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A Global Agenda
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INTRODUCING OMNIA

For those of you accustomed to seeing Penn Arts & Sciences Magazine on the cover—welcome to OMNIA, our new identity. In Latin, omnia translates to all things, which speaks to the incredibly diverse array of disciplines that define Penn Arts and Sciences. Whether we’re covering an undergraduate history major or an astrophysicist faculty member, our core mission remains: to keep you connected to the important research and tremendous creativity of the School’s faculty, students, and alumni. Our cover story explores a major challenge facing the world of science and technology—big data—while our multi-faculty perspective on mass incarceration provides expert analysis on one of today’s most critical issues. Also featured in the issue is a new program that is uniting students as they work to redefine ideas about sustainability, and, in a special infographic-driven feature, we examine two of our faculty members’ participation in a think tank that is influencing policy on a global level.

We are also nearing completion of a new web presence for OMNIA. As the saying goes, content is king, so we have designed our new homepage to be a universal destination for fresh content. One day the top story might be a discussion with an alumna filmmaker like Jean Lee, featured as the subject of this issue’s Movers and Quakers, and the next, a profile on an award-winning chemistry doctoral student. The new site will put an emphasis on visual content as well, including photo essays, video, and infographics. And a new section called (Ins)omnia will offer lighter content informed by our faculty.

Our ultimate goal is to bring you closer to Penn Arts and Sciences with the stories we tell. We will do our best to continue to tell them in a way that lives up both to the eminence of our scholars and the expectations of you, the reader.

—Blake Cole

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Cover Illustration: Jon Krause
An international perspective is one of the strengths that define what we do at Penn Arts and Sciences. I was reminded of this while in China earlier this fall to join President Gutmann, Penn alumni, fellow deans, and Chinese officials and academics to celebrate the Penn Wharton China Center and our expanding engagement with China.

The festivities included the announcement of the first recipients of the Penn China Research and Engagement Fund awards. Of the 16 projects that Penn is funding, five are led by Arts and Sciences faculty. These ambitious projects will examine questions ranging from linguistic diversity to China’s role in global economic history.

The wide variety of perspectives that Arts and Sciences faculty are able to bring to the University’s engagement with China comes as no surprise. As we noted in our strategic plan, Foundations and Frontiers, the international emphasis of the School is reflected in the very names of a large portion of our departments, majors, and research centers, and our faculty are deeply engaged in research initiatives all over the world. A brief sampling of the research interests of the 24 faculty who joined Penn Arts and Sciences this fall reflects the depth and breadth of our international engagement: environmental anthropology with a focus on South Asia; the political economy of transition in Central and Eastern Europe; Japanese thought, religion, and popular culture; health and healing in Africa; and transnational art in global Latino cities, from New York to Buenos Aires, are just a few highlights.

International perspectives expand the horizons of our undergraduates as well. Short-term, immersive experiences abroad, like the Penn-in-Cannes program featured in this magazine (pg. 38), offer students unique learning opportunities. Every summer, students take part in service initiatives that bring them all around the globe—including more than 20 students who engage across India through our Center for the Advanced Study of India’s long-running internship program. In addition, the College’s foreign language and cross-cultural analysis requirements ensure that all our students encounter the rich diversity of cultures beyond the U.S.

Finally we have the international community that makes up our campus. A total of 153 students in the College Class of 2019, making up 10 percent of the class, are from countries outside the U.S. Many of our brightest undergraduate stars come to Penn from all over the world—students like last year’s Presidential Engagement Prize winner Shadrack Frimpong (C’15), who has now gone on to establish a girls’ school and community clinic in his poverty-stricken home village in Ghana; and Rutendo Chigora, who came to Penn from Zimbabwe and is now studying in Oxford as a Rhodes Scholar. Through our many academic programs, the international research efforts of faculty across the School, and students like Shadrack and Rutendo, Penn Arts and Sciences is increasingly committed to thinking—and acting—globally.
For over a decade, the School’s 60-Second Lectures series has challenged audiences and professors alike to process a career’s worth of knowledge in just one minute. The outdoor, public talks feature a diverse collection of faculty tackling subjects as universal as climate change, and as specific as the heart rate of criminals.

This past fall, the series played host to two special presentations: Associate Professor of Sociology Melissa Wilde’s “How Much Does a Pope Matter?” which coincided with Pope Francis’s visit to Philadelphia for the World Meeting of Families, and Geraldine R. Segal Professor of American Social Thought Mary Frances Berry’s Constitution Day lecture, “Our Unjust Constitution and Still We Celebrate.”

“It was really great to be able to relate my research to the excitement of Pope Francis’ visit,” says Wilde. “I believe in public sociology—in the importance of making what we know through our years of systematic and painstaking research accessible to the general public.”

In her lecture “What Video Games Have Taught Me About Shakespeare,” School of Arts and Sciences Board of Overseers Professor of English Rebecca Bushnell discussed how video games can speak to what drives character development in theatrical plays. Professor of Economics Jeremy Greenwood presented on “Women’s Liberation: An Economic Perspective,” and Associate Professor of Near Eastern Languages and Civilizations Josef Wegner spoke about “Archaeology of the Mind: Wisdom Pharaoh-Style.”

Lectures are accessible on the Penn Arts and Sciences website at: https://www.sas.upenn.edu/60second
Poet and essayist Charles Bernstein, the Donald T. Regan Professor of English, has received the 2015 Janus Pannonius Grand Prize for Poetry, along with Giuseppe Conte of Italy.

Founded in 2012 by the Hungarian PEN association of writers, the award is modeled after the Nobel Prize for Literature and named after the first known and celebrated Hungarian poet. The prize honors and rewards poets who can be considered heirs to human spirituality and culture.

Ceremonies for Bernstein and Conte were held in both Italy and Hungary. The events also featured a reading of their work, including their joint bilingual volume, *Tutto il whiskey in cielo/Tutto il meraviglioso in terra (All the Whiskey in Heaven/All the Wonder of the World)*. The prize comes with 50,000 euros, or $56,405, which will be split between the two men.

This is the second major international poetry prize for Bernstein in 2015; he also won the Münster International Poetry Prize.

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John Tellis, a doctoral candidate in chemistry, was one of three winners of the 2015 Reaxys Ph.D. Prize, given at an annual symposium held at the Chinese University of Hong Kong. Sponsored by Elsevier, a provider of scientific, technical and medical information products and services, the Reaxys prize recognizes innovative and original research in chemistry, with an emphasis on synthesis. The prize is the world’s most prestigious award for young chemists; the 2015 winners were chosen from a field of almost 450 entrants.

Tellis works with Hirschmann-Makineni Professor of Chemistry and Department Chair Gary Molander. According to Molander, “John has redefined the direction of research in the group by developing a new paradigm for cross-coupling reactions, a class of transformations that drives the pharmaceutical and agrochemical industries worldwide. His seminal *Science* paper on the subject has already garnered over 55 citations. The Reaxys Prize acknowledges John as being among the top graduate students in organic chemistry on a global stage, a recognition he richly deserves.”

Tellis won the prize for his presentation “Single-Electron Transmetalation: Enabling C(sp3) Cross-Coupling via Photoredox/Nickel Dual Catalysis.” His fellow recipients were Andrew Jupp from the University of Oxford and Shinnosuke Uno from the University of Tokyo.
Penn Arts and Sciences welcomed 24 new members to its standing faculty for the 2015-2016 academic year. The appointments include seven professors, one visiting professor, two associate professors, and 14 assistant professors, in 17 departments spanning the humanities, social sciences, and natural sciences.

The group includes the 16th Penn Integrates Knowledge (PIK) Professor, Michael Platt. Platt is a world-renowned neuroscientist whose research focuses on how the brain makes decisions. As the James S. Riepe University Professor, he is the first PIK professor to hold appointments in three schools: the Department of Psychology in Penn Arts and Sciences, the Department of Neuroscience in the Perelman School of Medicine, and the Department of Marketing in the Wharton School. He received his doctorate in biological anthropology from Penn.

Penn President Amy Gutmann said, “Best known for his studies of decision-making, social cognition, and attention, Michael exemplifies Penn’s commitment to integrating knowledge in order to address both timely and timeless questions of great societal impact.”

New Associate Professor of Political Science Daniel Hopkins received two awards from the American Political Science Association (APSA) this fall. Hopkins was honored with the Clarence Stone Award, given by the Urban Politics Section of the APSA to a scholar who is “making a significant impact on the field of urban politics.” He also received the 2015 Warren Miller Prize for best article published in the journal Political Analysis, for “Casual Interference in Conjoint Analysis: Understanding Multi-Dimensional Choices via Stated Preference Experiments,” with co-authors Jens Hainmueller and Teppei Yamamoto.

Hopkins’ research centers on American politics, with a special emphasis on racial and ethnic politics, local politics, political behavior, and research methods. He is the author of nearly 30 papers, including “No Wilder Effect, Never a Whitman Effect: When and Why Polls Mislead about Black and Female Candidates,” which was covered by media outlets including ABC News, The New York Times, Time Magazine, and Science.
Before you set out for your next hike, make sure you bring sturdy boots, ample water, and an understanding of the cognitive underpinnings of your sense of direction.

In order to navigate successfully, your mind must work out two problems simultaneously: knowing your current location and understanding which direction you are facing. Most people think that locating themselves spatially is a single thought process, but the cognitive logistics are more complex than that, says Professor of Psychology Russell Epstein.

In an article published in the Proceedings of the National Academy of Sciences in the United States in May, Epstein and his team showed that animals’ internal map and compass work independently. Specifically, they demonstrated that mice use one brain process for place recognition and another for knowing which way they were facing.

Epstein noted that although people vary quite a bit in their spatial ability, they are good at self-assessment and knowing their own skill at being able to navigate. While a sense of direction might be considered a form of intelligence, it is independent of general intelligence.

Epstein is now using neuroimaging in humans to further his work. “Ultimately, we want to understand the same process in people, he said. We want to map the parts of the brain related to spatial ability.”

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“The compass of the mind” by Abigail Meisel
The Claw! Descending into a congregate of plush toys, the claw pulls out a single prize and isolates it from the pack. We are all familiar with the popular arcade game; now imagine such a mechanism put to use at the atomic level. Eric Schelter, associate professor of chemistry, has discovered a molecular claw can be handy for separating rare earth metals.

Though employed in a number of industrial applications—cell phone batteries, wind turbines, and electric car engines—rare earths are difficult to collect and concentrate. The metals are chemically quite similar. Schelter has spent his career considering the problem of how to improve the current, laborious process of separating rare earth metals from mined ores while at the same time investigating how to recycle the metals already unearthed. “At this point there are more rare earths in landfills than there are in global reserves in the ground in rocks,” says Schelter.

For the past five years the Schelter lab has focused on selectively changing the charge on one type of ion in a mixture of metal ions, hoping to use that unique charge as a separation method. While testing a molecule they had synthesized for this purpose, Schelter’s students noticed that one metal ion complex had different solubility properties.

“It started as a simple inorganic coordination chemistry project with the end goal of potentially improving rare earth separations,” says Justin Bogart, a graduate student assigned to the project. “I don’t think either of us had any idea of where the project would end up.”

The compound Schelter’s students made is known as a ligand, which attaches to metal ions dissolved in a solution. But this ligand does something unique. When it encounters a neodymium ion the three prongs of the ligand open just enough to accommodate the dissolved metal cations.

“The nature of the ‘tripod’ ligand is such that it grabs onto the ion like a little claw, and depending on the size of the ion it fits into the claw in a slightly different way,” says Schelter.

The spacing of the tripodal ligand with neodymium nestled in the center results in a structural arrangement that allows a second ligand to join the ligand–metal ion complex. Two ligands linked to the metal ion exhibit completely different properties than just one. When the tripodal ligand is attached to a different metal ion its size will not allow a second ligand to connect. This difference in chemistry is harnessed to separate neodymium from other metal ions in solution.

What is remarkable about this accomplishment is that neodymium is being isolated from other rare earth metals based on a minuscule size difference, a couple hundredths of an Angstrom (10^-10 meters).

“It’s a really hard problem,” says Schelter. “That’s part of the reason we don’t have an efficient process for doing this.”

So far Schelter’s group has been able to separate neodymium from dysprosium—key elements used in very strong permanent magnets—in laboratory experiments. The group plans to look for other size-selective ligands and to use the tripodal ligand to separate other rare earth pairs. They will also explore methods to separate yttrium from europium—a mixture disposed of after mercury is removed from compact fluorescent bulbs.

Schelter notes that the group was lucky to discover the size-specific claw while looking for a charge separation method. “This is how research works much of the time. Maybe it wasn’t exactly how we planned to do the separation, but it works.”
Was an 18th-century automated harpsichord player the forerunner of the Terminator? They’re both mechanical humanoids and are often analyzed together, but Heidi Voskuhl, associate professor of history and sociology of science, suggests that they shouldn’t always be.

Robot-like machines may have been around as early as the first century. Between the 1770s and the 1790s, European craftsmen built exceptionally sophisticated mechanical automatons that could write, draw, or play music. Voskuhl studied two of these, a life-sized harpsichordist and a smaller dulcimer player, for her book *Androids in the Enlightenment: Mechanics, Artisans, and Cultures of the Self*, which won the 2014 Jacques Barzun Prize in Cultural History of the American Philosophical Society.

The automatons were created essentially to improve business: The harpsichordist was made by a clockmaker, while a furniture maker built the dulcimer player to give to King Louis XVI and Marie Antoinette. Never again did economic resources and cultural incentives coincide in a way to spawn such objects, says Voskuhl. “The craftsmanship necessary to build them—in mechanics, metalwork, and carpentry—was at its peak.”

Many scholars have argued that the automatons, made during the Enlightenment, represented a deeper debate about whether humans were mere matter, rather than both matter and spirit. Others believed they were a way to demonstrate what happened when the human body and the human soul were overcome by mechanization. Freud, for instance, used the term “uncanny” to describe how we perceive androids.

Real or fictional, robots act as mirrors and evoke questions about humanity. But our reactions can change, says Voskuhl. “I would not deny that we recognize ourselves in androids. But I’m not sure whether we always draw the right conclusions.”

Voskuhl says we can learn a lesson from the debates that surround mechanization. “What does this tell us about our ability to make sense of the Industrial Age if we can’t even get its roots right? And now we are living in an electronic and information age. And I don’t think we are much better at making sense of those ages, either. It tells us how keen we are to have objects that we can point to, to say, this is the root of the factory age.”
In July, NASA’s New Horizons space probe captured dazzling images of the dwarf planet Pluto and its moons during a 31,000-mile-per-hour flyby. Surprising even some experts, the pictures revealed a vast variety of geologic features from frozen plains to streams. In the scientific community these photographs are provoking as many questions as they are answering.

“Pluto is the best known member of a class of objects that lurk in the exterior of our solar system,” says Cullen Blake, assistant professor of physics and astronomy. “Before the New Horizons photos, we conceived of these planets as big, dirty balls of ice. Now we realize that they are not featureless and barren because they have mountains and canyons on the surface.”

The conundrum for people in the scientific community is how this geology came about, Blake explains. On Earth, geologic change is caused by environmental forces, such as climate systems and atmospheric circulation—but just what is creating these features on planets like Pluto?

The Pluto pictures from the New Horizons were reaped via a payload of state-of-the-art technologies aboard the probe, including spectrometers capable of infrared and ultraviolet imaging.

Advanced imaging techniques are increasingly important to exploring and mapping space as astronomers, Blake among them, focus their investigations on a burgeoning enterprise: discovering and documenting of thousands of heretofore unknown smaller stars outside Earth’s solar system—and the exoplanets that orbit them.

Blake’s lab at Penn operates a planet-hunting telescope known as Minerva-Red, which is now installed at the Fred Lawrence Whipple Observatory in Arizona. Minerva-Red is part of a national astronomy initiative, the Minerva project, an array of low-cost telescopes designed to discover planets orbiting stars other than the sun.

“There is new evidence that there are planets orbiting little stars, and among these might be planets that are closest to our own solar system,” Blake says.

Blake is particularly fascinated by information culled from NASA’s Kepler Mission, which the agency describes as “a search for habitable planets.” The habitable zone is the range of distances from a star where liquid water might pool on the surface of an orbiting planet because it is neither too hot nor too cold. To date, Kepler has identified more than a thousand small planets and solar systems in our Milky Way galaxy, including one dubbed “Earth’s twin.” The so-called twin is a planet roughly one and a half times the radius of Earth and, according to NASA, it is the first Earth-size planet known to orbit a star in the habitable zone.

“The takeaway is that our solar system is not unusual,” Blake says. “We now know that a huge percentage of stars have planets revolving around them.”

Along with a team of two graduate students and an undergraduate, he is currently building a device to measure motion, which he calls “wobbles,” in small stars. These stellar wobbles are caused by unseen planets.

“If the stars wobble, we can infer that the planets exist,” he says. “We are working on two independent pieces of hardware that work together with the telescope at the Whipple Observatory to find new planets.”
The difference between having a passing familiarity with front-page news and truly comprehending world events comes down to a single word: context. “You can’t understand the snippets of national and global news reported by the media unless you have an understanding of the history surrounding those events,” says Tukufu Zuberi, Lasry Family Professor of Race Relations, professor of sociology, and professor of Africana studies. “Unfortunately, most people have an ahistorical view of major events and they want to remain ignorant of what’s going on around them because it’s easier.”

Zuberi is the director and producer of *African Independence*, an award-winning feature length documentary that brings context to the most important events to happen on the African continent since the eras of the slave trade and colonialism, with a focus on African independence movements. His companion volume to the film—*African Independence: How Africa Shapes the World*—was published earlier this year. The book argues that the history of the African independence movement has shaped and will continue to influence world events, including the ongoing wars in Nigeria, Libya, and Syria. “Africa is a wealthy continent,” Zuberi explains. “It is wealthy in natural resources that are essential for a modern economy.”

How can such a wealthy continent have so much poverty? Zuberi believes that a history of slavery and “brutal colonialism” is to blame. “In World War II, Africans fought for democracy, and they were inspired by the 1948 Universal Declaration of Human Rights, which was adopted by the U.N. General Assembly,” he says. “Africans launched an independence movement—and there were parallel movements in Asia: India, Korea, and Vietnam.”

The dream of these movements was the formation of democratic societies that provided exactly the rights Europe’s colonies had been denied: full participation in society—for example, the right to vote. The reality was far different. According to Zuberi, these former colonies became the turf for proxy wars between the United States and the U.S.S.R. during the Cold War, a conflict that only ended in the 1990s.

During the Cold War, the leaders of liberation movements in Africa were forced to choose between an alliance with the United State and one with Russia, and this choice sabotaged democracy movements there. Zuberi says that Africa’s national civil rights leaders had “the United States whispering in one ear and the Russians whispering in the other.” He lists Egypt, Libya, Senegal, and Zimbabwe as just some of the African countries that have had to “fight off the thugs” put into positions of leadership with the assistance of a superpower.

Zuberi likens the African independence movements to the civil rights movements of black Americans. “In 1957 Martin Luther King went to Ghana on the eve of its independence and got to speak with the [leader of the independence movement there] Kwame Nkrumah. He was an inspiration to King.”

Zuberi believes that today’s Black Lives Matter movement needs to understand former African independence movements in order to be successful. “What we learned from Nkrumah is that we need to press on in an organized manner to make strides. We need a true organization.”

In addition to his work on books and films, Zuberi also served as a host on the popular PBS television series “History Detectives,” which was on the air for 12 seasons. On the program, he used his historical and political acumen to unravel history’s mysteries—the same talents that make him effective in the classroom.

“My job is to educate students to think critically,” he says. “I teach them to pay attention to what a person is saying rather than who is saying it. I love watching my students become open to a new understanding.”
DIGITAL DELUGE

Junhyong Kim and his collaborators pursue innovation in a sea of data.

By Blake Cole
Illustrations by Jon Krause
Photo by Shira Yudkoff
Social media sites store hundreds of billions of photos, while super-retailers are clocking in millions of sales per hour. Deep space telescopes and powerful particle accelerators produce vast quantities of information that can transform the state of science—as long as that data can be stored.

How can we retain, process, and make sense of the seemingly endless amount of complex information that society produces? This is the quintessential challenge of big data in our modern technological age—and it will only escalate as our digital footprint grows with time.

“The world is awash in data of all types,” says Junhyong Kim, Patricia M. Williams Term Professor in Biology, previous co-director of the Penn Genomics Institute, and current co-director of the Penn Program in Single Cell Biology. “It affects every discipline, from the sciences to the humanities to even the arts.” Given the volume and complexity of data, computation on a previously unimaginable scale has become a necessity. “Computer processing,” Kim notes, “is involved in every aspect of knowledge-generating activity, including data access, data integration, data provenance, as well as visualization, modeling, and theorizing.”

Kim and his co-investigator Zack Ives, Professor and Markowitz Faculty Fellow in Computer and Information Science in Penn Engineering, are working at the frontiers of the expanding universe of big data with the help of a grant from the National Institutes of Health (NIH), through its BD2K (Big Data to Knowledge) initiative. Their main goal: Design a computer software program that can handle the extensive data management requirements of single-cell genomics and other genome-enabled medicine—and, while they’re at it, to help address big data issues that may have an impact on a range of endeavors within and beyond the research community.

“The really big questions in science can only be answered by collecting volumes of data from multiple sites, putting it together, and doing big data analytics over the results,” says Ives. “Unfortunately right now the data management tools available aren’t really up to the task.”

It turns out Kim’s own field, single cell genomics, offers a perfect laboratory for exploring the problem of marshaling big data. “People understand that there are different types of cells—that brain cells are different from heart cells and so on,” says Kim. “But there’s a tendency to view certain kinds of groups of cells like bricks in the wall, when it turns out that every cell is actually quite different.” To understand the function of individual cells in the human body, Kim’s lab and collaborator James Eberwine, Elmer Holmes Bobst Professor of Pharmacology at the Perelman School of Medicine and co-director of the Penn Program in Single Cell Biology, look at individual cells at a minute level of detail, using groundbreaking technology—technology that produces massive amounts of data.

The process involves multiple steps: isolating ribonucleic acid (RNA) from individual cells, amplifying it so that there are enough molecular copies to process, and, finally, sequencing it in order to reveal gene expressions. This glimpse at the function and behavior of individual cells provides a scientific foundation that may translate to important medical advances, such as the development of pharmaceuticals that target specific genes to treat degenerative diseases like Alzheimer’s. “If you look at your face and see where your freckles appear, it’s clear that there’s a lot of heterogeneity,” says Kim. “So when we get degenerative diseases, it’s not like your whole brain goes at once. Some cells go and some cells don’t. And that’s due to this cell-to-cell variation we are working to understand.”

Keeping track of the complex experimental processes and data analysis involved in genomics research is extremely challenging, and this is the problem that the new BD2K-funded project, titled “Approximating and Reasoning about Data Provenance,” is addressing. The technological advances that have brought the cost of sequencing the human genome down from $3 billion to $1,000 have also produced a data deluge, and processing and managing this volume of information is the main bottleneck in research and translational applications.

In order to chart the “provenance” of the data—the “where” and “how” that data came about—each step has to be meticulously traced. “When patients come in for neurosurgery, whether it’s for epileptic surgery or tumor resection, there is a lot of information associated with those patients and why they are there,” says Kim, whose lab studies several types of cells, including human heart cells, immune cells, olfactory sensory cells, and stem cells. “This includes who the patients are, what previous pathologies they had, what kind of medication they were on, and even who the surgeons were.” The variables continue in the lab. Once the tissue comes in, it’s separated into various processing streams. Sometimes,
The technological advances that have brought the cost of sequencing the human genome down from $3 billion to $1,000 have also produced a data deluge, and processing and managing this volume of information is the main bottleneck in research and translational applications.

for example, it’s taken directly for examination, while other times a specimen is frozen. Eventually the RNA of individual cells is collected and amplified, a multi-step process involving various reagents. All of these variables must then be processed by the sequencing software—the real hard-drive hog.

The tools and methods used to track data may ultimately determine the weight accorded to the results within the scientific community. “When we want to compare data from different sources, we need to understand whether it was created using the same recipe,” Ives says. “We’re trying to come up with better ways of storing, collecting, and making use of provenance to help scientists.” Any software Kim and his collaborators develop will be open source so researchers around the world can iterate and improve the platform down the road.
The team attacking this problem includes Kim, who has an adjunct appointment in the computer science department, and Ives, along with Susan Davidson, Weiss Professor of Computer and Information Science, and Sampath Kannan, Henry Salvatori Professor and Department Chair in Computer and Information Science. As Kim notes about this cross-pollination of biology with computer science, “I have been interacting with these faculty for over 10 years now, so we share a language. The key to this kind of interdisciplinary research is to be willing to work on something trivial at the beginning. And then that develops into something deep and interesting.”

“It’s a very exciting opportunity for me as a computer scientist to work on problems that can have real impact,” says Ives. “Here we not only have an opportunity to come up with new algorithms and new models, but to produce software that people in many different biomedical fields will find useful.”

Kim adds, “This project is an example of the kind of interdisciplinary research that really is important for us all to be able to do across school boundaries. In addition to the Arts and Sciences, this impacts Medicine and Engineering. And that’s sort of the great thing about the University—being able to do that.”
According to Junhyong Kim, Patricia M. Williams Term Professor in Biology and a co-director of the Penn Program in Single Cell Biology, big data isn’t just a challenge for scientists. He argues that students in all fields need to be exposed to technology early in the curriculum. This conviction is also reflected in the Penn Arts and Sciences strategic plan, “Foundations and Frontiers,” which identifies big data as one of eight areas that are key to the School’s future in education as well as research.

Having immersed himself in the challenges associated with big data, Kim has carefully considered its implications for the undergraduate curriculum. “The teachings of the classical liberal arts, for instance, can be used to help non-science and technology students relate to data issues,” he says. He cites the Trivium model from Ancient Greece and the Middle Ages, which encompasses grammar, logic, and rhetoric. “The Trivium can be interpreted in scientific and technological terms.

Grammar defines rules, patterns, and objects of interest, which relates closely to how we track and catalog data, as well as methods like machine learning. Logic determines rules of inference and meaning, and can be tied to how we use various data inference models including graphical models of genetic relationships, causal models of disease, and so on. Finally, rhetoric uses grammar and logic to tell a story—or in more scientific terms, a theory. Theory involves not only quantitative modeling but a conceptual framework for guiding the deployment of models—that is, the theater for the scientific story.”

This construct has inspired Kim’s thinking on potential curriculum-building applications for the future. “Technologies and principles related to computing, modeling, and theorizing are essential to 21st-century higher education, and the skills associated with these technologies should be an essential part of every undergraduate experience.”
Over the past 40 years, the U.S. has come to account for a disproportionate amount of the international prison population: Though Americans make up less than 5 percent of the world’s people, they account for almost 25 percent of the incarcerated. Pressure for reform mounts, supported by prominent political figures from both sides of the aisle and influential thought leaders, including Pope Francis, who met with inmates at a Philadelphia prison during his September trip to the States, and Facebook CEO Mark Zuckerberg, who used an October visit to a California prison to issue a call to action on the social media platform that reaches nearly 1.5 billion active users monthly. Here, experts from a range of fields share their thoughts on this hot-button issue that is becoming more and more a part of the public discourse.

Located at Eastern State Penitentiary, “The Big Graph” was introduced to encourage a public dialogue around issues of the criminal justice system. This portion demonstrates the U.S. incarceration rates compared to other nations.
FALL/WINTER 2015

WE ARE THE CARCERAL STATE
By Marie Gottschalk

Fifteen years ago, mass imprisonment was largely an invisible issue in the United States. Since then, criticism of the country’s extraordinary incarceration rate has become widespread across the political spectrum. But reforms to reduce the number of people in jail and prison have been remarkably modest so far.

Meanwhile, a tenacious carceral state has sprouted in the shadows of mass imprisonment and has been extending its reach far beyond the prison gate. It includes not only the country’s vast archipelago of jails and prisons but also the far-reaching and growing range of penal punishments and controls that lie in the never-never land between the prison gate and full citizenship. As it sunders families and communities and radically reworks conceptions of democracy, rights, and citizenship, the carceral state poses a formidable political and social challenge.

(continues pg. 20)

REAL REFORM AND MASS INCARCERATION
By Jason Schnittker

The tide is turning on mass incarceration. After decades of growth, the size of the prison population is declining in some states. Across the political spectrum there is more interest in further reductions. This effort is motivated by a number of things, including concerns about the costs of housing inmates, a recognition of racial disparities in arrest and incarceration, a progressive interest in providing more opportunities to the disadvantaged, and a libertarian concern over government overreach. It’s little wonder that political figures as diverse as Rand Paul, Barack Obama, and Grover Norquist have endorsed criminal justice reform of one form or another.

(continues pg. 23)

THE SOLUTION TO MASS INCARCERATION IS ALGEBRA
By John MacDonald

As of 2014 roughly 1.6 million U.S. adults are serving time in a state or federal prison. This compares to roughly 300,000 in 1978. This five-fold increase in the size of the U.S. prison reflects a relatively new era of mass incarceration. Many advocates for ending mass incarceration erroneously think that state and federal drug laws are the primary source for why we have sky-high rates of imprisonment, but changes in these laws have played a minor role in the increase in prison rates in the U.S. The main drivers of mass incarceration have been an increase in the number of offenses that receive mandatory prison time, an expansion in the number of prison-eligible offenses, and state and federal sentencing laws that require individuals convicted of violent offenses to serve a substantial portion of their sentence before being granted release.

(continues pg. 21)

MASS INCARCERATION AND THE LIFE-COURSE
By Charles Loeffler

Incarceration has existed since at least Ancient Greece. However, its use as a punishment instead of as a form of pretrial detention crystalized in the 19th century when the use of corporal punishment declined throughout the western world and legal authorities sought alternative means of sanctioning criminal behavior. One remnant of this new form of incarceration can be seen in the Eastern State Penitentiary, located in the Fairmount section of Philadelphia, where prisoners were originally kept in solitary confinement for the duration of their sentences to encourage repentance and reform.

(continues pg. 22)
The reach of the carceral state today is breathtaking. More than 8 million people in the United States—or in 1 in 23 adults—are under some form of state control, including jail, prison, probation, parole, community sanctions, drug courts, and immigrant detention. Millions more are booked into jail each year. An estimated 70 million to 100 million people—or as many as one in three Americans—has a criminal record. Millions of people have been condemned to “civil death,” denied core civil liberties and social benefits because of a criminal conviction. The carceral state directly shapes, and in some cases deforms, the lives of tens of millions of people who have never served a day behind bars or been arrested. Many neighborhoods and communities have been depopulated and upended as swaths of young men and women have been sent away to prison during what should be the prime of their lives. An estimated one in four black children will experience having an imprisoned parent by the time they turn 14 years of age.

Over the past decade or so, the growing opposition to mass incarceration has tended to gravitate toward two different poles, both of them inadequate in the face of these challenges. One pole identifies racial disparities, racial discrimination, and institutional racism as the front lines in the challenge to the carceral state. The other is anchored in how the fiscal burden of the vast penal system is increasingly untenable in an era of tight government budgets.

The new Jim Crow and the fiscal imperative frames have made major contributions to our understanding of the carceral state and have pried open some important political space to challenge it. But they also have contributed to public misperceptions about the relationship between crime and punishment and about who is being sent to prison and why. This has fostered some misguided penal reform efforts. These two frames are unlikely to germinate and sustain the broad political movement necessary to slash the number of people under direct state supervision and ameliorate the many ways in which the carceral state has deformed U.S. society and political institutions.
These three factors have mechanically increased the size of the prison population. One can express this as a simple formula where the current state of mass incarceration \((m)\) equals the average certainty \((c)\) of imprisonment plus \((+)\) the average length \((l)\) of stay in prison.

By increasing the number of crimes eligible for prison, prosecutors have free rein to charge people with multiple duplicative crimes and offer them not-so-stellar “deals” in which defendants end up serving substantially longer prison sentences than they would have in the past. Take a concrete example: An offender who committed a robbery in 1978 may have faced a single felony charge of robbery. If that offender was convicted he or she would have received a prison sentence of 10 years, but—with good behavior while in prison—could expect to be released in three years (two days off for every three good days).

That same offense in 2010 would likely face three charges: robbery, use of a handgun in commission of a felony, and felony menacing. In the plea bargain a prosecutor’s offer takes two charges off, removing the handgun and menacing charge. The defendant is now convicted of a robbery offense, but in 2010 can expect to spend eight years in prison since states no longer grant such generous “good time credits.” Under the more current scenario an accused offender is also more likely to accept a plea bargain that would have been rejected in the 1970s as a bad deal. After all, in the 1978 case the defendant charged with felony robbery may have been only willing to accept a plea bargain for an aggravated assault conviction, where he or she would receive only one year in prison.

In recent years there has been some leveling off in imprisonment rates, largely due to policy efforts made in a number of states to divert drug and nonviolent offenders from state prisons or to reduce prison populations in response to court orders. These changes will not reverse the size of the prison population. In order to make a major dent in prison populations, state and federal legislatures need to make adjustments to the basic algebra of mass incarceration.

A first step could be some serious reconciliation of state and federal criminal codes. Reducing the number of duplicative offenses in state and federal criminal codes that are prison-eligible would be important. If two crimes are essentially the same and have similar recommended sentences, then leave only one on the books. Relatedly, legislatures could require that new laws proposed to be prison-eligible have to replace existing law—no duplications allowed.

A second step would be to expand access to good time credits for early release from prison. Letting older convictions only count toward mandatory sentences if they have occurred within the past five years would be a good starting point. If more than five years have passed since someone’s last related conviction, do we need to count that against their current conviction at sentencing?

These two steps require serious political will. However, they don’t require that legislatures agree on the normative reasons behind sending someone to prison. They simply require legislatures to agree that we should treat prison sentences with some degree of austerity. This means reducing the number of prison-eligible offenses \((c)\) and the average length of stay \((l)\), without reducing the overall chance that serious offenders will receive sufficient prison time for their offenses.

John MacDonald is professor and chair of criminology. He also serves as the Penny and Robert A. Fox Faculty Director of the Fels Institute. His research focuses on primarily on the study of crime and violence, race and ethnic disparities in criminal justice, and the effect of public policy responses on crime.
Despite some disastrous results and early studies showing that virtually no prisoners were reformed, the use of prison as punishment continued. However, policymakers in the early 20th century began experimenting with more humane prison conditions, rehabilitative programming, and early parole releases.

This equilibrium began to change in the 1970s as rising crime rates coincided with a growing disillusionment with the criminal justice system, leading policymakers to ratchet up the use of incarceration. Through a series of legislative and other policy decisions, more people would be incarcerated, more often, for more time than at any point in U.S. history. Between 1970 and 2000, the number of persons in prison would jump from roughly 200,000 per year to over 1.4 million.

For scholars and policymakers, the consequences of this development have been quite complicated. While the scale of imprisonment has contributed to the record declines in crime, the toll that this unprecedented social experiment has had on human lives is cause for concern. If imprisonment has left ex-prisoners even less able to contribute productively to society than before they were incarcerated, then society will have gained less in the long run at substantial expense. However, determining the effects of imprisonment on the life-course (e.g., re-offending, employment, and education) is complicated by the need to observe what would have happened to the lives of the imprisoned if they had been sentenced to community supervision in lieu of imprisonment.

To overcome this challenge, I and others have examined a commonly occurring but often ignored natural experiment wherein criminal cases are randomly assigned to judges with very different patterns of sentencing behavior—some judges sentence most cases to imprisonment while others sentence very few. By tracking thousands of defendants whose cases are assigned to frequently and infrequently imprisoning judges and then checking to see whether they are any more likely to be re-arrested or re-employed five to 10 years after their cases are adjudicated, it is possible to see whether imprisonment—at least for short sentences—has large life-course-altering effects. The results, somewhat surprisingly, suggest that short spells of imprisonment do little to alter the offending and employment trajectories of the imprisoned, at least when compared to similarly situated individuals sentenced instead to community supervision.

This finding raises difficult questions for proponents and opponents of mass incarceration: Imprisonment, despite being incredibly expensive, appears to neither improve nor worsen the lives of the imprisoned. And one hundred years after prisons were first evaluated for their reformative effects, we find ourselves in a similar situation. Prisons can be used as punishment at great expense and doing so may protect the public in the short term, but almost all prisoners are eventually released back into the community and they will likely be no better off for their experience. This leaves us again wondering what else can be done to reduce re-offending and improve other life-course outcomes, not only for the many returning prisoners affected by mass incarceration, but also for the even larger number of non-imprisoned community-supervised persons facing similarly bleak life-course trajectories.

Charles Loeffler is the Jerry Lee Assistant Professor of Criminology. His research focuses on the effects of criminal justice processes on life-course outcomes.
But don’t take this political foment as a harbinger of an easy reversal. The reach of the criminal justice system in the lives of the disadvantaged is deeper than we often appreciate. A considerable body of research shows the lasting harm of a prison record for employment opportunities, family life, and health. But it is not entirely clear whether incarceration per se is the entire issue. The mark of a criminal record itself is an important driving force in the long-term negative effects of incarceration, and eliminating that mark is difficult. Even if we find good substitutes for incarceration, like home detention or diversion programs, it is not clear these things will make it easier for those who must still grapple with a criminal record when they, for example, apply for a job. By the same token, incarceration has negative consequences for mental health, but much of this association is driven by the discrimination former inmates face. Eliminating a prison sentence does very little to eliminate the stain other people will see in a conviction.

If politicians are concerned with providing offenders with more opportunities to make things right, rolling back the prison system is just a start. This is where it gets tough. No one would argue that the guilty should not be punished in some way. And some offenders surely deserve a prison sentence. Society demands and requires a robust criminal justice system. But at present the power of a criminal record far exceeds its usefulness. Providing former inmates with more opportunities involves thinking about the situation broadly. It involves, for instance, thinking of the prison system as an opportunity for training rather than a warehouse. It involves thinking about programs to provide inmates with health services, including crucial mental health services, when they’re released. And it involves encouraging employers to hire those with a criminal record, in some cases with real assurance that the risk they’re assuming will pay off. Bridging efforts of this sort have been shown to be highly effective.

Indeed, if we want to reduce the impact of the criminal justice system in the lives of the disadvantaged, there’s an argument for moving beyond even the offender. Some evidence suggests that merely the threat of arrest and the strong presence of a police force in a neighborhood can undermine the well-being of residents. When we talk about criminal justice reform, we usually talk about offenders, but many people are touched by the criminal justice system’s expanding net.

Prison reform is happening already. Efforts are occurring locally, in states, and at the federal level. These efforts will expand and the size of the prison population is likely to go down even more. But we need to think seriously about what the real goal is. It might be easy to reduce the size of the prison system. In some ways, this is simply an operational issue: if fewer people are coming in than going out, the prison population will shrink. But it will require even more political will and imagination to remove the scar left by 40 years of expanding the criminal justice system.

Professor of Sociology Jason Schnittker’s research focuses on the social, biological, cultural, and institutional determinants of health.
At the United Nations’ annual meeting in September, the assembled nations officially adopted an ambitious new agenda for global development. The Sustainable Development Goals include 169 targets grouped under 17 categories representing broad issues, running from Zero Hunger to Responsible Consumption and Production to Peace, Justice and Strong Institutions.

In the eyes of some observers, the proliferation of targets and goals in the newest plan—a successor to the influential UN Millennium Development Goals that launched in 2000—betrays a lack of focus. Among these are sociology’s Hans-Peter Kohler, Frederick J. Warren Professor of Demography, and Jere Behrman, William R. Kenan Professor of Economics.

Kohler and Behrman are two of the many experts who took part in a major initiative of the Copenhagen Consensus, a think tank that focuses on “smart solutions,” based on benefit-cost analysis, to some of the world’s biggest problems. Known as Post-2015 Consensus, the project was intend-

### FINDINGS: Prioritization of Development Targets and Policies Addressing Challenges in Population and Demography

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<tr>
<th>Highest Benefit-Cost Ratios</th>
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<td>Achieving universal access to sexual and reproductive health services by 2030, and eliminating unmet need for modern contraception by 2040.</td>
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<td>Reduction of barriers to migration within low- and middle-income countries, as well as between low- and middle-income countries and high-income countries.</td>
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<th>Probably High Benefit-Cost Ratios</th>
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<td>Elimination of age-based eligibility criteria for retirement; development of public pension systems that are based on expected years of remaining life given fixed characteristics.</td>
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<td>Select interventions, dependent on particular contexts, that make urbanization more efficient and equitable by achieving balance between functions for which there are considerable economies of scale (transportation, communication networks) and functions for which decentralization is likely to lead to the best responses to heterogeneous local conditions and preferences.</td>
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<th>Relatively Low Benefit-Cost Ratios</th>
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<td>Maintenance and expansion of public pension eligibility at relatively young old ages.</td>
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<tr>
<td>Family policies aimed at increasing low fertility in high-income countries (with the exception of expansion of early childhood education and high-quality daycare).</td>
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ed to rationalize and prioritize sustainable development goals in a way that will maximize the impact of international investments in development aid.

The Post-2015 Consensus project involved 60 teams of social scientists, NGOs, international agencies, and businesses, who worked together to identify among the UN’s development agenda those targets with the greatest benefit-to-cost ratios.

Kohler’s and Behrman’s activities involved assessing a series of development targets related to population. The starting point of their analysis was a look at the key population dynamics that would be likely to impact a post-2015 development agenda, along with a series of UN policy recommendations to respond to these dynamics: issues such as population growth, aging, migration, and urbanization (see figures in following pages).

Through their analysis, Kohler and Behrman arrived at a short list of policies that would be likely to yield substantial positive results: chief among them were universal access to sexual and reproductive health services, particularly in high-fertility regions such as Sub-Saharan Africa, and reduction of barriers to migration (see Findings on preceding page).

In addition to policies focusing on population quantities, Kohler and Behrman note that consideration of population quality—including health, education and other forms of human capital—is a key aspect in arriving at a development agenda, with important implications for sexual and reproductive health, gender equality, and human rights.

The collective research findings produced by Kohler and Behrman, along with all the other teams involved in the Post-2015 Consensus project, was reviewed by an expert panel including two Nobel Prize-winning economists. This panel distilled all this analysis into a series of 19 targets that “represent the best value-for-money in development” for the next 15 years (see p. 40).

Knowledge Applied
Informing Global Policy

It’s not every day your research is referenced in a tweet by Melinda Gates, co-founder of the Bill and Melinda Gates Foundation, the largest philanthropic foundation in the world. For Hans-Peter Kohler, Frederick J. Warren Professor of Demography, and Jere Behrman, William R. Kenan Professor of Economics, participation in the Copenhagen Consensus is about more than scholarship—it’s about making a difference.

“The Consensus is a very nice complement to the United Nations because it focuses attention on a subset of the big menu that should be given highest priority. The UN, to avoid politics, has a smorgasbord of issues, but like most things in life, if you have too many, you have none,” says Behrman, who was originally recruited by the think tank to lead a study on malnutrition and hunger. He then teamed with Kohler to study the global HIV/AIDS crisis and the two teamed together again to study policies related to demographic change, which they believe are near the top of the list when it comes to dollar-for-dollar potential for impact, particularly in regions like Sub-Saharan Africa.

“Globally, the demographic transition has been a remarkable success story of lives getting longer and fertility declining,” says Kohler. “For exceptions like Sub-Saharan Africa, promoting sexual reproductive health, which also helps to reduce gender inequalities, infant and maternal mortality, is an important policy lever that we know can be effective based on experiences in multiple countries.” Kohler and Behrman have also identified migration as a top priority. “Reducing barriers to migration is one of the best ways in which a globalized economy can respond to problematic population trends,” Kohler adds.

“Some equally serious academics would say those are just too strong. But, the default then is saying, well, things go on the way they are.”
MEGA TRENDS: FOUR MAJOR THEMES

Key population trends—including population growth, aging, migration, and urbanization—present important challenges for sustainable social, economic, and environmental development in the coming decades. These four trends provide the context for Hans-Peter Kohler and Jere Behrman’s assessment paper on benefits and costs of population and demography targets for the UN’s Post-2015 Development Agenda, part of the Copenhagen Consensus Post-2015 Consensus project.

HIGH FERTILITY AND POPULATION GROWTH

Rapid overall population growth represents an important development challenge for the 21st century, but national demographic trajectories are taking separate paths.

Wealthy countries of Europe, Asia and the Americas face rapid population aging, while Africa and some countries in Asia prepare for the largest cohort of young people the world has ever seen.

Thirty-nine of the 55 countries on the African continent have high fertility, along with nine countries in Asia, six in Oceania, and four in Latin America. Roughly 80% of these countries are also less developed, with a lower quality of population as measured by education and health.

After 2060, world population is projected to grow exclusively as a result of population growth in the current high-fertility countries.
Aging of societies can be seen as a consequence of past successes in social, economic, and human development, as improvements in health, increases in life expectancies, and reductions in fertility rates play out across populations.

Population aging can have impacts on a range of areas including productivity, innovation, and social, economic, and psychological well-being.

Many high-income countries face very rapid population aging in the next decades. The most rapidly growing age segments in these countries—sometimes the only growing age segments—are the old or very old. Old-age dependency ratios are therefore going to increase significantly in most high-income countries, and increasingly in middle-income countries as well.

Age pyramids for the United States and Japan illustrate the demographic shifts projected to result from current aging trends in two wealthy nations. In both cases, the number of people in the old and very-old age range will increase from the present to 2050, but the change is particularly dramatic in Japan.
Most differences in population growth across regions can be explained by differences in fertility and mortality rates, but international migration also plays a role.

In 2010, an estimated 214 million people—or 3.1% of the world’s population—were migrants (defined as people living in a country other than the one in which they were born).

Nearly 60% of those migrants were living in more developed regions of the world. But focusing on the flow of people, rather than the stock of migrants in any given region, reveals a more nuanced picture. Migration flows from 2005 to 2010 show significant migration occurring both within and across regions in patterns that are not entirely tied to level of economic development.

This migration plot shows flow of migrants within and between world regions from 2005 to 2010. Tick marks show the number of migrants (inflows and outflows) in millions. Only flows containing at least 170,000 migrants are shown.
In 1950 there were more than two rural residents for every urban resident globally. By 2050, experts project that ratio will reverse, with more than two urban for every rural resident; by 2100, there will be five times as many.

The trend toward urbanization is illustrated by the dramatic rise in megacities—cities of more than 10 million people. In 1970 the world had just two megacities: Tokyo and New York. By 2011, that number had increased to 23, and by 2025 it will be 37. Most of these megacities will likely be in Asia (22), with many having populations comparable to many countries.

This graph shows population changes from 2015 to 2030 for the top 25 megacities, along with select countries for comparison.

Note: Tokyo’s population is projected to decline by roughly 810,000 by 2050.
The Penn Program in the Environmental Humanities bridges disciplines.

*By Susan Ahlborn*

Most people think of climate change as a scientific issue, measured in degrees and addressed by strategies like alternative energy sources. Now the Penn Program in the Environmental Humanities (PPEH) is creating a fresh and unique forum for academic work on environmental issues.

A collective of scholars, students, and artists, PPEH’s mission is to generate awareness and engagement in the environment by acting as a bridge between disciplines and audiences, and as a lab to develop actions. Originally funded by a grant from Penn’s Green Campus Partnership, the program now has additional support from the office of the Dean of Penn Arts and Sciences and PennDesign’s Kleinman Center for Energy Policy.

PPEH people see part of their role as storytellers of the narrative of nature, but their ultimate goal is action. Program director Bethany Wiggin says, "The program is about generating new thought beyond the science-humanities divide. That includes public programming outlining our role, and student intellectual work that unsettles conventional disciplinary borders."
PPEH was the invention of Wiggin, an associate professor of Germanic languages and literatures, and Leah Davidson, a Benjamin Franklin Scholar who worked with her on an independent study on environmental writing. They wanted to create a permanent, interdisciplinary home for sustainability dialogue at Penn.

“There are so many students with different learning styles and different interests,” says Davidson. “With PPEH, you get to see the world through different lenses. It’s really bringing those perspectives to the forefront and seeing the synergies between different disciplines and how they can collaborate.”

Wiggin set the group up to be fully collaborative from the start. “PPEH began because there was so much student demand and interest, so I wasn’t going to tell them what it was about,” she says. She and the original seven research fellows created the group’s plan and goals and organized public programming. Each student also carried out a research project on an area of sustainability at the intersection of arts and sciences.

THE COLORS OF ENVIRONMENTAL ART: LEAH DAVIDSON

“I believe art can play a big role,” says Leah Davidson, W’16, a management and global innovation major who is minoring in English. “It can evoke emotion or it can be a call to action. It can interact with the environments. It can bridge cultures.”

Davidson used her PPEH fellowship and concurrent role as the undergraduate chair of the Penn Humanities Forum on Color to investigate the symbolism of color in environmental art and photography, and its relationship to human psychology. Visiting galleries and interviewing artists, she analyzed and catalogued 50 significant pieces of art that represented a variety of genres, colors, and cultural heritages.

“I wanted to explore the different focuses environmental art can serve and how it has played different roles in history, and encourage people to integrate that into education,” says Davidson. She found that while the book Silent Spring and Al Gore’s documentary An Inconvenient Truth used scare tactics to encourage people to conserve, she now sees more emphasis on inspiring other emotions and other forms of engagement.

“Environmental art can raise awareness, like Chris Jordan’s digitalizations of the number of cans thrown out in the U.S. per year,“ Davidson says. “It can convey the beauty of nature or be made with natural or recycled materials. It can repair damaged ecosystems or reinterpret natural processes.”

Davidson advocates a more cross-disciplinary approach to teaching about sustainability, whether it’s through students going out and exploring or bringing more art education into the classroom or even partnering with different religious groups. “There are so many different ways of thinking about environmental issues,” she says. “And I think that we really need new models for communication and exploration of the environment.”
Environmental sustainability is a global issue, but discussions about what to do to ensure it are usually divided by national borders. PPEH fellow Stephanie Businelli, C’16, took advantage of her year abroad at James Cook University in Australia to compare environmental issues and approaches there with those in the U.S.

Businelli, a biological basis of behavior major, talked with students and faculty to develop a more global perspective. She blogged about her conversations and the sustainability programs she saw, such as the way Aboriginal people collect abandoned fishing nets—which are death traps for marine life—and transform them into sculptures that pay homage to the totems and stories of their culture.

As she expected, Australia and the U.S. share many environmental issues, and Businelli hopes her blog will foster a more global perspective and promote discussion that may ultimately lead to courses of action. “It’s a way of telling the story. I hope that when people read it they will see that this is a global issue, and that we need to work together to do something about the problems,” she says. “A national program can help for issues that are contained within a country, like deforestation, but with issues like ocean or air pollution, the approach has to be global.”

How are sustainability efforts affected by the areas in which they take place? “When you walk through a war memorial it’s a completely different feeling than when you walk through a park,” says Austin Bream, C’17, W’17. “You have to ask yourself why, and how can sustainability take advantage of that dynamic?”

For his fellowship, the Huntsman International Studies and Business student documented sustainable spaces in Berlin. The sites ranged from Tempelhof, an airport-turned-park, to the historic Potsdamer Platz, which was completely restored after the Berlin Wall was torn down and now meets Germany’s environmental standards—a unique achievement for such a large area.

Bream’s catalogue of spaces is searchable by characteristics like type of place or the goal of the sustainability effort, and he hopes it will be the seed for a database of sites all over the world.

“Space is a really powerful element, and in really subtle ways it can impact how we see sustainability,” he says. He even included sounds from some of the spaces as another element to consider: “When you hear birds you think of nature, but what about church bells? I want to challenge common assumptions about sustainability.”
BEYOND BORDERS

PPEH also organized a public event series last year, culminating in “Urban Nature, Natural City,” which brought performance artist, historian, and Urban Rangers co-founder Jenny Price to campus. Urban Rangers members assume the mantle of park rangers and lead participants on tours through public spaces not often identified with nature, as a way of thinking beyond the scope of traditional projects and increasing awareness. The day also featured a roundtable of experts discussing “Nature in the Anthropocene.” The term anthropocene—the age of the human—signifies a new geological “era” beginning when human activity first began to have an effect on the climate, biodiversity, and trace elements. Panelists included Price, who is also a visiting environmental humanities professor at Princeton, along with Penn’s Etienne Benson, assistant professor of history and sociology of science, and Paul Schmidt, associate professor of biology.

Wiggin and the fellows have worked hard to build outreach across the campus and into the city, including partnerships with the Franklin Institute, Philadelphia Parks, and the Slought Foundation. This year a series of five linked public events will focus on faith, performance, extinction, infrastructure, and engagement, helping the group to construct a “Curriculum for a New Normal” that challenges traditional thought on sustainability. They are also partnering with artist-in-residence Mary Mattingly and her WetLand, a self-sustaining floating studio, residence, and public space where students will live and work. “It’s weaving together, bringing different disciplines into communication,” says Bream. “Not just academics of different disciplines. It’s also undergraduates and graduates. It’s young and old, Penn and the city.”

The group’s numbers are expanding, too. Last year’s research fellows are mentoring this year’s crop, and graduate fellows have joined the conversation, to conduct their own research and help plan programming.

“It has the energy of a startup,” says Wiggin. “There’s nothing required about PPEH. We are here because we think that this kind of cross-disciplinary cross-fertilization is really going to be important for producing the kinds of knowledge that this changing world really requires and needs.”

You can visit the Penn Program for Environmental Humanities’s online lab at: http://www.ppehlab.org
COLLEGE AND THE BOTTOM LINE

Racial Differences in Education’s Impact on Net Worth

by Grace Kao
Illustration by Jing Jing Tsong
On August 17, 2015, I appeared on a segment titled “Why College Fails to Close the Racial Wealth Gap” on Huffington Post Live. This panel was organized as a response to a report released by the Federal Reserve Bank of St. Louis that week that showed that while college education is associated with higher family income and net worth for all racial and ethnic groups (whites, blacks, Hispanics, and Asians) relative to their same-race counterparts who were not college-educated, the wealth of Hispanics and blacks was more susceptible to decline from 2007 to 2013. Overall, the median net worth of all families with a four-year college degree is $273,586 compared to $43,625 for those without a college degree. Specifically, the net worth of whites with four-year degrees declined by 16 percent, while the net worth for blacks with college degrees declined by 60 percent and the net worth for Hispanics with college degrees declined by 72 percent. In fact, the median net worth of black families with a college degree is actually lower ($32,780) compared to the median net worth of white families without a college degree ($80,692).

There are a few possible explanations for these differences. The first, and most obvious, is that blacks and Hispanics continue to experience lower income returns to college than their white counterparts, which in turn manifests in their lower levels of net worth. The median family income of blacks with a four-year college degree is $52,147 compared to about $68,379 for Hispanics and $94,351 for whites with a college degree. Simply having everyone go to college will not solve the problem of income inequality. I have often offered the following thought experiment to my graduate class in the Sociology of Education: If we suddenly granted every adult in the U.S. a college degree, what would happen to income inequality or racial and ethnic disparities in income or wealth? The short answer is probably nothing. While the U.S. and other nations should aspire to increase educational attainment for its citizenry, it is not a solution for the problem of income inequality. Second, Asian Americans are somewhat protected from recessions because they are more likely to earn graduate degrees and choose fields that are likely to be more recession-resistant. The report showed that Asian households with a four-year college graduate have a median family income of $93,000 compared to $94,000 for whites. In terms of median family net worth, the figure for Asian four-year college graduates is about $251,000 compared to about $359,000 for whites. However, Asians are more likely to earn Ph.D.s and M.D.s than any other group. For example, 20 percent of recipients of M.D.s in 2014 in the U.S. were Asian American, but Asians only represent 6 percent of the U.S. population. In fact, given their educational levels, they ought to have much higher earnings and net worth than whites. The report, however, finds the earnings and net worth of Asians to be lower than those of whites. This suggests that Asians also may receive lower returns to college than whites and have to earn higher levels of education to earn income and maintain wealth at comparable levels to whites.

Third, the report found substantial differences by group in the median debt-to-income ratio in 2007. Among those with four-year college degrees, whites had a median debt-to-income ratio of 102.2, compared to 86.5 for Asians, 134.3 for Hispanics, and 164.7 for blacks. Among non-college graduates, a very different picture of racial disparities emerges. Specifically, for those without a college degree, the median debt-to-income ratio was 47.4 for whites, 56.9 for Asians, 33.6 for Hispanics, and 24.9 for blacks. Blacks who choose to finish college also have by far the most debt of any group. This may be due to their parents’ lower ability to assist with college expenses. Other researchers have also found that blacks are less likely to inherit money from their parents than whites. Racial and ethnic differences in income and net worth stem from processes far beyond differences in their educational backgrounds.

While the U.S. and other nations should aspire to increase educational attainment for its citizenry, it is not a solution for the problem of income inequality.

Professor of Sociology Grace Kao is researching the causes of immigrant, racial, and ethnic disparities in educational outcomes. She holds a secondary appointment in the Graduate School of Education and is a member of the core faculty of Penn’s Asian American Studies Program.
Jean Lee, C ’09, arrived at Penn wanting to be a lawyer and left a burgeoning filmmaker. The moviemaking bug bit senior year, when, for her thesis project, she created an award-winning documentary—*We Do Not Exist*—about Philadelphia’s sex-trafficking industry. After Penn, she earned an M.F.A. from NYU’s Tisch School of the Arts, Asia, and she has had projects at Sundance, Film Independent, and the...
American Film Institute Directing Workshop for Women. The 28-year-old rising star is finishing *Tortoise*, a short starring David Arquette about a sex offender who embarks on an unexpected adventure with his estranged daughter. Here, Lee talks about her path to filmmaking, where stories come from, and what’s on the horizon.

**Q: How did you go from law to film?**

I was always into the powerful impact the legal system could have on important issues. When I got to Penn, I majored in 20th-century American literature, creative writing, and cinema studies and took some law classes. In junior year, I met Peter Decherney, a professor of English and cinema studies. He agreed to be my thesis advisor and encouraged me to make the documentary. I was interested in Penn Law’s Documentaries and the Law program and thought the film would be a foot in the door. But while making it, I realized I could make a more visceral impact on big issues through filmmaking than through some of the bureaucratic red tape that exists in the field of law. That’s how I transitioned into film.

**Q: Had you had any experience making movies prior to *We Do Not Exist***?

I don’t know what I was thinking—I had never made a film of any kind. I had taken theory classes, but that was it. I had no experience, no equipment. Thankfully, everyone was really supportive—people at Penn’s Vitale Digital Media Lab, classmates, Professor Decherney, and so many others were all behind me.

**Q: How did Penn prepare you for making films, both documentary and narrative?**

I very much believe that filmmakers should get an undergraduate degree in something unrelated to film. When I got to Tisch, I was surrounded by people who had gone to film school for undergrad or who were from film families. At that point, I still didn’t really even understand the mechanics of cameras. But I had the research and analytical skills to approach a topic or story. At Penn, I really learned to think, which equipped me for anything.

**Q: You’ve tackled some tough topics, from sex trafficking to pedophilia. And many of your films focus on people whom society has, in many ways, cast out. How do you come to your stories?**

Where some filmmakers are consistent in style or topic, I am consistent in theme. And one of my main themes is redemption. I’m interested in marginalized, fringe communities and putting people who don’t have voices in the spotlight—or giving them a voice. So far, many of my films have been somewhat controversial, which means there’s a big chance they’re not going to be a market success. For example, with *Tortoise*, I tried to identify the most hateable character—a pedophile—and then ask if there’s hope for that person. Is there room for redemption, for personal connection? In the film, I look for the possibility of it, even if it makes me feel uncomfortable. And I’m always very sympathetic to the audience. But, at the same time, I also feel that just because something is taboo or difficult, it shouldn’t go unexplored.

**Q: What are you working on now?**

I’m writing the pilot for my first television show, an anthology called *Stranger Pilgrim*. Every season follows a different scientific invention and looks at whether science and faith can coexist. The first season is called *Robot Courtesan*. It’s at a very early stage, but I’ve had some really positive reactions. I’m excited about this piece because in theme, style and tone, it has everything I’m passionate about. And it’s actually quite marketable. There also aren’t a lot of genre-directing women—in this case sci-fi—so this would add a woman’s voice, another reason I’m excited.

**Q: How will you know you’ve “made it” as a filmmaker?**

There are two parts to this for me: First, if I’ve satisfied my own vision in my projects. Second, if I’ve raised awareness or discussion or inspired people to think beyond the films. For me, it’s not just about entertainment, but whether I’ve made a difference in someone’s life or perspective. All that and [laughing] if I make *Robot Courtesan* before I turn 30!
SUMMER ON THE CIRCUIT

Penn-in-Cannes Program Inspires Adventurous Scholarship

by Blake Cole
Photos courtesy of Peter Decherney

It’s not every college class where you get credit for sneaking into movies, with the chance of scoring a seat next to one of the world’s biggest film celebrities. This is Penn-in-Cannes, a cinema studies course created over a decade ago that whisks students away to a relatively small city on the French Riviera that once a year becomes the premier place on Earth to be if you’re a film enthusiast.

Each year the program accepts 30 students, the maximum number the festival allows from one university. Students attend two mandatory pre-departure lectures on the state of global cinema and the festival itself to get a sense of how they’re changing.

“Some students are more interested in aesthetics, while others pick up on the business side of film, which is a big

Students often rely on the generosity of Cannes VIPs for tickets to exclusive screenings. 

Peter Decherney, professor of English and cinema studies, and program students at the annual program dinner at Cannes.

Before departing, students write a paper on a recent festival film. One of the most popular paper subjects this past year was Biutiful, a 2010 Mexican-Spanish drama film directed by Alejandro González Iñárritu, who won three Academy Awards for his film Birdman.

While in Cannes, students stay at the Collège International, a French foreign language school. That’s when the race to see as many films as possible begins, with students waking up at dawn with the goal of seeing 25 movies in two weeks. Some students attend more that 40 screenings.

Attendees are given badges which control their film access. Students need to be creative if they want to sit in on some of the biggest features. “What the students tend to do, which I unfortunately can no longer do because I’m too embarrassed [laughs], is to beg for invitations,” says Decherney. “They stand in front of the venues and wait for someone to give them an invitation. So depending on your luck you might end up sitting next to Cate Blanchett.”

And while the films are front and center, they are only a small part of what’s happening at the festival. “A lot of people are there to host industry meetings, to pitch a new project, or speak with a distributor,” says Decherney. “It could be a company that is trying to sell Asian horror films. It could be the country of Norway, trying to entice filmmakers with tax credits.”

The festival is unpredictable and there are surprises each year. “We were at a very luxurious hotel one year and one of our students saw Quentin Tarantino,” says Nicola Gentili, associate director of the cinema studies program and the director of the Cannes program, who has posters from each year’s festival hanging in his office. “They asked if they could get a part in one of his movies and he replied, ‘Well, you would probably be killed quickly. Do you really want to?’ It was a laugh for everyone.”

Students also keep journals, describing their experiences at screenings, meeting festival goers and industry insiders, and special anecdotes. “They’re always fascinating to read,” says Decherney. “It’s a very friendly atmosphere at the festival, and students often have the chance to speak with industry leaders from many different countries.”

Another crucial aspect of the trip is Penn’s network of alumni on the ground, who meet with the students to impart their industry wisdom. In the past this has included Jeffrey Berg, PAR’06, PAR’10, former CEO of International Creative Management, Inc.; Geoffrey Gilmore, C’74, past director of the Sundance Film Festival and current creative director of the Tribeca Film Festival; Richard Hess, C’84, PAR’18, founder and co-managing partner of Evolution Media Capital; and Lorraine Carrady Quinn, CW’73, PAR’07, PAR’13, president of Caribbean Cinemas.

And though the festival is full of stars, Priyamvada Dalmaia, C’16, a psychology and history of art major, says, “Cannes is not just about living at the heart of cinematic glamour. It is about being alive to the experience of a global arena of the film industry and soaking in the culture of the festival.”

Cinema studies and English major Gabe Morales, C’16, adds, “Cannes had always seemed like a pipe dream, but being there amongst all of these people that loved film and had some part in the film world made it all very real and instilled in me a burning desire to return one day on the other side of things.”

When students return they are tasked with writing a final paper about the festival. “Many students this year wrote about the official theme of the festival, which was ‘year de la femmes,’” says Decherney. “Historically one of the biggest criticisms has been that Cannes is an all-boys club.”

Jennifer Schofield, C’17, a communications and cinema studies major, says the program helped influence her eventual line of study. “If someone would have told me a few years ago that I would get the opportunity not only to go to France, but also to attend the screenings and the ceremony of the awarding of the Palme d’Or, I never would have thought it to be true. It is what ultimately led me to decide to become a French language minor.”

Penn-in-Cannes is part of the Penn Summer Abroad program offered through the School’s College of Liberal and Professional Studies—a program that also includes Penn-in-Havana, a course on sustainability and climate change in Berlin and Rotterdam, and a class on Greek religion and ancient architecture in Athens.

“The program is a good example of a creative combination of in-class learning in West Philly with an intense experience abroad,” says Dennis DeTurck, Stephen A. Levin Dean of the College, Robert A. Fox Leadership Professor, and Professor of Mathematics. “This combination of meaningful abroad experiences that illustrate, amplify, and inspire classroom study exemplifies the new global educational initiatives Penn is pursuing in many disciplines.”
The Copenhagen Consensus Center asks: In a world of limited resources, how should we prioritize the agenda for global development? After analyzing more than 100 targets in terms of social value-for-money, an expert panel that included two Nobel Laureates identified 19 targets that represent the best value-for-money in development. The decision was based on over 100 peer-reviewed analyses from 82 of the world’s top economists and 44 sector experts—including Penn’s own Hans-Peter Kohler, Frederick J. Warren Professor of Demography, and Jere Behrman, William R. Kenan Professor of Economics (see pg. 24)—along with many UN agencies and NGOs. According to Consensus findings, “prioritizing 19 targets instead of the UN’s 169 targets is equivalent to doubling or quadrupling foreign aid” in terms of impact and “offers more than $15 back on every dollar invested.” The Consensus has divided the 19 targets into three categories: people, planet, and prosperity, illustrated in the graphic below.

**SMART DEVELOPMENT GOALS**

**PEOPLE**
- Lower chronic child malnutrition by 40%
- Halve Malaria infection
- Reduce tuberculosis deaths by 90%
- Avoid 1.1 million HIV infections through circumcision
- Cut early death from chronic disease by 1/3
- Reduce newborn mortality by 70%
- Increase immunization to reduce child deaths by 25%
- Make family planning available to everyone
- Eliminate violence against women and girls

**PLANET**
- Phase out fossil fuel subsidies
- Halve coral reef loss
- Tax pollution damage from energy
- Cut indoor air pollution by 20%

**PROSPERITY**
- Reduce trade restrictions
- Improve gender equality in ownership, business and politics
- Boost agricultural yield growth by 40%
- Increase girls’ education by two years
- Achieve universal primary education in Sub-Saharan Africa
- Triple preschool in Sub-Saharan Africa

For more information on the Copenhagen Consensus project, visit: https://www.copenhagenconsensus.com/post-2015-consensus

For more information on the United Nations Sustainable Development Goals, visit: https://sustainabledevelopment.un.org
Justin McDaniel, professor of religious studies and creator of the Thai Digital Monastery project, is digitally scanning historic Buddhist manuscripts. He plans to create hypertext editions where visitors can view the documents while seeing a running translation and listening to a monk or nun chant the words. This image is from an 1860s Thai manuscript that tells the story of Buddhist monk Phra Malai, who visited heaven and hell and returned to transmit what he learned to his followers. The illustration depicts the monk speaking to the god Indra next to the celestial stupa (a structure containing relics) called Chulamani. The manuscript is in the collection of the University Museum, a gift of the Estate of Elizabeth Lyons.
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“PENN ARTS AND SCIENCES ENABLED ME TO LOOK AT THE WORLD FROM A BROADER PERSPECTIVE. I CAN BRING SOMETHING NEW TO THE TABLE.”

–Hayley Boesky, C’88
Vice Chairman of Global Markets for Bank of America Merrill Lynch

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