inspired Bearden as he grew up.

The small but potent Miss Mamie Singleton’s Quilt singles out quilts and quilters. Long before he began making collages, or art, young Bearden noticed these bed coverings. In one of the documentary’s outtakes he recalls: “It was a beautiful sight when she would wash them and hang them up in the yard.” Pointing to the collage...
itself, he remarks: “And there’s also a play of texture—the texture of the wall, the texture of the lady who’s about to take a bath, a little wooden tub, the stove. And I’d call your attention to the pictures [often portraits] on the walls. I used them to show the people who were there and that there was continuity in their lives.”

Music’s influence, well documented in Bearden scholarship, resounds in the series with depictions of country and jazz bands, and church choirs rehearsing and performing. The collages Daybreak Express and I’m Slappin’ Seventh Avenue With the Sole of My Shoe are titled after Ellington compositions. But the influence of dance, so important to Bearden’s aesthetic, remains lesser known. One of the Profile paintings, dedicated to the African-American dancer-pantomimist Johnny Hudgins, is captioned, “What he could do through mime on an empty stage helped show me how worlds were created on an empty canvas.” Bearden told his biographer Myron Schwartzman: “When I was a little boy, I was in a theater. The lights went on, the show was stopped, and the manager came out…Lindbergh had just flown the Atlantic and had landed in France…. [T]he greatest poem written on that flight was done at the Savoy [Ballroom]: the Lindy hop—the dancers throwing the girls, their skirts billowing…the essence of flight. So sometimes we tend to look in the book store or the museum for our history, while neglecting other aspects of it.”

Bearden couched his greatest lesson in painting in another, often repeated, story, captured in the Profile series’ centerpiece collage, Artist With Model in Studio. Strolling in Black Manhattan in the 1930s, he heard the repeated jangling of keys, the prostitute’s signal of that era. “There she was,” said Bearden, “the homeliest woman I ever saw in my life. ‘Two dollars,’ she said. And then ‘A dollar’ and then ‘Fifty cents?’ and then at last, ‘Please, just take me!’” Telling her she was “in the wrong profession,” he directed her to see his mother, Besseye, whose contacts extended through Harlem and beyond. Mother Bearden did find Ida a job. To thank Romare, Ida cleaned his studio once a week. He was struggling with a painter’s block (a recurring motif in his artist-as-young-man stories), and couldn’t find a subject to paint. “You told me I was in the wrong profession!” said Ida, observing the blank paper. “Why don’t you paint me?” She could tell by Bearden’s expression what he was thinking. “I know what I am,” she said. “But when you can look at me and see something beautiful, maybe you’ll be able to put something on that paper of yours?” “That,” said the artist, “was the most important lesson in art that I have ever received.” In 1947, Bearden made a journal entry: “Rembrandt took beggars, draped them in exotic garments, and painted them as kings. They were kings, but his greatness consists in the fact that you can see that they were also beggars.”

Artist With Model in Studio shows several influences: Picasso and especially Matisse, Duccio, Benin sculpture, a reworking of one of his earlier “Visitation” paintings into the collage. Here, Bearden has learned to see Ida as a lovely young model while depicting her as a sainted spiritual figure. His overarching project was to show that—viewed with a discerning eye, which is to say, embracing a capaciousness of vision—there was beauty all through the black community, North and South—plenty for the artist to draw on.


In the collage Artist With Model in Studio (right), Bearden’s self-portrait echoes his stance in a photograph taken three decades earlier (opposite). A 1975 image taken in his studio includes photographer Jeanne Moutoussamy and master printmaker Robert Blackburn. The collage Johnny Hudgins Comes On shows Bearden’s love of the performing arts as well.
WALTER CRONKITE stepped to the podium before a respectful audience at Harvard one November evening in 1990. An avuncular legend of broadcast journalism, celebrated as “the most trusted man in America,” he was an obvious choice to initiate an annual lecture series at the Kennedy School’s Shorenstein Center on Media, Politics and Policy. Cronkite shared insider tales from the 1950s and ’60s as he described the unfortunate effects of television on American politics: shallow debates, shrinking soundbites, image over substance.

The ninth of 11 questions he fielded pointed him toward the future. “There is the imminent emergence of a digital, global information environment with the instantaneous transmission of information…in many forms almost anywhere,” his questioner said. Combined with the proliferation of cable channels and worldwide satellite broadcasting, where would this lead? In response, Cronkite foresaw a “couch-potato society,” freed to gorge all day on televised sports, sewing, or other narrow interests without exposure to the broadening experience of the evening news. His solution to a world lost in televised abundance? Nourish the inquisitive spirit through books, magazines—and newspapers.

Here, in retrospect, like his colleagues across the American news industry, Cronkite missed the story: the transformational impact of the Internet, with the devices, the corporate giants, the acceleration of everyday behavior, and the vexing cultural and political challenges it has spawned in its unbound flood of information. Though Cronkite spoke that evening from the apex of American journalism, he had begun his career at its base: with a local reporting job at The Houston Post. In 1990, that base appeared secure. Even in the age of television, American newspapers employed by far the most journalists and produced by far the most journalism, especially at the local level. The industry’s most profitable year would not come until 2000. And then it collapsed.

Long supported by advertisers drawn to the audience they commanded, newspaper publishers found themselves stunned and stumbling across an unfamiliar and treacherous landscape. People selling couches and cars, renting apartments, or mowing lawns stopped paying for listings in their newspaper’s lucrative classified advertising section; instead they found buyers or tenants for free on Craigslist. Help-wanted ads migrated online, too. As readers flocked to Google and Facebook on their smartphones, advertisers followed. Advertising revenue declined from $49 billion in 2006 to $14 billion in 2018. Newspapers, and the reporting they underwrite, are starving.

“Every quarter, literally, since the middle of 2005, the newspaper business has deteriorated,” said Richard Tofel ’79, J.D.-M.P. P. Supporting journalism—and democracy—after the Internet eviscerated American newspapers by Mark Travis
In an interview. In that time, nearly half of all U.S. newsroom jobs have disappeared, as newspapers coped with the loss of advertising revenue. Diminished news content accelerated the loss of subscribers and their income. During the past decade, one in five American newspapers vanished, most of them weeklies, typically to mergers that rendered them less local. Many of the survivors were gutted. Already, the ability of newspapers to play their essential role in democratic discourse and community identity—a role they have filled since before the American Revolution—has been compromised. While national newspapers, such as The New York Times and The Washington Post, appear to have found their digital footing, the belief that the next recession will deliver a death blow to many of their less fortunate regional and local counterparts is widely shared. “I think a lot of people around the country—well, they may have some idea where it’s going,” Tofel said. “I think they don’t know how fast it’s getting there, and that it’s almost certainly coming to their town.”

A professorial man, Tofel brings experience and insight to these challenges. He is a former assistant publisher of The Wall Street Journal who now serves as president of ProPublica, a digital-news nonprofit dedicated to investigative reporting. His published work ranges in content from the 1939 Yankees to John F. Kennedy’s inaugural address, as well as the state and future of journalism. He is among a number of Harvard graduates who play leading roles at journalism nonprofits taking root in barren terrain: searching for ways to fill the widening void in investigative journalism; exploring approaches that can support local and specialty newsgathering in a digital age; and providing information citizens need to navigate their democracy and life in their communities.

The story about the hospital’s oppressive debt-collection practices broke one morning last June on a small nonprofit website in Memphis called MLK50. “Methodist Le Bonheur Makes Millions, Owns a Collection Agency and Relentlessly Sues the Poor,” the headline said. The article was written by MLK50 founder Wendi Thomas, who documented how the church-based, nonprofit hospital aggressively chased overdue payments and penalties from working-poor patients and its own low-wage employees. Her story made national news. Within a month, declaring itself “humbled,” the hospital announced that it would raise its minimum wage, expand its financial assistance, and de-escalate its collection efforts. In September, it erased the unpaid debt of 6,500 patients. “I have heard from hundreds of people who have medical bills,” Thomas said. “Just about everybody, it seems like, has medical bills.”

Thomas’s work was supported by ProPublica’s Local Reporting Network, through which 21 news organizations around the country received a year’s funding and editorial guidance in 2019 to produce an investigative project. Like all network projects, the
hospital story was published jointly on the ProPublica website. As is typical of investigative stories, Thomas’s reporting took months of painstaking work. “Sort of a superwoman,” Tofel said. “A one-person movement.” Thomas considered her editor at ProPublica an essential ally: “He is the first man that wasn’t a relative who has ever been in my favorites. I called him that much.”

For ProPublica, stories that lead to real-world reforms are the one true measure of success. The organization’s founders, Herbert and Marion Sandler, built one of the country’s largest savings and loan institutions over 40 years before selling it in 2006 and dedicating themselves to philanthropy. They foresaw that investigative journalism would become an early target of cost-cutting, committed $10 million to the problem, and traveled the country seeking advice on how to invest the money. Paul Steiger, the managing editor of The Wall Street Journal, offered the idea they found most persuasive: establish an independent digital nonprofit and publish in partnership with established news organizations.

ProPublica launched in 2007; Steiger was its first editor-in-chief and Tofel its general manager. They faced the challenge of every start-up. “Nobody had ever heard of us,” Tofel said. “On the first day, it’s pretty close to a tree falling in the forest.” But the partnership model worked, because it provided established organizations with good content in exchange for distribution to their readers. “That got the stories out,” Tofel said, “and then you end up in a virtuous circle of more people know who you are, and you can build.”

In 2010, ProPublica earned the first Pulitzer Prize ever awarded to a digital organization—in partnership with The New York Times Magazine—for exploring the life-and-death decisions faced by doctors at a New Orleans hospital after Hurricane Katrina. ProPublica has now worked with almost 200 publishing partners across the country. Recent projects include probing the Sackler family’s role in the opioid crisis in conjunction with The Boston Globe’s health-news website, STAT, documenting how TurboTax effectively hid a free-filing option for lower-income Americans; and exploring sexual violence in Alaska with The Anchorage Daily News.

ProPublica had grown steadily but slowly beyond its initial dependence on the Sandlers, Tofel said—until the triumph of Donald Trump in 2016, which was fueled by his hostility to the press. Donations began rising on election night and soared the following Sunday evening, when TV comedian and political commentator John Oliver flashed the ProPublica logo on the screen as he encouraged viewers to support investigative journalism. ProPublica had 3,400 individual donors in 2015—and 27,000 by the end of 2016. The organization’s size has more than doubled in less than three years. Tofel expects ProPublica’s spending to approach $32 million in 2020, supporting a news staff of 150. “The president says a lot of things that aren’t true,” he noted. “One of the things he says that is true, I think, is that he saved The New York Times. He took ProPublica to a completely different level.”

Carroll Bogert

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While ProPublica seeks to close a gap created by the struggles of newspapers, a second national news nonprofit is dedicated to covering one topic with a single-mindedness that no daily paper would have attempted. The Marshall Project was founded in 2014 by Neil Barsky, a former hedge-fund manager who named the organization in recognition of civil-rights giant Thurgood Marshall. Barsky saw the nation's criminal-justice system as a profound failure, and his answer was to heighten awareness of the issue through journalism. He hired Bill Keller, former editor of The New York Times, to edit the project. Carroll Bogert ’83, A.M. ’86, joined as president in 2016, after working as a foreign correspondent for Newsweek and then as deputy executive director for Human Rights Watch. While Bogert is an accomplished executive responsible for a 2020 budget of $8.5 million and a staff of 40, her informal bearing and occasional profanity echo the newsroom outside her office.

Like ProPublica, The Marshall Project defines itself by the traditional journalistic values of independence and fairness, and has built its audience through partnerships with 140 news organizations. Its Life Inside email newsletter features essays by people who work or are imprisoned within the criminal-justice system. News Inside is a print product—unusual for a digital organization—that circulates in prisons and jails. “We are increasingly working with USA Today,” Bogert said. “Because you know what cops read? It’s not The New York Times.” As president, Bogert’s responsibilities include fundraising, and here too the organization’s focus shapes the story she tells and the audience she addresses. “The Marshall Project is funded as much or more by people who care about the criminal-justice system...than by people who care about a free press generally,” she said. “That is, I think, one of the advantages of being a single-subject media organization...We have a separate niche.” Still, with that focus come risks—what if philanthropic interest in criminal justice fades?—and the challenge of making clear that donations don’t buy advocacy. “We’ve written mean stories about some of the people who give us money—‘mean story’ is not the right way to put it—but stories they might not love about things that they funded that failed,” she said. “We don’t shy away from that.”

In 2016, The Marshall Project became the youngest news organization to share in a Pulitzer—with ProPublica—for examining how an 18-year-old woman who reported being raped at knifepoint was disbelieved by the police and charged with lying to investigators in Washington state, while the man who had assaulted her went on to rape more victims before being caught in Colorado. Reporters for the two organizations had been working the story independently, one from Washington and the other from Colorado—only to realize in the midst of their labors that they were not alone. “They did not do the typical thing, which was to say ‘Oh shit!’ and try to beat the other guy into print,” said Bogert. Instead they spoke and decided to cooperate. “The fact that two nonprofit organizations won a Pulitzer Prize for work they did in collaboration,” she said, “is a loud bell ringing in our industry.”

But the experience of collaborating with newspapers across the country rings a warning bell of a different sort. “It’s not just that they don’t have the reporters to do the story, because we can do the story,” Bogert said. “Sometimes they don’t have the editors to lay out the story, or to spend 20 minutes thinking about the photographs they’re going to put on the story. There’s just practically nobody home. And it’s really alarming.”

Charles Sennott’s response to the alarm is a program that puts more journalists on the ground—many of them beginning reporters, placed at news organizations around the country in a spirit much like that of AmeriCorps. Called Report for America, the initiative stationed 15 journalists in the field in 2018, the first three in Appalachia; in 2019, it placed 61 in 28 states and Puerto Rico, at organizations ranging from The Fresno Bee and the Detroit Free Press to Nashville Public Radio. The program provides basic training in reporting as well as in using digital tools and pays half the participant’s salary for the first year, with a reduced contribution for a second. In 2020 Report for America hopes to place 250 local journalists, and in 2023, 1,000; in its first two years, it attracted 2,000 applicants. “There’s a sense that the crisis in American journalism has become a crisis for our democracy, and for democracy writ large,” Sennott said. “Report for America tries to look at that crisis right here in America and say there’s something we can do about it, there’s something we can do right now.”

Sennott was a strife-weary foreign correspondent for The Boston Globe when he arrived at Harvard in the fall of 2005 on a Nieman Fellowship. The Nieman Foundation, which began with a gift from a newspaper family in 1938, offers two dozen journalists a mid-career opportunity for reflection and academic study each year. Thomas, of MLK50, followed Sennott as a Nieman Fellow a decade later. Like Thomas, Sennott emerged from the program emboldened to embark on his own digital venture. Following his fellowship, he co-founded a for-profit digital news organization focused on international reporting, another early casualty of cost cutting. The difficulties of paying the bills through digital advertising led him to found a successor nonprofit in 2014 called The GroundTruth Project. The organization supports dozens of field reporting fellowships on social-justice issues worldwide, is embedded within the offices of WGBH, the public television station in Boston, and counts the station among its editorial partners. For Sennott, as for ProPublica’s donor base, the 2016 election was a domestic awakening. “I think journalism failed to hear the voices of people across the country who felt unheard,” he said. “It surprised us all.” That led to a new realization: If the organization’s mission was to support emerging journalists in uncovered corners of the world, com-
munities across the United States should be counted among them.

Report for America is a GroundTruth program that grew out of Sennott’s relationship with Steve Waldman, an entrepreneur and journalist with an interest in faith and service who had written a landmark study for the Federal Communications Commission on the country’s unmet local information needs. Waldman serves as RFA’s president, with Sennott as co-founder. In addition to placing reporters in news organizations, the program advances the notion of journalism as a public service. Participants are required to perform a community project along with their journalistic work; host organizations are encouraged to cover part of the participant’s salary through local fundraising. While placing beginning journalists at what can be struggling news organizations can’t overcome what Sennott called “the king tide” of challenges faced by the industry, it is, he said, an oar in the water. “I’ll never regret a single day we have a reporter in a community covering something that wasn’t covered before,” he said.

The local crisis has also influenced the development of ProPublica and The Marshall Project. The first of two long-term regional initiatives at The Marshall Project involves two reporters who cover criminal-justice reforms in California. The second, announced last summer, is focused on the South, with staff based in New Orleans and Dallas. “It’s a region of the country that is plagued with criminal-justice problems and really high incarceration rates, and also a region of the country where journalism has really been decimated,” Bogert said. Meanwhile, ProPublica Illinois, founded in 2017, deploys a staff of 12 in what Tofel called a potential model for regional offshoots. ProPublica’s Local Reporting Network began in 2018 with seven participants and will support projects in 23 newsrooms with the start of 2020. “It’s a stopgap, and it’s during a transition,” Tofel said, “because it requires healthy—or healthy enough—local partners.” This fall, in a variation of local partnership with lasting potential, ProPublica announced a five-year commitment to field an 11-person investigative team with The Texas Tribune, a digital news nonprofit that is highly regarded for its quality journalism and innovative business practices. “I think they have become the preeminent new entrant in local news around the country—a model in a lot of ways,” Tofel said.

The biggest obstacle The Marshall Project and ProPublica face in developing local initiatives is finding local funders. “We are in this funny moment where there is a great deal of national philanthropic attention to local news and much less local attention to local news than I think the country needs there to be,” Tofel said. It’s a matter, he said, of persuading local givers to add journalism to a mental checklist that already includes hospitals, schools, and the arts. Bogert is cautiously optimistic. “I would say that’s happening,” she said. “I don’t want to overplay it, but it’s more than before.”

Elizabeth Green ’06 intends to accelerate the progress. She is co-founder of the American Journalism Project, an ambitious initiative...
announced this year with a goal of raising $1 billion to seed promising local journalism around the country. Its focus is funding nonprofits—what it calls civic news organizations—and its goal is helping them develop the local revenue they'll need to grow. The program's backers include such leaders in funding journalism as the Knight Foundation, a legacy of the family that owned what was once the country's second-largest newspaper chain, and the Emerson Collective, which was founded by Laurene Powell Jobs and has acquired a majority stake in The Atlantic and bought California Sunday Magazine. These stak- warts have been joined by philanthropists newly interested in journalism, including Arnold Ventures (founded by Laura E. Arnold '94 and John D. Arnold). With their support, the American Journalism Project launched with $42 million in first-year funding—enough, Green said, to support an initial group of 25 to 35 projects. “The bad news about raising a billion dollars is that we're not going to raise a billion dollars for local news overnight,” Green said. “But the good news about a billion dollars is that it is actually the same size as [the funding for] a number of social sectors that already exist,” she added, pointing to public media and dance companies nationwide.

In seeking to recruit potential investors, Green needs only to tell her own story. She lost her first newspaper job, covering education for The New York Sun, when the paper closed in 2008. It was the first year of the Great Recession, and she was among many peers in finding her career expectations upended. So she followed the example of friends who started their own companies and built their own future. “It wasn’t unusual to sort of think, ‘Okay, I’ve been given lemons, my industry is in disrepair, but that’s also an opportunity to rebuild,’” she said.

First, Green developed an in-depth blog on education issues on a website called GothamSchools. The quality of her work yielded an opportunity to write a piece for The New York Times Magazine. Two fellowships yielded a book called Building a Better Teacher. And initial funding of $200,000 yielded Chalkbeat, a national nonprofit dedicated to education coverage, with seven regional bureaus from Newark to Tennessee to Detroit and Colorado, a staff of 60 and 2020 budget of $12 million, with plans to cover 18 regions by 2025. “We always were looking from the very beginning to meet needs, fill gaps, not replicate something,” said Green, who is Chalkbeat’s CEO and editor-in-chief. In its growth, Chalkbeat has demonstrated the nimbleness you'd expect from a for-profit start-up, building on a revenue base of foundation funding through education-centered events, individual donations, a job board, sponsorships for its email newsletters, and display ads on its website. All this, Green explained, is possible because of Chalkbeat's single-subject focus. “In New York City,” she said, “the teachers union is a sponsor of our New York City vertical, because they know teachers are passionate about reading Chalkbeat.” A similar passion, she said, has lifted single-subject, for-profit news start-ups, too: “The Information and the tech industry, The Athletic and sports, Eater and restaurants.

For all these organizations, Green said, the essential audience is readers, not the advertisers upon whom newspapers traditionally relied. Every summer, every Chalkbeat bureau holds listening events to solicit ideas from people who care about their coverage. During the school year, they hold office hours in libraries or at parents-group meetings. “A recurring theme we hear is mistrust,” Green said. “Who are you, who pays for you? ... We have a pretty good answer: Nobody owns us, actually. We’re community-serving and editorially independent. By the end they’ll say things like, ‘You know, in my 35 years as a community leader in Newark, The Star Ledger never once asked me what I wanted.’”

Green had her own 2016 moment, as she recognized the weakness of local journalism and the consequences for the country. “The current landscape, among other things, does not include enough news organizations led by people of color, news organizations that are led by people from rural America, news organizations that will truly create a new civic media that looks like and serves the full scope of the country,” she said. Her initial what-can-be-done conversations led her to John Thornton, a venture capitalist and the founder of The Texas Tribune. Green and Thornton learned they had done the same math, based on Waldman’s FCC report: It would take about 25,000 more journalists to ensure every state and municipal organization in the country was covered. That works out to a $2 billion challenge; allow for the efficiencies of digital news, Green said, and perhaps the needed sum drops by half—hence the American Journalism Project’s goal.

Taken together, the budgets of news nonprofits amount to only a tiny fraction of the $14 billion in advertising that newspapers still command, and newspapers continue to employ thousands more journalists. But there is no question which hull is rising, and which is falling. The unknowns include how close digital journalism can come to matching what’s been lost, and when, and how different it will be; the next downturn may threaten philanthropy and digital-news start-ups just as it does newspapers. The challenge facing journalism’s reinventors is immense, and despite their vision and successes, the future could be dark. “I think you’re going to have fewer people gathering less news and less news being available to people about local events,” Tofel said. “I would be very surprised if that were not true.” It won’t be a journalistic world Walter Cronkite would have recognized, and whether it evolves to meet the needs of the American public will depend on factors beyond the control of those who work toward ensuring that it does. That, as in Cronkite’s day, is the way it is.

Mark Travis, a Nieman Fellow at Harvard in 2002-2003, spent the first phase of his career as a reporter and editor; much of it at the Concord (N.H.) Monitor; the second phase as a newspaper publisher; and the third phase in the local digital news and information start-up. He lives in Canterbury, New Hampshire.
In the finale of the Netflix series Living with Yourself, Paul Rudd’s character gets into a fight with himself—or, rather, with a clone of himself. That new-and-improved version has spent the previous seven and a half episodes tormenting the original, a sad sack named Miles, by outshining him at work, at home, and pretty much everywhere. When they finally come to blows in the climactic scene, Miles and New Miles—both played by Rudd—destroy an entire apartment, leaving furniture smashed, sheets torn, packing peanuts strewn all over: a careening, spectacular mess.

And every second, of course, was meticulously choreographed. For that, the show’s creators turned to Kuperman Brothers—the eponymous enterprise of Rick ‘11 and Jeff: choreographers and directors with third-degree black belts in Kenpo karate and a growing list of screen and stage credits. The pair devised and rehearsed an action sequence emphasizing the idea of two equally matched—and equally awkward—fighters whose lives and identities are inextricably joined. During the fracas, the two Mileses sometimes seem to come together like a seesaw; and when one tries to hurl the other over his head, the force hurls them both into a circular tumble. At one point the two characters get twisted up together inside a bedsheet; later, facing off like mirror images, they push off each other with one foot, a double-kick...
move that sends each falling backward. During the four-day shoot, as Rudd filmed the fight, first as one Miles and then as the other, one or the other Kuperman subbed in to stunt-double as his opponent: two brothers who look almost like twins (Rick and Jeff are only 13 months apart) standing in for doppelgangers who look, and fight, like brothers. “It was a really cool process,” says Rick Kuperman, “creating the action of these two leads, and also figuring out how it translated to the camera, how the camera would move to capture it.”

For the Kupermans, choreography came gradually, although dance started early. The two grew up in Toronto, where an interest in gymnastics quickly led to ballet and then tap, jazz, and contemporary dance. They branched into acrobatics and parkour, and then martial arts. The dance studio where they spent much of their childhood was an unusually nurturing place for young boys, Rick says: “There were a lot of male dancers. Oftentimes, you’re lucky if there are one or two guys. But there, it was the kind of thing where masculinity and movement were naturally combined.”

After high school, Rick, who is older, came to Harvard and Jeff went to Princeton. Both kept up their dance training alongside their other studies (Rick graduated with a concentration in psychology: “Incredibly relevant for work in the arts, process-wise”). They were learning about the greats of modern American dance—Isadora Duncan, Martha Graham, Katherine Dunham, Paul Taylor—while auditioning for performances and experimenting with choreography and directing at their separate campuses. They converged every summer in New York, where they put on a show, sometimes two, at Sightline Arts, a production company and arts incubator co-founded by Rick’s friend Calla Videt ’08. Their formal partnership grew out of those yearly convergences. “We just found that the work was better when we were together,” says Rick, “and that it was also more fun to make.” Safer, too. With his brother anchoring him, Rick says, he felt secure taking artistic risks and articulating wild ideas. “You have the freedom to go to the outer edges of your creativity.”

Kuperman Brothers incorporated in 2012, and the pair’s burgeoning repertoire now includes work in television, films, commercials, music videos, and theatrical productions. In 2016, they choreographed some 20 dancers performing to the Phish song “Pet-

**“They Need Money”**

In *Invisible Americans: The Tragic Cost of Child Poverty* (Knopf, $24), Jeff Madrick, M.B.A. ’71, an economics columnist, author, and teacher, draws attention to a problem Americans seem, mostly, inclined to ignore. At a time of intense debate about income inequality, he puts a face—or millions of young faces—on the meaning of real poverty and deprivation. Madrick begins by recalling Michael Harrington’s 1962 book, *The Other America,* and the federal government’s response, observing:

Harrington presented persuasive evidence that at least 25 percent of Americans were poor, and it shocked a nation that thought of itself as newly affluent. A middle class was flourishing by the 1960s. Harrington’s book and the buoyant economy combined to raise the American people’s sense of obligation and commitment to decency. Under President Lyndon Johnson, the country adopted a range of generous programs for the poor, including children, and people of color. This “War on Poverty,” though hardly as bold as it could have been, succeeded far more than its later deriders claimed.

But the child poverty rate in America today is 20 to 25 percent as I measure it, and arguably higher, and it has produced no wave of response vaguely similar to Johnson’s more than 50 years ago. My purposes here are to document the scourge of child poverty, the many ways it damages children and limits their possibilities, to make clear the immense irresponsibility of the world’s richest nation to tolerate basically the highest child poverty rates in the developed world, and to recommend what should be done about it.

There are roughly 13 million officially poor children in America, nearly one in five. If properly measured it would be closer to one in four, and with more honest assumptions more than one in three. In France and Germany only around one in 10 children are poor, and by a more stringent test. In the Nordic nations, only one in 30 children are poor. Child poverty is lower in these nations not because the economy produces fewer poor people but because social policies are directed at supporting the poor more generously and efficiently than in the United States.

Our struggling children lack material goods and services, including minimally decent shelter and healthcare. The level of material deprivation, or hardship, as analysts call it, is much higher than the government-reported poverty rate…. I will argue that poor children have many requirements, but above all they need money.
With *Alice By Heart*, the Kupermans set up a “choreography lab” to collaborate with the ensemble.

inning of *Alice in Wonderland* that places the protagonist in a London Tube station during the Blitz. The result, developed over four months in what Rick calls a “choreographic lab” with a team of collaborators and performers, won several awards. More recently, they choreographed *Cyrano*, a moody musical adaptation of *Cyrano de Bergerac* that starred Peter Dinklage, with a score by the rock band The National; they also choreographed a forthcoming Miramax film, *Silent Retreat*, about a bumbling group of four people who go to upstate New York for three days of silent meditation. It becomes a silent comedy about 20 minutes in, Rick explains: “Our role was to create some of the physical comedy,” drawing on the traditions of Buster Keaton, Charlie Chaplin, and other silent-film comedians.

Humor—physical, ironic, witty, poignant—is a common thread through their choreography. Another is the importance of story. “In every format,” Rick emphasizes, “our principal goal is to tell a compelling story. That’s always been my strongest interest: not movement for movement’s sake—although that is often brilliant and virtuosic and can bring me to tears—but creating a movement language that is part of a narrative structure, that helps drive a story.”

### Open Book

**Assaulting the Ramparts**

Don’t try to attack a “castle”—the established order, the dominant way of dealing with issues—head on. A direct attack provokes defensive actions. Fortifications get deployed. Every window shows a weapon. Iron gates drop, and drawbridges rise to make it impossible to cross the moat. Legions of protectors are mobilized. Occupants become even more defiant, not wanting to be displaced. They hunker down for a long siege, secure in the knowledge that they are superior to the peasants and barbarians outside.... They fail to see that there might be a new way of life taking place beyond their walls.

The world is littered with literal and figurative castles.... In America, castles take... modern physical form as suburban corporate headquarters, heavily guarded office towers, gated communities with hidden delivery entrances, or massive government buildings with intimidating security lines. These edifices are designed to protect executives and functionaries from unwelcome intrusions—or the need to change....

Castles are representations of institutions. Health is equated with hospitals, education with schoolhouses, news with newspapers, spirituality with the church.... Headquarters become the impersonal embodiment of the established structure (“the Pentagon says”).

Castles are pernicious because of what they leave out.... Health isn’t the hospital or even the doctor’s office. Health might be a function of nutritious food, clean air, or stress-free work. But behemoth establishments dominate health care, including rival fiefdoms such as providers and insurance companies, full of fortification and defenses, sometimes shutting out alternatives for treatment or blocking routes to wellness.... And the city isn’t only city hall.... It is also the life and culture of the people as seen in pop-up stores, food trucks, events, festivals, sidewalk chalk artists, and outdoor mural painters.

... Castles are monuments to the past and to past thinking, museums of preservation. They are establishments harboring the establishment, the elites of business and society.

... The best way to attack a castle is not head on. (Unless you command a mighty army and are willing to risk mutually assured destruction.) The best way is to go around it or underneath it.
Tension crackled through the audience, which was clumped in a circle in the Frankfurt Conference Center. At the center of the group, Lena Chen ’09, an artist and writer, paced like a cat around a bed, scanning nervous faces for her next victim. A camera trained on her face projected her image onto the back wall, as she led each chosen person to the bed, before inviting him or her to pick one of the several notebooks fanned out in a semicircle on the floor: they are revealed to be Chen’s diaries. Then, sometimes coquettish, sometimes convivial, she read several entries, both intimate and mundane, aloud to the group.

The performance was part of the B3 Bien­nial of the Moving Image, hosted this past October in partnership with the Frank­furt Book Fair. Earlier, Chen and frequent collaborator Molly Baber (the videogra­pher that evening) won an award for Best Emerging Talent for their video installation, Expose Her. For that project, Chen posed in her Berlin apartment as her recorded voice recited passages from some of those same diary entries, which recount how she has dealt with revenge porn—she became one of its first known victims—online harassment, and mental-health issues during the last 10 years.

Chen was raised in Los Angeles, the
daughter of Chinese immigrants. At Harvard, she quickly became a campus celebrity as her blog, Sex and the Ivy, chronicled her sexual forays into the sometimes-disfunctional world of Harvard undergraduate social life. Some readers were shocked. “I don’t think the actual content was controversial,” Chen recalls, “so much as the fact that I was writing so publicly as a woman of color—and that this was in 2008, when the types of writing that we’re used to, very confessional essays from women, wasn’t as common.”

Concentrating in sociology, with a secondary in women, gender, and sexuality studies, Chen thrived at the newly founded Women’s Center, particularly in a seminar led by its then-director, Susan Marine. She says Marine taught her to understand that feminism “is not just about what you discuss in the classroom; it’s about how you incorporate this in your real life.” For Chen, it has become a guiding artistic principle. In 2018, she and a group of other artist-activists launched Heal Her, a traveling workshop that seeks to help survivors of sexual violence—so far, in six different countries—through “transformative storytelling”: communal, therapeutic, spiritual, and artistic techniques for helping women process sexual trauma through art. Facilitators lead the women in meditation, psychodrama, breathing exercises, and even neopagan rituals all focused on “opening up the body, psychologically, physically, [and] getting people into a safe state where they can start sharing their stories.” The resulting art

Off the Shelf
Recent books with Harvard connections

City on a Hill: Urban Idealism in America from the Puritans to the Present, by Alex Krieger, professor in practice of urban design (Harvard, $35). Americans romanticize the pastoral countryside and clustering in suburbs, but cities—and visions of better urban places—are threaded through their imaginations and experiences. Krieger, a distinguished practitioner-scholar (and member of the steering committee for Harvard’s urban development for its vast Allston holdings), surveys the history and expression of this vision, comprehensively and vividly.

The Puritans: A Transatlantic History, by David D. Hall, Bartlett professor of New England church history emeritus (Princeton, $35). Turning to that other “city on a hill,” Hall anchors Puritanism in its roots in Elizabethan England and Scotland, follows its migration to the more hospitable New England, and traces its religious and political decline. A sweeping, vigorous narrative, drawing on a lifetime of scholarship, it begins, briskly, “When Christendom in the West was swept by currents of renewal and reform in the sixteenth century, the outcome was schism.” Who would not read on?

Kinds Come First, by Jerome Kagan, Starch professor of psychology emeritus (MIT, $30). A seemingly technical book about the validity of experiments and their results, this volume makes a most humanistic point: Kagan argues that “a particular value on a reliable measure” probably does not possess “the same theoretical meaning for human participants who vary in developmental stage, gender, social class, or ethnic group.” That is to say, per the subtitle, the categories of “age, gender, class, and ethnicity give meaning to measures”—especially important to remember in a data-driven age.


presidential campaigns, and then eight years speechwriting in the White House, might drive anyone to contemplate her inner life. Hurwitz’s approachable account of her rediscovery that she did, indeed, “love Judaism enough to choose it back,” might find wide appeal.

Why Trust Science? by Naomi Oreskes, professor of the history of science (Princeton, $24.95). A scholar who has probed attempts to sow skepticism about science (by, among others, the tobacco industry and fossil-fuel producers), makes a strong case that science is credible precisely because it is a social, human process. (See Harvard Portrait, July-August 2014, page 23.)


Virtue Politics: Soulcraft and Statecraft in Renaissance Italy, by James Hankins, professor of history (Harvard, $45). The founding editor of the I Tatti Renaissance Library (see “Rereading the Renaissance,” March-April 2006, page 34) undertakes a magisterial reassessment of the humanist political thought of that momentous upwelling. He finds that the focus on Machiavelli and the machinations of statecraft underplay the focus on character,
Three Poems, by Hannah Sullivan, Ph.D. ’08 (Farrar, Straus & Giroux, $23). The author, associate professor at New College, Oxford, where she is a scholar of English new start. She assumed an alter ego, Elle Peril, and made her living modeling, often nude, for photographers and artists. At first, the new name was merely an escape from the reaches of Google. But as Chen began reading about feminist performance artists from the 1970s—particularly Sophie Calle, Lynn Hershman Leeson, and Carolee Schneemann—who had made their bodies into sites for con-

A New World Begins: The History of the French Revolution, by Jeremy D. Popkin, A.M. ’71 (Basic Books, $35). The Bryan Chair professor of history at the University of Kentucky, who grew up during the convulsions of the 1960s, crafts a narrative history of the revolution, two centuries and three decades after its convulsive beginning raised, indelibly, the persisting issues of liberty and democracy.

Moving Up without Losing Your Way: The Ethical Costs of Upward Mobility, by Jennifer M. Morton (Princeton, $26.95). The author, an associate professor of philosophy at CCNY and now UNC-Chapel Hill, reflects on what it takes, and costs, to move from one stratum of society to another as a first-generation student at elite colleges: in her case, from birth in Lima, Peru, through a Princeton undergraduate education and a Stanford doctorate. At a time of increased focus on such students’ needs (see Anthony Abraham Jack’s research, “Adjacent but Unequal,” March-April 2019, page 26, and the College’s First-Year Retreat and Experience, harvardmagazine.com/fyre-18), this welcome exploration deepens understanding of the real challenges.

The Affirmative Action Puzzle: A Living History from Reconstruction to Today, by Melvin I. Urofsky (Pantheon, $35). The professor of law and public policy and of history emeritus at Virginia Commonwealth University, a leading Brandeis scholar, has performed the useful service of delivering an even-handed, comprehensive survey of the subject—about which he was and is “conflicted.” The chapter on higher education necessarily deals extensively with Harvard, from the Bakke case to the recent, if preliminary, victory in the Students for Fair Admissions lawsuit (“Harvard’s Admissions Process Upheld,” November-December 2019, page 21). But it is worthwhile thinking about the whole field for a more parochial perspective on what remains fiercely contested terrain.
The Mystery of Mathematics

Teaching and learning math as a human endeavor

by JACOB BARANDES

A couple of years ago, I found myself reading through the “Principal’s Column” in an email newsletter from my kids’ elementary school. In her essay, the school principal wrote, “I don’t have memories of curling up with a workbook and solving equations the way I have memories of reading a good book in front of a fire. Math feels like work, while reading feels like pleasure.” I found it disheartening to see mathematics described in this way by the head of a school, as though recreational or professional mathematicians spend their time trudging through workbooks.

Unfortunately, I can attest that this perception of mathematics is widespread in education circles. And this mentality has real impacts on children. When I talk with high-school students, I often hear from those who enjoy their math classes that their favorite things about math are its rules and its definite answers—and I usually hear the same from students who don’t enjoy their math classes.

How has it come to this?

In some ways, math is a victim of its own success. Math has given human societies so many powerful tools for invention, for science, and for our practical needs that it’s hardly surprising that methods and applications of mathematics have come to dominate how it’s taught today.

But math can’t be reduced to these methods and applications, any more than the visual arts or journalism or music can be reduced to their methods and applications. Real math isn’t about memorizing arcane terminology, or following a set of rules and procedures laid out centuries ago, and has as much to do with workbooks and long division as real writing has to do with diagramming sentences or memorizing vocabulary.

Real math is a quest driven by curiosity and wonder. It requires creativity, aesthetic sensibilities, a penchant for mystery, and courage in the face of the unknown. It involves playing around with ideas, shapes, concepts, numbers, and structures; asking questions; collaborating with others; looking for patterns; breaking out of old paradigms; recognizing beauty; connecting with a transcendent realm of immortal entities; and making convincing cases to defend your claims. Real math is about making bold conjectures and then figuring out how to turn them into eternal theorems by proving them, or finding connections between existing mathematical tools and the worldly phenomena that surround us. Kids can start to do real math as soon as they’re able.

With rituals that adapt to each city, Heal Her helps women process sexual trauma through art.

outside SOMA Gallery in Berlin in 2017. She read excerpts from her now-abandoned memoir as she stripped to nude on the street. Opportunities throughout Europe followed as she collaborated with dramaturges, photographers, videographers, sound engineers, and others on performances, installations, videos, and photography exhibitions exploring the slippery world of identity—which Chen calls “the ultimate creative project.”

Now she is making art under her original name, which she returned to after a nervous breakdown in 2016, precipitated by living between these two identities. “Basically, I lost track of myself,” she remembers. Today, she is enrolled in an M.F.A. program at the University of Pittsburgh, and touring with shows like the one she took to the B3 Biennial. Though her alter ego has faded into the background, her art-as-activism remains all-encompassing. Chen’s body was once used against her, as a weapon of shame and degradation, but as an artist, she has regained control: “I have taken my trauma,” she says, “and I’ve transformed it into art.” That art is often shocking, precisely because it—like the revenge porn—blurs the boundaries between her private and public selves. It is both literally and figuratively embodied: Chen has taken hormone pills and used a breast pump to try to induce lactation; has invited the public into rituals held by her Berlin-based coven, practicing non-monotheistic spiritual traditions and witchcraft; and, in the case of the Frankfurt show, has laid bare every detail of her past.

Whether audiences experience her work in person or through video, Chen is driven by the potential for intimacy that, perhaps paradoxically, is a part of performance itself. “There’s always this impulse in me to reach inside people and do something more,” she says, “and break this barrier between what is performance, what is art, and what is reality.”

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to play around with puzzles, draw pictures, and reason logically, even before they know their multiplication tables or how to solve for x.

During the last 10 years, mathematicians have published a number of books attempting to bring this perspective on their subject into the public discourse. One of my favorites is a polemic called A Mathematician’s Lament by Paul Lockhart, who was a research mathematician at Brown University and UC, Santa Cruz before becoming a teacher at St. Ann’s School in Brooklyn. Lockhart compares most elementary and secondary math education to forcing novice music students to spend their time copying musical notation rather than singing or playing instruments, or making art students fill out paint-by-numbers kits rather than using their imaginations to create works of their own.

Other recent books, like Steven Strogatz’s The Joy of X (based largely on his columns for The New York Times), Arthur Benjamin’s The Magic of Math, and Lockhart’s later books like Measurement and Arithmetic, spend little time critiquing contemporary educational practices and instead revel in the elegance and excitement of math itself.

In his new book, Mathematics for Human Flourishing, Harvey Mudd College professor Francis Su, Ph.D. ’95, a former president of the Mathematical Association of America, splits the difference between these two approaches. Su argues that math is a far more profound and enriching human endeavor than can be captured by traditional arithmetic drills, and that to do math is to be fully hu-
**Friday**
3pm – Check In
Welcome to The Charles! Time to set your internal clock to vacation mode.
5:30pm – Dine Out
Return to a nostalgic spot or check out the hot new dining rooms in town.
7:30pm – Snap Along
Cozy up around the stage at Regattabar Jazz Club with wicked talented jazz artists from across the globe.
10pm – Sweet Dreams
Order yourself a late night snack (or drink) from room service and find a late night film to fall asleep to. No wake-up call needed!

**Saturday**
9am – Wake Up
Follow the scent of coffee and bacon downstairs for a home-cooked breakfast at Henrietta’s Table.
11am – Shop Local
Fueled up? Hit the Square to window shop: book stores, chocolates, and clothes – oh my!
7pm – Buon Appetito!
Relax over a leisurely, multi-course meal on the second floor with Benedetto. Save room for dessert!

**Sunday**
12pm – Sleep In & Check Out
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man. Su also lays out the case that doing math doesn’t just make a person a better calculator, but builds character in a whole assortment of different ways. The book is organized around a set of human virtues—“imagination,” “persistence,” “hopefulness,” “confidence in struggle,” “disposition toward beauty,” “inventiveness,” “joyfulness,” and “love”—the last of which Su gives its own complete chapter.

He has a lot to say about the way schools teach math (or fail to do so). His views are well summarized early on:

> When some people ask, “When am I ever going to use this?” what they are really asking is “When am I ever going to value this?” They’re equating math’s value with utility because they haven’t seen that they can value anything more than its usefulness. A grander, more purposeful vision of mathematics would tap into the desires that can entice us to do mathematics as well as the virtues that mathematics can build.

Su contends that we’re all math educators in one form or another, and that we should avoid presenting mathematics to the impressionable young minds around us as a strict set of procedures to be committed to memory, or as an innate capacity reserved for a select few:

> As a mathematical learner, don’t let yourself be sucked into an education that champions mathematics as pure logic, cold and heartless, a bunch of rules to follow. Who would want to learn that, or teach that? That is not where the heart of mathematics is. You cannot separate the proper practice of mathematics from what it means to be human.

He writes that we should instead communicate that math is an exploratory adventure, and anyone can become proficient at it. I can speak from personal experience that cultivating skill at mathematics can bring a great deal of joy and satisfaction, much like learning the art of gourmet cooking or playing a musical instrument.

The book is filled with thought-provoking and inspiring statements, such as a quotation from the math educator Fawn Nguyen, whose words teachers in every discipline should take to heart: “Critique the effectiveness of your lesson, not by what answers students give, but by what questions they ask.” Emphasizing the value of
The “freedoms of mathematics” include the freedom to solve problems, to explore new directions, to open one’s imagination, and to land in a welcoming community.

Fèw mistakes and the importance of struggle to the process of personal development, Su writes that “even wrong ideas soften the soil in which good ideas can grow.” In pushing for a more welcoming attitude in mathematical communities, he also sagely points out that “Background is not the same as ability.” And he takes a refreshing point of view on freedom:

I know that some people define freedom as “the absence of constraints,” as if it means “do whatever you want.” I don’t believe that’s what true freedom is. True freedom never comes without cost, relationship, or responsibility....Those of us who have experienced the freedoms of mathematics have a significant responsibility to welcome others to those freedoms as well.

Among the freedoms he describes are the freedom that comes from knowing many approaches to solving problems, the freedom to explore new directions, the freedom to solve problems, the freedom that comes from knowing many points of view on freedom: “Mathematics for Human Flourishing” is by no means a traditional math book. There are very few equations in it, and Su weaves in many personal details from his own life: his adoption, his parents’ illnesses, his personal experiences with racial identity, his challenges in graduate school, his efforts to make math a more inclusive discipline for newcomers, and his long-running correspondence with a federal inmate learning advanced math. True to the spirit of his book, his exposition is deeply human-centered, and begins with an apt quotation from the philosopher Simone Weil that animates the book as a whole: “Every being cries out silently to be read differently.”

Who is Su’s book for? Like mathematics itself, Su’s book is for everyone. It’s for students in high school or college who are new to the subject and may sometimes feel discouraged or uninspired. It’s for people who may have had challenging experiences with math in school but are open to re-evaluating their feelings. It’s for professional mathematicians who are thinking about how they mentor students and reach out to their larger communities. It’s for parents who recognize that their attitudes toward math have profound effects on their children. And, above all, it’s for teachers of every kind who ought to think carefully about what they’re teaching—and why.

Jacob A. Barandes, Ph.D. ’11, is director of graduate studies for the division of science in the Faculty of Arts and Sciences, co-director of graduate studies for the department of physics, and a lecturer in physics. He earned dual bachelor’s degrees in mathematics and physics at Columbia, and teaches Harvard undergraduate and graduate courses on physics and teacher training.

ALUMNI

Your Tech Relationship Counselor

Geoffrey Fowler tackles the “great reckoning” with privacy.

by Jacob Sweet

When the batteries of his three-year-old Apple Airpods began to fail, Geoffrey A. Fowler ’00 took them to the Apple Store. A repair was impossible, an Apple Genius told him. New ones would cost $149.

Others might have rolled their eyes and dug into their wallets. But Fowler, The Washington Post’s technology columnist, had some questions. How could Apple, a company worth more than a trillion dollars, have no way of repairing the battery of a product used by tens of millions? During the next few weeks as he dogged Apple, via email, for answers about the durability, sustainability, and replaceability of one of its flagship products, Fowler also gathered sharp dental tools, borrowed a special plastic-slicing knife, and performed an “Airpod autopsy” on his wireless headphones.

A few days later, with enough of his questions reluctantly addressed in corporatese, he posted the pseudo-medical results as a column and video, narrating his predicament and explaining Apple’s lackluster AirPod repair policy. “We shouldn’t let Apple turn [headphones] into expensive, disposable electronics,” he argued in his column. “It’s hurting our wallets—and the environment.”

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“Renewing the News” (page 48), profiling alumni who are remaking American journalism in the wake of the Internet and the digital destruction of the community daily newspaper.

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Based in San Francisco, Fowler joined the Post in 2017, after 16 years covering consumer technology, Silicon Valley, and China for The Wall Street Journal. Unlike some tech reporters, he’s not particularly interested in what he calls the “Game of Thrones aspect” of tech journalism: who’s up, who’s down, who’s a billionaire. His approach is more anthropological, filled with questions about technology’s impact on everyday life. He compares his role as columnist to that of a “relationship counselor” between users and technology. “So, is this really working for us?” is often the question at issue.

Lately, his main interest has been what he calls “the secret life of your data”: the myriad ways industries harvest personal information while concealing the extent of the snooping. His videos and columns are filled with “experiments” he uses to peel back the curtain on typical tech practices.

When a giant Apple ad proclaimed, “What happens on your iPhone, stays on your iPhone,” Fowler fact-checked it. He asked a friend—a former National Security Agency staff member—to hack his iPhone and see what happened to his data. In one night, his iPhone shuttled information to a dozen marketing companies, research firms, and other organizations. Yelp, a crowd-sourced restaurant reviewing service, received a message that included his IP address once every five minutes. In just one week, his iPhone fed information to 5,400 data trackers, mostly through apps. “Isn’t Apple supposed to be better at privacy?” Fowler wrote.

In another column, he examined thousands of records that his Amazon Echo had kept of him during a four-year period. People can manually delete the saved recordings, but they can’t stop Amazon from collecting and sending them to employees tasked with improving the device’s artificial intelligence. “My life, I think it belongs to me. They think it belongs to them,” Fowler says, his voice rising in semi-amused frustration. “I have a big problem with that. It’s my life, not their life!”

Behind the serious subject matter, and his very real concerns about data privacy, Fowler’s coverage retains a sense of humor. Readers can tell that he actually enjoys bugging Apple representatives with emails, knowing that even after weeks of pressure, their responses will be woefully inadequate. His favorite part of journalism has always been the exploration and discovery—chasing an elusive question to the furthest extent possible. (Sometimes that question isn’t especially substantial. In one video, he asks people on the street if they can flip open Samsung’s Galaxy Fold—a $2,000 phone with a massive folding touch screen—with just one hand. It’s not easy.)

In his videos, Fowler’s round face appears both amused and incredulous, his mouth on the verge of a knowing smile, as if he’s asking, Isn’t this stuff comically insane? Though an early adopter of personal technology, he’s managed to keep a critical distance as tech has become omnipresent, approaching it not as a “consumption device” to distract and entertain, but as a tool.

When Fowler was six, his father, a professor of medicine at the University of South Carolina, brought home a brandless computer assembled at a local tech store in Columbia. Fowler took to the massive device quickly as a drawing tool. His first composition, executed on a now-obsolete program named GEM Draw, featured a self-portrait: a boy with a square torso wearing a pink-patterned shirt, with a lower body resembling a tuning fork.

Every month, the family received PC World, a magazine thick with ads for computer components. Fowler remembers the consistent effort required to keep the device up to date, replacing and installing new parts. At the time, using a computer required some knowledge of what was going on inside. With user-friendly options today, it’s easier to operate the devices, but harder to know what’s happening within. Fowler thinks some of the opacity is intentional: “They don’t really want you to know what they’re taking, who they’re sharing it with, and what they’re doing with it.”

When he was 10, his mother, a librarian, encouraged him to apply for the Mini Page Press Corps, a program led by The State, a respected local newspaper. “Basically, they hired 10-year-olds to write stories,” he says. “And I loved it.” He recalls the staff putting a surprising amount of time into training ‘tween reporters. Through this job and summers at journalism camp, he fell in love with the sense of wonder that journalism fosters: “going someplace new, having to figure something out.”

When he arrived at Harvard on the cusp of the dot-com boom, his interests in journalism and computers melded. He installed Ethernet...
technology in student dorms, and was enlisted when the Faculty of Arts and Sciences and the College wanted websites. He distinctly remembers meeting with an administrator and debating whether to put each House’s Facebook online. They decided it was a terrible idea. “So that, obviously,” he says, laughing, “was the same idea Mark Zuckerberg ’06, L.L.D. ’17] eventually had, and which became the world’s fifth most valuable company.”

As a Ledecky Fellow for this magazine during his senior year, Fowler often addressed the rising allure of the tech world, and the promise of riches. “The commercialization of the Internet has fabricated an ethos of e-commerce so powerful that computer science and finance now share a common battle cry: ‘Who wants to be a millionaire?’” he wrote. In 1997, when The Harvard Crimson got serious about a Web presence, Fowler and another Ledecky Fellow, Jennifer Lee ’99, became the paper’s first webmasters. (Lee, now an incorporator of this magazine, is the subject of “Of Dumplings, Bok Choy, and the Politics of Emoji,” 2/14/19.)

Despite all this, Fowler never considered concentrating in computer science, or even taking a class on the subject. “For me, it’s always been about what the things do, or what you can do with the thing, rather than the science of the thing—like how it works in and of itself.” Instead, he took an introductory anthropology class and found his intellectual home. While editing the student magazine Diversity and Distinction, he aimed to merge an anthropological way of thinking—trying to understand something through a new set of eyes—with narrative storytelling.

After graduation, he spent a year at Cambridge’s Trinity College, earning a master’s degree in anthropology, but also freelancing as a writer. An internship at The Wall Street Journal led to his being hired as a news assistant on the foreign desk. His first day of work was September 11, 2001; the paper’s office, located beside the World Trade Center, was severely damaged and filled with ash. Fowler,
“That’s the cognitive dissonance of being a modern consumer in 2019,” Fowler says. “You can wonder at the new thing and also realize it’s bringing peril into our lives. That’s the tension that I often find myself in, as a writer.”

on his way to work by subway, rushed back home before the towers collapsed.

As the United States prepared to invade Afghanistan, Fowler helped coordinate journal reporters covering the region. During the 2001 anthrax attacks that targeted politicians and journalists, he was in charge of opening the newspaper’s mail. Despite such turmoil, he stuck with his focus on tech—and anthropology: his first front-page story explored the historical development of human thumbs and their rising importance in texting culture.

The following year, he was promoted to a reporting role in Hong Kong. As international companies poured in during the decade, Fowler covered business, media, advertising, and the early rise of the Internet in China. He also got to cover the 2008 Olympics. But after seven years in Hong Kong, he was ready for a new challenge. When a reporting slot covering tech and national news in the journal’s San Francisco office became available in 2009, he took it.

That year put him, once again, at a news epicenter, covering e-commerce and start-ups, the rapid growth of Facebook and Apple, and the smartphone revolution. When Steve Jobs died, Fowler was the fill-in Apple beat reporter. In 2014, an opportunity opened up to write about technology in the first person: “One day they snapped a switch and said, ‘Okay, sound like you!’ and that causes an existential moment of, like, ‘What do I sound like? Who am I?’” In his new role as personal-technology columnnist and reviewer, he covered tech’s consumer side: How does this product affect you? In 2017, the Post called to ask if he could do him for them. As part of an expanding technology team there, he had even more freedom to explore his role of consumer-advocate.

In person, as in his writing, Fowler is funny. He’s prone to breathless, amusing rants when discussing the way consumers’ data are being collected and distributed. (Walking through the San Francisco streets, he promises to make a scene outside Facebook’s office. “I can shake my fist and say, ‘Damn you, Zuckerberg!’ he jokes, with fists dramatically clench.)

But the substance behind the words and his most pointed columns is no joke. Fowler’s reporting dissects the privacy policies and practices of some of the world’s biggest, most powerful, and influential companies, and challenges them to do better. In one recent column, he lists the 15 most egregious default privacy settings at Amazon, Facebook, Google, Microsoft, and Apple—and then tells readers how to change them. In another, he uses brand-new credit cards from Amazon and Apple to buy a single banana from Target, then tracks how the two industry giants broadcast his data to a host of private companies. Even when he’s not working, his trusty group of electronicassistants—a Sonos speaker, Google Home, Apple HomePod, and Amazon Echo—sit on his living room table, serving as constant sources of unnerving inspiration. Although they are supposed to function only upon hearing an explicit voice command, the sounds of television shows and private conversations frequently trigger them. “I’m waiting for the day to come when they start talking to each other,” he says. “And then they don’t really need me anymore.”

Fowler believes it likely that some people in the Bay Area consider him too negative about technology. After his years of consistent and thorough coverage, the response he often gets from tech companies is one of vexed recognition. “I’ve actually had them say, ‘We know what you do,’” he says, laughing. “And I’m like, ‘Great! If you know what I do, then we can save a lot of time here. Just give me the answers I’m looking for!’”

But behind even his most critical columns is a sense of hopefulness. Fowler thinks that tech companies can change how they deal with privacy. “These billion-dollar corporations are giving us a false choice between having our lives surveilled and monetized—or living in the Stone Age,” he explains. “They’re like, ‘You either allow us to collect all this data and do what we want with it, or you can’t use artificial intelligence, you can’t use a voice agent, you can’t have all these things.’”

What if Google just charged five dollars a month for the technology, he wonders, instead of tracking our data through its home assistant? He notes that some of these companies have amazing—and amazingly helpful—artificial intelligence. Why should capitalizing on people’s private lives be the only way to make money? “That’s the cognitive dissonance of being a modern consumer in 2019,” he says. “You can wonder at the new thing and also realize it’s bringing peril into our lives. That’s the tension that I often find myself in, as a writer.”

Fowler sees potential danger when governments have more tools to harness data. As he speaks, massive protests wrack Hong Kong, his “other hometown.” The familiar backdrop of tech surveillance lies in plain sight, with protesters wearing masks and shrouding themselves with umbrellas to escape detection by advanced facial-recognition software: technology deployed to intimidate and stifle expression. Recently, he has noticed his friends from Hong Kong wiping their social-media accounts clean, worried that their records could be searched and potentially used to put them in jail if they travel into mainland China. “When governments have data about your whereabouts and about what you’re up to, they can use that however they want,” he says. He thinks about his new Google Home Max, a talking speaker with facial-recognition software. “Is there a record now of every time I’m at home? Do the police get to have that record?”

Even as he challenges companies’ lack of transparency and the potential for information abuse, Fowler thinks that increasing pressure can rein in surveillance capitalism. “Younger people know enough about the Internet and the power of data, that I think they’re going to reject it,” he says. This unease has prompted the growing pushback against Facebook and Instagram. Fowler’s purpose is to show people that the system doesn’t need to stay the way it is—that citizens and consumers have a right to demand some control over their lives. “I think as a society, we’ve been sort of distracted by the sparkly, shiny aspect of what this can do for us. Maybe we haven’t always realized what we’re getting into. That’s the great reckoning that’s happening right now.”
ERRING-D. Peter Ashton, a pioneer in the study of Asian tropical forests—particularly of the towering dipterocarps that dominated the canopy he investigated on foot in Borneo in the late 1950s, before they were largely felled—served as director of the Arnold Arboretum from 1978 to 1987 (“Honorable Forester,” September-October 2007, page 34). The Bullard professor of forestry emeritus learned much from life, on occasion in circumstances more exciting than those in Jamaica Plain. Writing about his early fieldwork in a recent Arnoldia, he recalled attempting to navigate back to his home base on a bark raft after tropical downpours put the river into sudden flood:

“Within little more than a minute, the waters had gone up 15 feet, swirling, carrying whole trees, the rocky bottom shaking and rumbling... We proceeded with caution. Ladi and I had ascended the Temburong some months earlier, and we were stopped by a two-meter waterfall called Wong Uan, which was practically impossible to portage or descend. Below it, a catacatast known as Gerugu Rimau raged between the cliffs. After little more than one hour on the river, we rounded a bend, and Ladi and I recognized the terrain—only too late. We leapt into the torrent, while our Murut assistant attempted to haul in the raft by its attached cord.

All to no avail. The raft turned, bent in two, and flipped over the fall, and within it our clothes (including our shoes!), our remaining food, and our parangs—everything... Our only option was now to find the nearest Iban longhouse, several days walk downstream.”

You can learn how Ashton’s adventure turned out at arnoldia.arboretum.harvard.edu/pdf/articles/2019-76-4-in-bornean-rainforests-exploring-the-flora.pdf.

RODEO, YANKEE-STYLE. Given a common perception that Harvard exists somewhere apart from the American heartland, it was gratifying to learn that the University is doing its part to embrace customs enjoyed with gusto beyond the Berkshires: a rodeo, no less.

In an autumn newsletter, vice president for campus services Meredith Weenick (to whom this magazine’s publisher reports) noted that 17 shuttle-bus drivers from Albany, Boston College, Harvard, UConn, UMass, UNH, and Yale had duked it out at the Second Annual Collegiate Bus Rodeo on June 15, navigating an obstacle course set up on Harvard Business School’s parking lot. Contestants had to “maneuver a 35-foot bus through a series of tight s-curves, back into difficult spaces, and finish off with a 30 mile-per-hour dash through two rows of barrels.”

The video (with drone footage), backgrounded by the Dropkick Murphys’ rousing rendition of “I’m Shipping Up to Boston,” displays more spirited competition than the Red Sox (who blast the song at Fenway) managed this season. The rifle-toting color guard was a fine touch. The winners were UNH’s Tyler Blish (third) and Harvard’s Richie Clifford and Dennis Pena (second and first). Relive their glory at youtube.com/watch?v=BcSwI NnqQX4&feature=youtu.be.

Note to real cowboys, who may look down on the competition: try riding your horse through Harvard Square at rush hour.

HEARTLAND, CONTINUED. Also lampooning coastal Harvard, the undergraduate humorists of Satire V posted “New York Freshman Mistakenly Makes Non-New York Friend” early in the school year. “[F]reshmen Rachel Stein ’23 and Jessica Williams ’23 were seen studying in the Smith Campus Center when Williams let slip to Stein that she was not of New York blood,” ran the report. As Williams revealed that she was from, gasp, Nebraska, “Stein immediately seemed to disengage...” While the newly outed Cornhusker gushed about making new friends, “especially ones with such different backgrounds from my own,” the shaken Stein “also expressed excitement” about enlarging her own circle of friends with “amazing people from all over Manhattan!” ~PRMUSVI
Editor's note: The July-August 2019 comment in 7 Ware Street, on admissions preferences, addressed this issue in part.

**AMPLIFICATIONS AND ERRATA**

Netflix numbers. David Rountree, of Montgomery, Alabama, writes in reference to “Craig Lambert’s wonderful article on A.O. Scott” (“The Way of the Critic,” November-December 2019, page 48) that it notes parenthetically that Netflix doesn’t release ratings data. He observes, “I suspect the piece was written and edited before Netflix began doing so.”

Ratings, righted. Helene Liberson Keers ’59 writes, “My husband, a University of Chicago graduate, has brought to my attention an error in the ‘Ratings Game’ item on page 27 (Bревия, November-December 2019). Behind Princeton and Harvard in the U.S. News & World Report compendium there is a four-way tie, including Chicago as well as Columbia, MIT, and Yale, not a three-way tie as listed.”

Legal standing. Grant Glovin was a second-year law student when he wrote the paper covered in “Land Use and Climate Change” (November-December 2019, page 15), but he had moved up to the third year of his legal studies by the time the magazine’s article was reported and published.

**STATEMENT OF OWNERSHIP, MANAGEMENT, AND CIRCULATION**


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Irina Kuksin, Publisher

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**ENGINEERING LIFE**

(continued from page 41)

few genes that are completely new, Church has numerous genetic tools at his disposal to determine their function. He can splice genes into other organisms to observe their effects, or silence them to see what changes then take place, or induce mutations in vitro, to see how that changes the protein products of the altered genes.

He has already introduced genes recovered from mammoth DNA as much as 700,000 years old into cultured cell lines. Some facilitate blood oxygen release at low temperatures, others the growth of thick hair and the accumulation of subcutaneous fat. Endowed with these genetic gifts, the potential range of the Asian elephant would expand into frigid areas where the animals would be far less likely to compete with humans for habitat. “We’ll be further increasing their diversity, possibly even making them more genetically diverse than any species has been before in that lineage,” Church explains, “because we’re not limited by time or geography, or even by natural DNA.”

The idea is not so farfetched as it might sound: “There’s evidence that there was interbreeding in the past,” he says. “It’s like the evidence in the human genome that our ancestors interbred with Neanderthals—it’s a pattern with elephants and mammoths.” Besides recently developing (with professor of genetics Chao-ting Wu) an improved method for reading ancient DNA, Church has successfully demonstrated the function of two woolly mammoth gene variants that aid adaptation to a cold environment, and has plans to modify at least 44 more ele---
phant genes based on what he has learned from mammoths and other sources.

His approach is also pragmatic: he has thought through business models that might support this effort. “Bison,” he points out, “returned from near extinction to a population of almost half a million worldwide, largely because the species has very low-cholesterol meat. Mammoths, or cold-resistant elephants, could support even more business models: you’ve got tourism, meat, hair (following a sheep model of seasonal removal), and maybe legal ivory. So there’s a lot more models for cold-resistant elephants than for bison.”

Church is sanguine about the potential of biological engineering to make a better world. “It’s easy to get overexcited...because everything that’s currently made by non-biological methods—inorganic materials—could be made by biological systems: bacteria make magnets, sponges make fiber optics, they make hard shells, bones, all sorts of inorganic materials.” Such optimism helps explain why synthetic biologists dot the departments of genetics and systems biology at the schools of medicine and engineering and applied sciences. As a transdisciplinary field, synthetic biology almost demands collaboration; more than a few labs do so through the Wyss Institute, and Church’s lab does, too.

The near-term future of synthetic biology, and particularly commercial applications, are being shaped as much by market forces (including social acceptance) as by technological advances within the field’s core disciplines of molecular and genetic engineering, whole-cell, cell-extract, or organism-level tinkering, and computer modeling. Although the ethics of human enhancement and environmental interventions will be debated, the often life-saving applications of synthetic biology to medicine and health are not only profitable but embraced by the public, presumably ensuring their steady growth. (Sales of the 10 biggest “blockbuster biologics”—commercial drugs with more than a billion dollars in sales that are manufactured with the use of living organisms—already exceed $70 billion annually in the United States, and are obvious candidates for improvement.) And immunotherapies—modifications to immune cells that enable them to recognize and fight diseases such as cancer—are an area of intense research.

“I think there’s almost no limit to synthetic biology,” Church says. “It will help us build space colonies, it will help us build anything that’s atomically precise. Everything, including circuits, would be better if it were atomically precise—and we can make things that way. Because that’s what biology does very well.”

Church has successfully demonstrated the function of two woolly mammoth gene variants that aid adaptation to a cold environment and has plans to modify at least 44 more elephant genes.
Five years after the founding of the Hasty Pudding Club in 1795, in the dorm room of Nymphas Hatch, A.B. 1797, the then-secret society staged its first performance: a courtroom drama in which a club member was charged with “insolence.” This proved so entertaining, the membership enshrined the practice in the club’s constitution. Later, the group began trying historical figures: Marcus Brutus, for example, was held accountable for killing Caesar. In 1837, the poet James Russell Lowell, A.B. 1838, then Pudding secretary, described the first instance of a performance in drag. The evolution continued: the first real play, its script written by a professional in England, was staged in Hollis 11 in 1844, and described in the club secretary’s records (rendered in verse as tradition required) as “…a theatrical representation/On Pudding rules an innovation/And of College regulation/A most flagrant violation.”

Although the plays continued to be performed for members only for another decade, the first posters celebrating the club and its performances began to appear in the years bracketing the Civil War. Harvard’s collection of this artwork, spread between the University Archives and Houghton Library, contains many unusual rarities, including the only known depiction of the College out-house, “University minor,” that stood behind grand, granite, Bulfinch-designed University Hall. These posters, known as shingles, were hung on the walls of student rooms, and then of theaters, during performances.

Return of the Puds, from 1866 (above), is full of the “Oriental iconography”—from the sphinx to the alligator (the title for an officer of the club whose role is to recite poetry)—“that became part of club mythology,” says Dale Stinchcomb, assistant curator of Harvard’s Theatre Collection. Atop an elephant, the alligator serves hasty pudding from the familiar pot. The 1910 Diana’s Debut (far left), one of the most beautiful illustrations in the collection, was the cover for the musical selections from club member (and later communist) John S. Reed’s play satirizing the “coming-out” of a Boston society girl. Seeing Red (1932) spoofed McCarthyism. (Reed, A.B. 1910, a hero of the Bolshevik revolution buried in the Kremlin wall necropolis in 1920, would no doubt have approved.)

Once all-male, the club is now fully integrated, and perhaps poised to reinvent itself again. In the current era, “the novelty of a drag performance has worn off almost entirely,” Stinchcomb points out, but there will always be a need for “clever social satire.” There is no shortage of subjects.

—Jonathan Shaw
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