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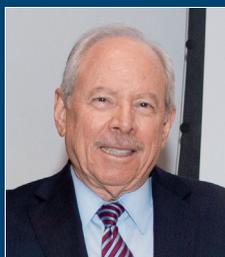
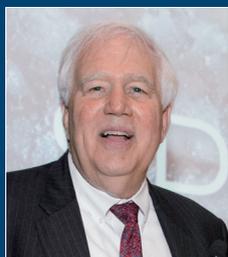
On Free Speech and Academic Freedom

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Dædalus explores “The Prospects & Limits of Deliberative Democracy”
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Upcoming Events

SEPTEMBER

8th

Yale University
New Haven, CT

Luncheon for New Haven Members

Investment and Matching: The Economics of Specialized Markets

Featuring: **Larry Samuelson** (Yale University)

11th

Cornell University
Ithaca, NY

Luncheon for Members

26th

Rice University
Houston, TX

Genomics in Medicine

Featuring: **John Mendelsohn** (University of Texas MD Anderson Cancer Center; Rice University), Moderator; **Andrew Futreal** (University of Texas MD Anderson Cancer Center), **Richard Gibbs** (Baylor College of Medicine), **Brendan Lee** (Baylor College of Medicine), **Huda Zoghbi** (Baylor College of Medicine)

26th

Duke University
Durham, NC

Reception for Members

Featuring: **Nancy C. Andrews** (Duke University School of Medicine), **Michael S. McPherson** (formerly, Spencer Foundation)

29th

Stough Elementary School
Raleigh, NC

America's Languages in North Carolina

in collaboration with North Carolina State University

Featuring: **Nancy C. Andrews** (Duke University School of Medicine), **Jeff Braden** (North Carolina State University), **Karl W. Eikenberry** (Stanford University; former Ambassador to Afghanistan), **David E. Price** (U.S. House of Representatives, North Carolina's Fourth District), **Rick Van Sant** (Go Global NC)

OCTOBER

6th–8th

Cambridge, MA
Induction 2017

6th

Harvard University
Cambridge, MA

A Celebration of the Arts and Humanities

Featuring: **Elizabeth Broun** (Smithsonian American Art Museum), **Brenda L. Hillman** (St. Mary's College of California), **Greil Marcus** (Oakland, CA), **Lynn Nottage** (Columbia University), **Faith Ringgold** (University of California, San Diego), **Mark S. Slobin** (Wesleyan University), **Arthur C. Sze** (Institute of American Indian Arts)

7th

Harvard University
Cambridge, MA

Induction Ceremony

8th

American Academy of Arts and Sciences
Cambridge, MA

Annual David M. Rubenstein Lecture

Looking at Earth: An Astronaut's Journey

Featuring: **Kathryn D. Sullivan** (Smithsonian Institution National Air and Space Museum; formerly, U.S. Department of Commerce; former NASA Astronaut), **David M. Rubenstein** (The Carlyle Group; Smithsonian Institution)

From the President



Jonathan F. Fanton

The Academy is more than 5,500 Members strong and the connections between Members across disciplines, institutions, and other divides is just as strong. The Membership Engagement Initiative, launched in 2015 with the generous support of the Jack, Joseph, and Morton Mandel Foundation, creates opportunities for Members to connect with each other and serve the common good. Since the start of the Initiative, the Academy and its Members have expanded national and international programming, developed a network of Local Program Committees, and promoted civic discourse on timely and important issues.

In March 2017, we sent a survey to all Members to gain a clearer understanding of their experiences with and views of the Academy. The response to the survey was significant and included a good representation of our membership across gender, class and section, and geographic location. I am pleased to share what we have learned from the survey and to highlight some achievements and future opportunities for the Membership Engagement Initiative.

The Membership Survey revealed that more than two-thirds of Academy Members reported a “positive” or “very positive” overall experience with the Academy and 91 percent feel proud of their membership in the Academy. Over half of the Members indicated that they are well-informed about our work, with a majority reading the Academy newsletter and print publications regularly or occasionally. Members also reported that, in addition to the honor and prestige of being elected, one of the most rewarding aspects of membership is the opportunity to gather and interact with other Members. Nearly 60 percent of the Members who responded to the survey said that they would like to be more involved in the Academy.

These are all encouraging signs that the Academy continues to realize the vision set forth by its founders 237 years ago – to promote and encourage knowledge in service of the common good. Other responses to the survey suggest that the Membership Engagement Initiative enhances that vision by creating more opportunities for Members to connect with each other across disciplines, professions, and even geography.

Since the launch of the Initiative in 2015, Member participation has increased across all areas of the Academy. More Members are involved in the nomination and election process and are serving on class committees. Project committees have seen a 20 percent increase in Member participation, and we estimate that nearly one hundred Members will have participated in or led an Exploratory Meeting by the end of 2017. Participation in our governance committees has also increased and these committees are now operating at a level that supports the size and scope of the Academy.

One of the most meaningful ways that Members participate in the Academy is by attending programs and events both in Cambridge and, increasingly, in cities across the country. Since the launch of the Membership Engagement Initiative, the number of meetings held at the House of the Academy has nearly tripled from 18 events in 2013–2014 to 51 events in 2016–2017. Our programming in Cambridge includes Stated Meetings, which date back to the founding of the Academy, Local Fellows Lunches, Friday Forums, and a discussion series initiated by the Boston-Cambridge Committee on “Civic Discourse.” The meetings were warmly received and well attended.

The Academy has also significantly expanded its programs beyond Cambridge. With the support of the Membership Engagement staff, Members have formed more than one dozen Local Program Committees across the country, from Los Angeles, Berkeley, and San Diego to Houston and St. Louis, and from Washington, D.C., Philadelphia, and Princeton to New York, Providence, and New Haven. Four additional Local Program Committees are now in formation. These committees have held receptions to welcome and engage new Members and also to plan events in their home cities, such as the San Diego

FROM THE PRESIDENT

Program Committee's lecture on Neuroscience and Architecture and the New Haven Program Committee's Town Hall Meeting on the U.S. Elections.

Our goal is not only to engage Members across the country, but also in other parts of the world. The Academy's membership includes more than six hundred International Honorary Members, representing forty-five countries on six continents. Just over one year ago, the Academy established a Committee on International Activities, chaired by James Cuno of The J. Paul Getty Trust, to help bring an international perspective to our work and to develop closer ties both to our Members living abroad and to academies located overseas. Over the last two years, the Academy expanded its international programming with meetings in Berlin, Edinburgh, Geneva, Jerusalem, London, Milan, Moscow, and Paris. This fall, I will travel to Abuja, Nigeria, along with John Randell, John E. Bryson Director of Science, Engineering, and Technology Programs, and Francesca Giovannini, Program Director of Global Security and International Affairs, to participate in a meeting of the African Academies.

Opportunities abound to expand our efforts to engage Members in the United States and abroad. This is a high priority, especially given that the survey revealed many Members feel that the largest barriers to their participation in the Academy are time and distance. A few years ago, the Academy developed an online platform, called Member Connection, to encourage engagement beyond traditional meetings and events. And our new live-streaming initiative has enabled Members living around the world to attend, in a virtual sense, the Stated Meetings held at the House of the Academy in Cambridge. Laurie McDonough, Morton L. Mandel Director of Membership Engagement, will continue to work with Members to expand these opportunities in their local areas over the next year.

In 1981, when then President Milton Katz dedicated the House of the Academy in Cambridge, he noted that the "primary function" of the Academy was to "foster the gathering together of individuals absorbed in their respective specialties for their mutual reinvigoration in the common enterprise of understanding, discovery, and expression." The results of the Membership Survey reveal that a great many Members share this view of the Academy. In the spirit of common enterprise, we look forward to connecting with more Members through the Membership Engagement Initiative and all the projects and programs of the Academy. In these uncertain times, there are many opportunities for the Academy to advance evidence-based research and promote civil dialogue. I look forward to pursuing those opportunities together.

A handwritten signature in black ink that reads "Jonathan F. Fanton". The signature is written in a cursive style with a large, stylized initial 'J'.

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Gift Spotlight

\$5 Million Gift from John and Louise Bryson will Fund Science, Engineering, and Technology Research

When John Bryson began his professional life after receiving an undergraduate degree from Stanford and a law degree from Yale, he knew that he would not follow established paths. He created a singular career defined by his dual interests in understanding complicated policy challenges and addressing them with innovative, real solutions. With every opportunity in the nonprofit, public, and private sectors, he confronted new hurdles and overcame each with a combination of creativity and consensus.

After law school, John was one of the founders of the Natural Resources Defense Council and helped to shape the NRDC's environmental protection work. Subsequently, he was asked by Governor Jerry Brown to serve the state of California. First, John chaired the California State Water Resources Control Board during a period of extreme drought, and then he served as President of the California Public Utilities Commission and helped increase the use of alternative energy. After leaving state government, John led Edison International as its Chairman and CEO over nearly two decades that included a national energy crisis, deregulation, and globalization. He distinguished himself as a thoughtful, gifted, and creative leader able to bring people together, even when resources and solutions were in short supply.

John brought his proven, passionate belief in the compatibility of economic growth and environmental protection to national and international roles. He served as a member of the United Nations Secretary-General's Advisory Group on Energy and Climate Change and as the 37th Commerce Secretary of the United States, appointed by President Barack Obama.

John shared each stage of his public life with his wife, Louise Henry Bryson. Her work in media also spanned an era of significant change. She began by writing and producing documentary films for public television and then, after graduating from Stanford Business School, she worked in the burgeoning cable television business for twenty-five years. Louise is currently a member of the Board of Directors of the American Academy of Arts and Sciences and of the Public Policy Institute of California. She is the Chair Emerita of the Board of Trustees of The J. Paul Getty Trust.

Both Louise and John are members of the Academy, where the commitment to developing knowledge for the public good and investing in long-term work resonates with their values. The Brysons have given a gift of \$5 million to the Academy to support research and study in the fields of science, engineering, and technology, with a particular focus on energy and the environment.

John and Louise have four daughters – Julia, Jane, Ruth, and Kathleen. “Our entire family is committed to the advancement of science and to the protection and preservation of the environment,” said Louise Bryson. “We are truly honored to be able to help sustain the Academy's work and John's values in perpetuity with this gift.”



John and Louise Bryson

“John's career epitomized the best in service and leadership in the nonprofit, public, and private sectors,” said Roger Sant, who knows the Brysons well. “One of John's greatest accomplishments was proving the compatibility of environmental protection and economic growth. This gift to the Academy is a fitting way to honor John's many contributions to the public good and extend them in innovative and important ways.”

A portion of the Brysons' gift will be used to endow the John E. Bryson Director of Science, Engineering, and Technology Programs at the Academy. Staff member John Randell will be given that title in support of his work as a senior leader at the Academy, bringing together leading experts across all disciplines for research and recommendations that connect scientific expertise and public policy.

Don M. Randel, former Chair of the Academy's Board of Directors, said the gift “raises our aspirations for the Academy's current and future initiatives in science, engineering, and technology. We are deeply appreciative of the lasting and significant impact their gift will have on this area of inquiry.” ■

STEM Fields Growing among Four-Year College Degree Recipients

Since the Great Recession, news coverage about the state of the humanities has often looked to the trend in undergraduate majors as a sign of the field's flagging health. But where are those students going, and why? New data from the American Academy's Humanities Indicators (HumanitiesIndicators.org) reveal a recent substantial shift toward bachelor's and graduate degrees in the science, technology, engineering, and medical (STEM) fields; the data also highlight some of the underlying complexities in this shift.

From 2006 to 2015, bachelor's degrees in the STEM fields rose from 22 percent of the baccalaureate degrees awarded to 30 percent of the total – the highest level since detailed national record-keeping began in 1987 (see Figure 1). Much of the recent growth in the STEM fields can be attributed to a sharp increase in the shares of bachelor's degrees awarded to students in the health and medical sciences, which doubled from 2006 to 2015.

During that same time period, all other fields of study experienced a decrease – and in some cases a sharp decrease – in their share of the market. The humanities tend to garner the most attention in the media, and the trend there is substantially downward – the shares of bachelor's degrees in the humanities fell 20 percent from 2006 to 2015. In explaining the decline, commentators often suggest that students are turning to professional subjects that appear to have clear career paths. The data indicate these assertions may be too simplistic, as two of the largest professional degree subjects are also experiencing substantial declines. Education had the largest proportional decline in share – down 27 percent in the most recent decade with data – while business and management degrees also fell (by 13 percent). What all three subject areas (business, education, and the humanities) have in common is that their share of bachelor's degrees declined to near historic lows in 2015 while STEM fields approached or reached historically high levels.

A substantial portion of the shifting pattern in degree recipients may be attributed to an increase in the share of women receiving degrees in the health and medical fields. In 2006, 9 percent of women earned baccalaureate degrees in these fields. As of 2015, that share had risen to 16 percent. At the same time, the shares of women earning degrees in business, education, and the humanities all fell to historically low levels.

Liberal Arts Ascendant at Community Colleges

While STEM degrees surged at the bachelor's level, the share of humanities and liberal arts degrees earned by associate's degree recipients increased substantially, reaching an unprecedented level in 2015 and accounting for almost 42 percent of the total.

The growth in liberal arts degrees reflects the increased importance of community colleges as a first step toward a four-year college degree, often providing a less expensive way to satisfy general education requirements. (According to the National Student Clearinghouse, 16 percent of students who started their studies at a two-year institution went on to complete a four-year college degree.) Unfortunately, the trend data do not reveal whether, and if so how, the rise of the liberal arts degrees at the associate's level may be connected to the decline in humanities degrees at the bac-

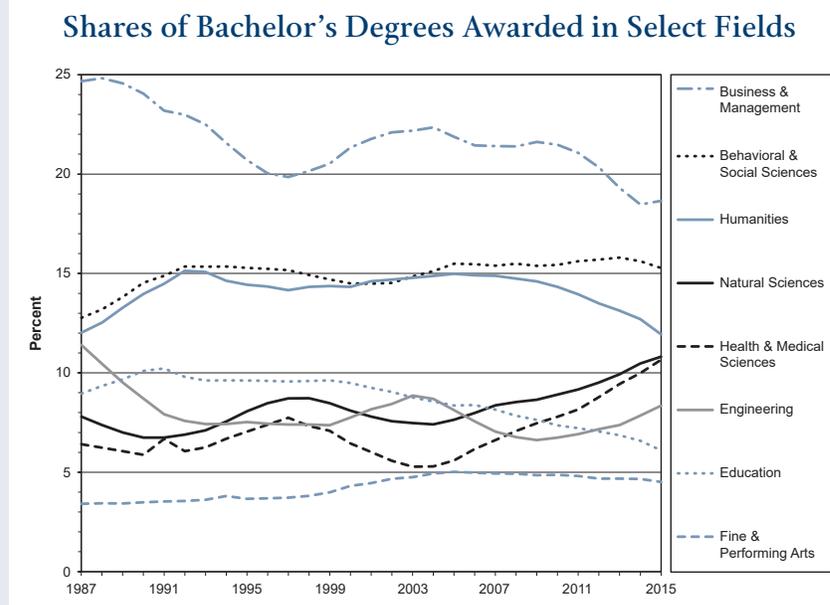


Figure 1

Source and details at <http://humanitiesindicators.org>.

calaureate level. The pathways from community college study to the bachelor's degree remain murky, particularly at the disciplinary level.

The demographics of students receiving community college degrees point to an important challenge for policy-makers and administrators concerned about the pipeline of students into four-year degrees and beyond. For instance, in 2015, 32 percent of the associate's degrees conferred in the humanities and liberal arts were awarded to students from traditionally underrepresented racial/ethnic groups (for instance, African Americans, Hispanics/Latinos, and Native Americans). That share was ten percentage points higher than the share at the baccalaureate level. Similarly, the share of underrepresented minorities among associate's degree recipients in the health, medical, and natural sciences was almost six percentage points higher than their counterparts at the bachelor's level.

A similar disparity was found among the women earning associate's degrees: the share of women earning science degrees at the associate level was nine percentage points higher than the share among bachelor's degree recipients. A large proportion of the women receiving associate's degrees in this field earned them in professionally oriented programs of nursing and health administration.

The demographic disparities in the student population between two- and four-year degree recipients highlight an important policy challenge for those seeking to diversify the student body at four-year institutions. This challenge is reflected in a growing number of federal and private efforts to improve the transition process from two-year to four-year institutions.

Trends at the Graduate Level

At the graduate level, the main story once again is the rising shares of degree recipients in the STEM fields (especially in the health and medical sciences), and the corresponding declines among graduates in other fields.

For instance, the share of all master's and first professional degrees conferred on graduates from the health and medical sciences has been rising unevenly, but reached a high water mark of almost

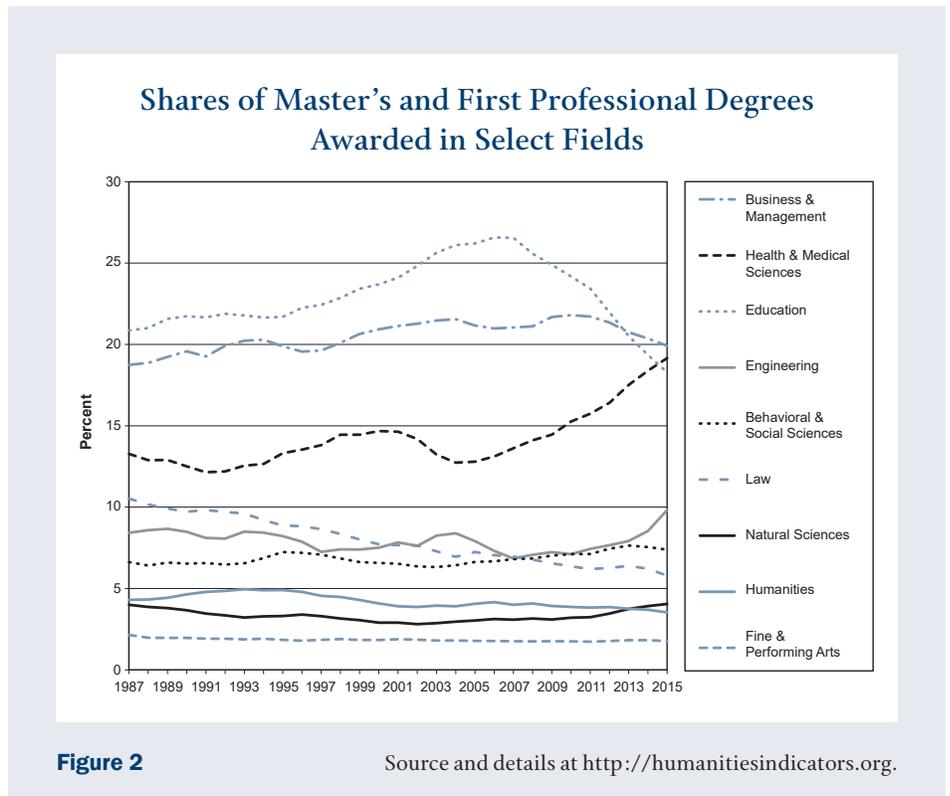


Figure 2

Source and details at <http://humanitiesindicators.org>.

20 percent in 2015 (see Figure 2). Here again, the shares of degrees awarded in business, education, and the humanities (as well as law) all experienced substantial declines in recent years, with the share of humanities degrees falling to the lowest level on record. The legal profession experienced the most extended period of decline, with its share of degrees declining gradually from over 10 percent of the master's and first professional degrees in 1987 to below 6 percent in 2015.

At the doctoral level, the shares awarded in engineering and the health and medical sciences increased substantially, while the shares awarded in the humanities fell unevenly from 1987 to 2015 (see Figure 3). The relative shifts in the shares of students receiving doctoral degrees is somewhat deceptive, however, as the total number of doctorates rose to an unprecedented level in 2015. The most rapid growth occurred in the STEM fields (which accounts for their growing share of the total), but the number of humanities doctoral degrees also increased. Even as a growing number of commentators worried about a surfeit of new humanities PhDs for a saturated academic job market – a problem exacerbated by the declining number of undergraduate majors in the humanities – the number of doc-

Shares of Doctoral Degrees Awarded in Select Fields

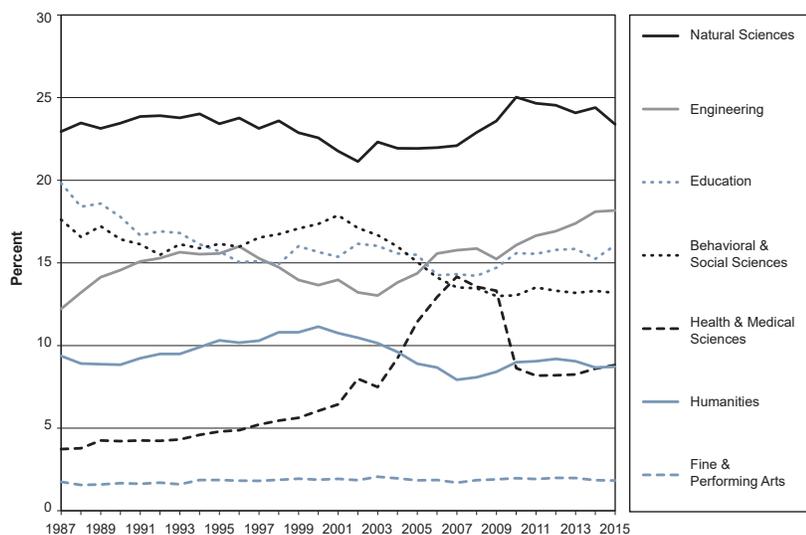


Figure 3

Source and details at <http://humanitiesindicators.org>.

torates awarded in the field increased from a pre-recession level of 4,773 awarded in 2007 to a historic peak of 5,891 in 2015.

Part of the recent growth reflects efforts to increase the racial and ethnic diversity of students receiving graduate degrees. On this point, administrators and policy-makers can claim some success. Among recipients of graduate degrees, almost every field has seen a substantial increase in the percentage of students from traditionally underrepresented racial/ethnic groups. In every field except law and engineering, the shares of traditionally underrepresented minorities earning master's and first professional degrees increased by 60 percent or more from 1995 to 2015. (Among recipients of law degrees, the share increased 33 percent, while the share among engineering degree recipients increased 48 percent.)

At the doctoral level, the gains were even more pronounced. The percentage of degrees awarded to members of traditionally underrepresented racial/ethnic groups increased more than 90 percent from 1995 to 2010. The only exceptions were the fine and performing arts (which increased 78 percent) and the humanities (which experienced a 73 percent increase).

The patterns among degree recipients provide one part of the story for those interested in the health of academia. In reports due out

later this year, the Humanities Indicators will focus on employment outcomes for degree recipients, which will be discussed in a future issue of the *Bulletin*.

For more information about the Humanities Indicators, please visit the Academy's website at <http://www.humanitiesindicators.org> or contact the Indicators staff at humanitiesindicators@amacad.org. ■

Technology in a Time of War: Humanitarian Aid at an Inflection Point

Reflections on the American Academy's work on *New Dilemmas in Ethics, Technology, and War* and Its Engagement with International Organizations

By Francesca Giovannini with Kathryn Moffat

In an age of rapid technological development, social unrest, and rising geopolitical tensions, the Academy's initiative on *New Dilemmas in Ethics, Technology, and War* has attracted attention from policy-makers, scholars, and humanitarian aid practitioners.

The goal of the project is simple yet timely: to explore the ethical and moral issues that develop from the creation and use of new military technology (such as drones, robots, and cyber weapons) in contemporary and future warfare. As wars become progressively high-tech, states *should* be more capable of fighting accurate wars that spare the lives of soldiers and civilians. But with what consequences? Some of the contributors to the Academy's project on *New Dilemmas in Ethics, Technology, and War* contend that futuristic high-tech wars might not necessarily be less brutal and devastating than conventionally fought conflicts. Quite the opposite: because of the illusion of precision-technology and zero-casualty wars, states may be more likely to embark on aggressive combat operations, which could result in higher numbers of casualties. The use of precision weapons and other technologies that reduce immediate casualties may also contribute to a tendency to overlook the resulting indirect effects, which may carry more severe consequences over time.

The work of the project has interested several international organizations, including the United Nations Department of Peacekeeping Operations (UNDPKO), NATO, and the High Commissioner for Refugees (UNHCR). Beginning in the fall of 2015, representatives from these organizations have participated in a series of meetings, organized by the Academy, about some of the key issues these institutions face as they respond to crises created by technological developments in warfare. These meetings included:

- A workshop at West Point in November 2015 that brought together experts from international organizations based in New York and around the world to participate in roundtable discussions about draft essays for two issues of *Dædalus* on "Ethics, Technology & War" and "The Changing Rules of War."
- Two briefings in Geneva, in May 2016 and July 2017, at which project contributors met with leaders and practitioners at

UNHCR, as well as with representatives from other Geneva-based organizations, such as the International Committee of the Red Cross, the World Health Organization, the Centre for Humanitarian Dialogue, and Médecins Sans Frontières.

- A convening in Brussels in November 2016 with representatives from the European Commission's European Group on Ethics in Science and New Technologies Office, the International Crisis Group, and NATO.
- Two roundtables in February 2017 and April 2017 on "Populations, Perceptions, Power, and Peace Operations" with UNDPKO and the UN Department of Political Affairs.

The Fourth Industrial Revolution and Its Impact on Humanitarian Interventions

Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, argues in his most recent book that humanity is now facing its fourth industrial revolution.¹ Whereas previous industrial revolutions liberated humankind from animal power, made mass production possible, and brought digital capabilities to billions of people, the unfolding fourth industrial revolution brings both great opportunities and grave dangers.

New technologies – such as cyber, drones, artificial intelligence, and biotechnology – that are fusing the physical, digital, and biological worlds and impacting all disciplines, economies, and industries, characterize this new age. Even more so, according to Schwab, this revolution challenges the conventional idea of what it means to be human and calls into question concepts such as war and peace, ethics and rationality, and human rights.

Technology, in particular, raises significant dilemmas when used in warfare. On the one hand, the increasing use of unmanned aerial vehicles and the development of artificial intelligence technologies that could be applied to autonomous offensive weapons – frequently referred to as Killer Robots – spur concerns that new warfare will be fought based on algorithms and without any human ethical judgment or moral considerations. On the other hand, technology

Francesca Giovannini is Program Director for Global Security and International Affairs and Kathryn Moffat is Program Associate for Global Security and International Affairs at the American Academy.

offers humanitarian agencies unprecedented access to crisis-affected communities and could potentially facilitate the timely and efficient delivery of aid to isolated, war-torn areas. These new technologies are already affecting the operations of many international organizations. UN peacekeeping forces, for example, have begun using drones for intelligence gathering in such places as Mali, the Central African Republic, and the Democratic Republic of the Congo. And recently, the office of the UN High Commissioner for Human Rights announced a landmark five-year partnership with Microsoft Corporation, which will lead to the development of advanced technology designed to predict, analyze, and respond better to critical human rights crises around the globe.

Three central questions have emerged from the work of the New Dilemmas in Ethics, Technology, and War project and from conversations with international organizations and other audiences over the past two years. These questions are central to how the debate about technology, and its threats and opportunities, will affect the ways these organizations respond to conflict and humanitarian crises throughout the world in the coming years.

Airpower and Autonomous Weapons-Driven Wars: What Happens to the Civilian-Military Interface?

There is little doubt that wars will be increasingly characterized by the deployment of unmanned aerial vehicles and artificial intelligence, as witnessed by recent operations in Afghanistan, Iraq, and Yemen, among others, and that this trend will continue in the future. Although the armed drones deployed currently still rely on a person to make the final decision whether to fire on a target, the autonomy of these and other weapons that have been deployed or are under development is growing quickly. Newer military drones, such as the MQ-9 Reaper, can take off, fly to designated points, and land without human intervention. Low-cost sensors and advances in artificial intelligence are making it increasingly practical to design weapons systems that would target and attack without human oversight. If the trend toward autonomy continues, the human role in decision-making will disappear. Although fully autonomous weapons do not currently exist, the capacity to develop these technologies is expected to be available within a matter of years, rather than decades. In conventional warfare, humanitarian personnel interact with the military on the ground in order to negotiate the creation of humanitarian spaces, where civilians are protected and given medical treatment and aid. In the new wars, however, operations will be conducted mostly through airpower without military personnel on the ground. This shift eliminates the interface between the humanitarian agencies and the military, who are critical in the protection of noncombatants.

The Urbanization of Warfare: Where Can Humanitarian Spaces Be Created?

One new characteristic of contemporary war is that it has become increasingly an urban phenomenon. In modern conventional conflicts before the advent of drones and other high-tech military capabilities, adversaries fought primarily in open spaces outside of cities. Urban fighting was costly, slow, and risky. Today, warring parties are increasingly fighting in densely populated neighborhoods (for example, Syria). The use of drones and technologies with remote sensing and satellites allows for faster and more accurate identification of targets in crowded urban areas, which in some cases has dramatically reduced the number of direct casualties from the fighting. This creates two challenges for international organizations: 1) urban populations can easily become trapped in war-torn cities, where humanitarian agencies may be unable to gain access quickly enough to respond to the urgent needs of the population; and 2) the enduring consequences of warfare are magnified when conflicts take place in cities. The wholesale destruction of cities such as Aleppo, Damascus, Baghdad, and other major urban centers – as well as the devastation of human capital, the educational and health infrastructure, and other essential components of urban society – will have effects extending far beyond the lifetime of the conflict. These lasting and indirect consequences are intensified further when civilians and health facilities are targeted.

What are the Privacy Implications of Humanitarian Operations?

As humanitarian crises increase around the world, the imperative for international organizations is to save as many lives as possible with limited resources and in a short time span. Information and communication technologies offer unprecedented opportunities to these agencies to collect data on forced migration patterns and the locations of refugee camps. Concurrently, however, the use of big data systems and other surveillance tools raises new ethical and political challenges. Information collected for humanitarian purposes might end up in the hands of rebel groups or be used by rivals to threaten communities and individuals. How can data be collected securely without infringing on the privacy and safety of people in need? During a briefing conducted at the UNDPKO, project participants discussed ways for humanitarian data gathering to be improved and strengthened. Some of their recommendations include: 1) the adoption of a code of conduct that would restrict the collection of personal information for humanitarian purposes only; 2) training for UN staff on how to use adequately and ethically the

data collected; and 3) establishing local coordination mechanisms with the communities in question so that they can be part of the decision-making on how their data ought to be used and shared.

Conclusion: Toward a Tripartite Dialogue among International Organizations, High-Tech Companies, and the Military Establishment

The reaction to the New Dilemmas in Ethics, Technology, and War project has made clear that the challenges raised by new technologies are best addressed through multistakeholder dialogues. International organizations play an essential role in providing humanitarian and development assistance around the world, but they are often not involved in the military and technology discussions that are taking place within states. For the UN system especially, the need to coordinate with member states can create additional challenges, both for adopting relevant new technologies and for responding effectively to other actors' use of such technologies.

The world is moving toward high-tech, fast, short, and targeted military operations that will have severe consequences for communities and people around the globe. International organizations, equipped to respond to and use new technologies to their advantage, can alleviate some of the potentially negative humanitarian impact of these operations. It is in everyone's interest to make sure that a new dialogue involving technology companies, international organizations, and militaries takes place. The scholarship that the Academy has produced through its issues of *Dædalus* on New Dilemmas in Ethics, Technology, and War provides a platform to frame and nurture much needed dialogue among these important players. ■

Authors' Note: Many of the ideas discussed in this article are the result of the Academy's year-long engagement and partnership with UN agencies and international organizations and capture the dialogue that the Academy's project on New Dilemmas in Ethics, Technology, and War – led by Scott D. Sagan – has encouraged. These ideas do not necessarily reflect the views of the project authors and participants.

ENDNOTE

1. Klaus Schwab, *The Fourth Industrial Revolution* (Geneva: World Economic Forum, 2016).

The Academy's project on *New Dilemmas in Ethics, Technology, and War* brings together an interdisciplinary group of scholars and practitioners to explore the ethical dilemmas posed by contemporary political developments and changes in military technology. The idea behind this initiative is that although technological innovations and political developments are changing the way in which modern wars are conducted, efforts to align the legal and ethical frameworks that guide and inform states' behavior before, during, and after war have not evolved accordingly. For many centuries, just war theory represented the pinnacle of human morality in warfare. As such, it has informed and influenced the formulation of international laws and treaties in the protection of noncombatants, civilians, and vulnerable categories of individuals. The most important intellectual work examining the application of just war principles to modern wars remains Michael Walzer's *Just and Unjust Wars* (1977), a classic investigation into just war doctrine applied within the context of interstate war and civil conflict during the Cold War. No volume since the end of the Cold War has successfully become the successor to Walzer's book.

New Dilemmas in Ethics, Technology, and War sets out a new research agenda on emerging military technologies and examines the political and moral issues that societies and countries will face in a new high-tech military landscape. The project is led by Scott D. Sagan (Stanford University) and supported by Humanity United, the John D. and Catherine T. MacArthur Foundation, and The Rockefeller Foundation.

More information about the New Dilemmas in Ethics, Technology, and War project is available on the Academy's website at <https://www.amacad.org/newdilemmas>.



New issue of *Dædalus* on “The Prospects & Limits of Deliberative Democracy”

Democracy is under siege. So begins the Summer 2017 issue of *Dædalus* on “The Prospects & Limits of Deliberative Democracy.” In their introduction to the issue, guest editors James S. Fishkin (Director of the Center for Deliberative Democracy and Janet M. Peck Chair in International Communication at Stanford University) and Jane Mansbridge (Charles F. Adams Professor of Political Leadership and Democratic Values at the Harvard Kennedy School) consider the crisis of confidence in the ideal of democracy as rule by the people. If the “will of the people” can be manufactured by marketing strategies, fake news, and confirmation bias, then how real is our democracy? If the expanse between decision-making elites and a mobilized public grows, then how functional is our democracy? If political alienation and apathy increase, then how representative is our democracy?

The essays in this issue assess the current crisis of democratic governance and explore the alternative potential of *deliberative democracy*, in which the will of the people is informed by thoughtful, moderated citizen engagement and discussion. But is a diverse and polarized citizenry even capable of deliberation? How likely is group deliberation to reach a well-reasoned decision? And wouldn't group deliberation recreate the same power imbalances obstructing other kinds of discourse?

There are no consensus answers in this issue. The authors include both proponents of deliberative democracy and its staunch critics. Deliberative models are presented in theory and in practice, with case studies including the angry populism of the Brexit vote, the rise of deliberative mechanisms in authoritarian China, the first Deliberative Polls in rural Uganda, and the deliberation practiced in the executive branch of the U.S. government.

What the contributing authors do share is the recognition that the legitimacy of electoral representation suffers when people in democracies become disillusioned, disappointed, and disaffected. The authors provide competing and compelling ideas about how to restore faith in democracies by making them more resilient and responsive.

Inside the Issue

James S. Fishkin (Stanford University) and Jane Mansbridge (Harvard Kennedy School) argue in the introduction to the issue that the legitimacy of democracy depends on some real link between the public will and the public policies and office-holders who are selected. But the model of competition-based democracy has come under threat by a disillusioned and increasingly mobilized public that no longer views its claims of representation as legitimate. Fishkin and Mansbridge introduce the alternative potential of deliberative democracy, and consider whether deliberative institutions could revive democratic legiti-



Audience member asks a question on the International Day of the Girl.
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macy, provide for more authentic public will formation, offer a middle ground between mistrusted elites and the angry voices of populism, and help fulfill some of our shared expectations about democracy.

In “Referendum vs. Institutionalized Deliberation: What Democratic Theorists Can Learn from the 2016 Brexit Decision,” Claus Offe (Hertie School of Governance, Germany), putting aside the substantive question of whether the United Kingdom leaving the European Union was a “good” idea, uses the Brexit referendum to illuminate the weaknesses of plebiscitarian methods of “direct” democracy and shows how Parliament failed to build safeguards into the referendum process. He proposes a design for enriching representative electoral democracy with random, deliberative bodies and their methods of political will *formation* (as opposed to the expression of a popular will already formed).

In “Twelve Key Findings in Deliberative Democracy Research,” Nicole Curato (University of Canberra, Australia), John S. Dryzek (University of Canberra, Australia), Selen A. Ercan (University of Canberra, Australia), Carolyn M. Hendriks (Australian National University), and Simon Niemeyer (University of Canberra, Australia) note that though deliberative democracy is a normative project grounded in political theory, it is also home to a large volume of empirical social science research. So what have we learned about deliberative democracy, its value, and its weaknesses? The authors survey the field by discussing twelve key findings that conceptual analysis, logic, empirical study, normative theorizing, and the refinement of deliberative practice have set to rest.

In his essay, “Political Deliberation & the Adversarial Principle,” Bernard Manin (École des hautes études en sciences sociales, France; New York University), retrieving an insight dating back to antiquity, argues that the confrontation of opposing views and arguments is beneficial to any political deliberation. He proposes practical ways of promoting adversarial deliberation, in particular the organization of debates disconnected from electoral competition.

Hélène Landemore (Yale University), in “Deliberative Democracy as Open, Not (Just) Representative Democracy,” argues that in order to retain its normative appeal and political relevance, deliberative democracy should dissociate itself from representative democracy and reinvent itself as the core of a more truly democratic paradigm – what she calls *open democracy*, in which popular rule means the mediated but real exercise of power by ordinary citizens.

In “Inequality is Always in the Room: Language & Power in Deliberative Democracy,” Arthur Lupia (University of Michigan) and Anne Norton (University of Pennsylvania) discuss that though deliberative democracy has the potential to legitimize collective decisions, deliberation’s legitimating potential depends on whether those who deliberate truly enter as equals, whether they are able to express on equal terms their visions of the common good, and whether the forms that govern deliberative assemblies advance or undermine their goals. Lupia and Norton examine these sources of deliberation’s legitimating potential, and contend that even in situations of apparent equality, deliberation is limited by its potential to increase power asymmetries.

Ian Shapiro (Yale University), in “Collusion in Restraint of Democracy: Against Political Deliberation,” argues that calls to inject deliberation into democratic politics rest on a misdiagnosis of its infirmities. Robustly defending the model of competitive democracy, Shapiro contends that deliberation undermines competition over proposed political programs, while deliberative institutions are all-too-easily hijacked by people with intense preferences

and disproportionate resources. Arguments in support of deliberation are at best diversions from more serious threats to democracy: namely, money’s toxic role in politics. Shapiro concludes that a better focus would be on restoring meaningful competition between representatives of two strong political parties over the policies that, if elected, they will implement.

In “Can Democracy be Deliberative & Participatory? The Democratic Case for Political Uses of Mini-Publics,” Cristina Lafont (Northwestern University) argues against recent proposals to insert deliberative mini-publics into political decision-making processes, such as through citizens’ juries, Deliberative Polls, and citizens’ assemblies. She suggests that deliberative mechanisms could diminish the democratic legitimacy of the political system as a whole.

In “Deliberative Citizens, (Non)Deliberative Politicians: A Rejoinder,” André Bächtiger (Universität Stuttgart, Germany) and Simon Beste (Universität Luzern, Switzerland) discuss that although both politicians and citizens have the capacity to deliberate when institutions are appropriate, high-quality deliberation can collide with democratic principles and ideals. Bächtiger and Beste employ a “need-oriented” perspective, proposing institutional interventions and reforms that may help boost deliberation in ways that exploit its unique epistemic and ethical potential while making it compatible with democratic principles and ideals.

Deliberative critics contend that the deliberative process inevitably perpetuates societal inequalities and can produce distorted dialogue determined by inequalities, not merits. However, Alice Siu (Stanford University), in “Deliberation & the Challenge of Inequality,” presents empirical evidence demonstrating that inequalities in skill and status do not translate into inequalities of influence when deliberations are carefully structured to provide a more level playing field.

Much of the time, the U.S. executive branch has combined both democracy and deliberation, placing a high premium on reason-giving, the acquisition of necessary information, internal diversity, and debate and disagreement. In “Deliberative Democracy in the Trenches,” Cass R. Sunstein (Harvard University), who served in the Obama administration, explores the concrete practices, rather than the abstract ideals, of the operation of deliberative democracy in the executive branch.

Reflecting on the first two applications of deliberative democracy in Sub-Saharan Africa, James S. Fishkin (Stanford University), Roy William Mayega (Makerere University, Uganda), Lynn Atuyambe (Makerere University, Uganda), Nathan Tumuhamy (Makerere University, Uganda), Julius Ssentongo (Makerere University, Uganda), Alice Siu (Stanford University), and William Bazeyo (Makerere University, Uganda), in “Applying Deliberative

Democracy in Africa: Uganda’s First Deliberative Polls,” apply the same criteria for success commonly used for such projects in the most advanced countries. They find that the projects in Uganda were representative, produced substantial opinion change, avoided distortions, and achieved actionable results that can be expected to influence policy on difficult choices.

Authoritarian rule in China increasingly involves deliberative practices that combine authoritarian command with deliberative influence, producing the apparent anomaly of *authoritarian deliberation*. Drawing from their own research in China, Baogang He

(Deakin University, Australia) and Mark E. Warren (The University of British Columbia, Canada) explore in “Authoritarian Deliberation in China” two possible trajectories of political development in China in this context: that the increasing use of deliberative practices could stabilize and strengthen authoritarian rule, or that deliberative practices could serve as a leading edge of democratization.

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“The Prospects & Limits of Deliberative Democracy”
Summer 2017 issue of *Dædalus*

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On Free Speech and Academic Freedom

On April 6, 2017, the American Academy of Arts and Sciences presented the Talcott Parsons Prize to Joan W. Scott. Professor Scott gave the following remarks on receiving the prize.



Joan W. Scott

Joan W. Scott is Professor Emerita in the School of Social Science at the Institute for Advanced Study. She was elected a Fellow of the American Academy of Arts and Sciences in 2008.

I was ten years old when my father was suspended from his job as a high school social studies teacher. Two years later, he was fired for insubordination and conduct unbecoming a teacher because he refused to cooperate with an investigation into purported communist infiltration in the New York City public schools. His defense was eloquent.

I have been a teacher for fifteen years, a proud American teacher. I have tried all those years to inspire my youngsters with a deep devotion for the American way of life, our Constitution, and Bill of Rights. Hundreds of my youngsters fought in WWII and I know their understanding of the need to fight for their country was inspired by my teach-

Free speech makes no distinction about quality; academic freedom does.

ing and the Bill of Rights. . . . From that teaching our youngsters got the feeling that we are living in a country where nobody has a right to ask what are your beliefs, how you worship God, what you read. As a teacher and a believer in those fundamental principles, it seems to me that it would be a betrayal of everything I have been teaching to cooperate with the committee in an investigation of a man's opinions, political beliefs, and private views.¹

At the time, I took it all in stride – we were expected to be proud of the principled stand my father had taken. But looking back, I can see that I was also afraid. Our family life was rendered uncertain by his firing and not only because he no longer had a job. In fact, it was not so much economic insecurity that I felt, but a sense of foreboding: FBI agents showing up at the door, friends whose fathers were in jail, Joseph McCarthy's voice leering, insinuating, angry – the sounds that to a child conveyed dangerous, unreasoning hatred.

That was some sixty-five years ago. I thought all of it was long passed, a stage in my history – in American history – we had all survived and that even some of its most ardent supporters had repudiated. So, I was unprepared for the power of my reaction to the election of Donald Trump: diffuse anxiety; a sense of fear in response to an indeterminate threat; dread about what would come next, as day after day more draconian measures were announced. It was, in some sense, the return of the repressed and not only for me, but for the country as a whole.

Looking for insight, I turned (not for the first time) to Richard Hofstadter's *Anti-Intellectualism in American Life*, a reflection on the experience of the 1950s, published from the critical distance of 1963. In the book's first chapter, Hofstadter comments on "the national disrespect for mind" that characterized the era. "Primarily it was McCarthyism which aroused the fear that the critical mind was at a ruinous discount in this country. Of course, intellectuals were not the only targets of McCarthy's constant detonations – he was after bigger game – but intellectuals were in the line of fire, and it seemed to give special rejoicing to his followers when they were hit."² Hofstadter went on to argue that the experience of the fifties was not new, but a recurrent aspect of American identity with "a long historical background. An examination of this background suggests that regard for intellectuals in the United States has not moved steadily downward . . . but is subject to cyclical fluctuations."³ In a conversation with my son Tony, he characterized these fluctuations as the escape of the American id from the confines of its reasonable containment. The return of the repressed with a vengeance!

The American id has been let loose again, this time by Donald Trump and, as in the McCarthy period, intellectuals are only one of his targets. But targets we are. It's not only the president's preference for alternative facts that challenge evidence-based argument, but direct attacks by him and others on scientists who work on climate change or who challenge drug company claims about the safety of their products.

It's also an apparent distrust of and dislike for writers, artists, journalists, and professors. Secretary of Education Betsy DeVos tells college students that "the fight against the education establishment extends to you, too. The faculty, from adjunct professors to deans, tell you what to do, what to say, and, more ominously, what to think."⁴ We are, in her view, dangerous agents of thought control, purveying our ideology to the detriment of free thought. A "Professor Watchlist," established by the conservative organization Turning-Point USA, publishes online the "names of professors that advance a radical agenda in lecture halls." An Arizona legislator introduces a bill that would prohibit state institutions from offering any class or activity that promotes "division, resentment or social justice toward a race, gender, religion, political affiliation, social class or other class of people."⁵ The bill failed, but it is a sign of the times. (Arizona has already banned the teaching of ethnic studies in grades K–12.)⁶ In Arkansas, another bill seeks to prohibit any writing by or about Howard Zinn from inclusion in the

The century-old notion of academic freedom insists on the expertise of scholars and the importance of that expertise for advancing "the common good."

school curriculum.⁷ In Iowa, a state senator introduces a bill to use political party affiliation as a test for faculty appointments. "A person shall not be hired as a . . . member of the faculty . . . if the person's political party affiliation . . . would cause the percentage of faculty belonging to one political party to exceed by ten percent the percentage of faculty belonging to the other party."⁸ A Republican Party operative in Michigan reveals his darker side in a tweet recalling the Kent State shootings of students protesting

Academic freedom – the right of teachers to teach as they choose, without outside interference – is, I am arguing, the key to the exercise of free speech.

the Vietnam War and recommends similar treatment for today's demonstrators: "Violent protestors who shut down free speech? Time for another Kent State perhaps. One bullet stops a lot of thuggery."⁹ *The New York Times* cites a report by the Anti-Defamation League noting that since January white supremacists have stepped up recruiting on campuses in over thirty states.¹⁰ Their anti-Semitic, anti-Muslim leaflets have caused concern, but also – as in the case of speeches by the likes of white nationalist Richard Spencer or the disgraced Breitbart provocateur Milo Yiannopoulos – they have raised the question of what counts as free speech.

These days, free speech is the mantra of the right, their weapon in the new culture war. Their invocation of free speech has collapsed an important distinction between the First Amendment right of free speech that we

one's opinion, however unfounded, however ungrounded, and it extends to every venue, every institution. The Goldwater Institute's model legislation, the "Campus Free Speech Act," has been taken up in Tennessee, North Dakota, and by the National Association of Scholars. It calls on professors to present both sides of an issue in the classroom in order to protect the student right of free speech. A teacher, in this view, has the right to regulate speech, "provided that [he or she] regulates the speech in a viewpoint- and content-neutral manner."¹¹ In effect, students are allowed to say anything they want, removing intellectual authority from the professor. Here is the vice president of the College Republicans at the University of Tennessee supporting a bill to protect student free speech: "Students are often intimidated by the academic elite in the classroom. Tennessee is a conservative state, we will not allow out of touch professors with no real world experience to intimidate eighteen-year-olds."¹² The National Association of Scholars has proposed new ways to evaluate the "academic elite." Among their recommendations is the elimination of peer review and its replacement by "experts . . . who are of genuinely independent minds."¹³ It's hard not to see in these recommendations a more veiled version of the political party test proposed by the Iowa legislator.

There's a kind of blood lust evident in these charges, an attempt to reign in serious intellectual work, critical thinking, scientific inquiry. I don't want to deny problems on "our" side, the moralism that is apparent in some courses and some student activism, the calls for "trigger warnings," the insistence on the authority of their experi-

ences by those whose minority status has silenced or marginalized them – who look to “safe spaces” as a way to gain traction in an otherwise hostile or neglectful institutional and social environment, who erupt in protests that are sometimes ill-considered violations of the rights they need to respect

Critical thinking is precisely not a program of neutrality, not tolerance of all opinion, not an endorsement of the idea that anything goes. It is about how one brings knowledge to bear on criticism; it is a procedure, a method that shapes and disciplines thought.

and protect. But these don't seem to me to explain the ferocity of the anti-intellectualism we are witnessing, the desire to impugn our motives and disparage our work, to do away with what power academics are supposed to have. If Tony's reference to the unleashed id is right, we are the superego who would spoil the fun, who endanger its unruly pursuits. We keep asking questions, they already have their answers. We have to be gotten rid of if they are to enjoy their power to its fullest – because that power depends on reversing advances to equality that have been made and undermining the institutions of democracy: the constitution, the citizenry, the courts, and the schools. These are the institutions of government that, arguably, provide the ground rules for the conflict and diversity that James Madison understood to be the permanent condition of the republic. In his view of it, regulation was the guarantee of democracy.

That may be why freedom is the principle invoked so forcefully on the right these days – freedom in the sense of the absence of any restraint. From this perspective, the

bad boys can say anything they want, however vile and hateful: Yiannopoulos, Spencer, Charles Murray, Donald Trump. The worse the better, for it confirms their masculine prowess, their ability to subvert the presumed moralism of those they designate “eggheads” and “snowflakes” – female-

identified prudes who, in a certain stereotypical rendering of mothers, wives, and girlfriends, are the killjoys who seek to reign in the aggressive, unfettered sexuality that is the mark of manly power. Intellectuals and liberals (the terms are often taken to be synonymous) are portrayed as enemies of this freedom. “Inside every liberal is a totalitarian screaming to get out,” warns David Horowitz, who has been on the frontlines of the anti-intellectual movement for years.¹⁴ The strategy of the alt-right these days is to provoke situations that can be used to demonstrate the truth of Horowitz's claim. By collapsing the distinction between free speech and academic freedom, they deny the authority of knowledge and of the teacher who purveys it. I think Danielle Allen fell right into their trap when she compared Charles Murray's experience at Middlebury a few weeks ago with that of the Little Rock Nine, the black high school students who had to be protected from violent crowds by the National Guard as they sought to integrate Central High School in Arkansas in 1957. In her rendering of it, the

proponent of racist false science becomes, surprisingly, the defender of “the intellectual life of democracies.” Like the Little Rock Nine, who defied racists and “tried, simply, to go to school,” she concludes, “Murray and his hosts were also trying, simply, to keep school open. In this moment, they, too, were heroes.”¹⁵

Middlebury, I would submit, was not about “the intellectual life of democracies” – that goes on in schools and forums where tests of truth and evidence apply. It was about the violation of an individual's right of free speech, where no such standards are applied. The confusion between these two – between academic freedom and free speech – was evident in the call for respect for individuals with different points of view issued by the unlikely duo of Harvard's Cornel West and Princeton's Robert George.¹⁶ As they insist on the importance of respecting free speech, their paper also concedes what should be refused: the conflation between the individual's right to express his opinions and criticism – lack of respect even – of the opinions themselves. They assume a necessary parity between different sides of the debates about discrimination, equality, and justice, as well as about what counts as scientific evidence and the validity of certain forms of political protest. The issue of the authority of knowledge is denied in their call for neutrality, as is the unequal distribution of social power; it is as if everything is of the same quality in the marketplace of ideas.

Free speech makes no distinction about quality; academic freedom does. Are all opinions equally valid in a university classroom? Does creationism trump science in the biology curriculum if half the students believe in it? Do both sides carry equal weight in the training of future scientists? Are professors being “ideological” when they refuse to accept biblical accounts as scientific evidence? What then becomes

of certified professorial expertise? Does the university have a responsibility to uphold standards of truth-seeking outside the classroom as well as inside it? When does an invitation imply endorsement of a speaker's views? What is the difference between a climate denier and a Holocaust denier? Is the exchange of ideas really impeded by passionate debate, even angry exclamations? Ought the right of free speech be restricted to polite and civil exposition? Is righteous anger unreasonable in the face of racial, economic, religious, or sexual discrimination? Is there really no difference between the structures of discrimination experienced by African-Americans and the criticism of those structures leveled against whites? Are both worthy of being deemed racist, as the conservative student newspaper at Pitzer College claimed last week?¹⁷ Does "all lives matter" carry the same critical commentary as "black lives matter?" What has it meant historically for those marginalized by or excluded from majority conversations and institutions to protest their treatment? The historian William Chase tells us that the students participating in the sit-ins that launched the Civil Rights movement were deemed "uncivil" by their segregationist critics. Sometimes it requires extraordinary actions to make one's voice heard in a conversation that routinely ignores it. Incivility, even today, is most often a charge made against protestors on the left, while the hate speech of those on the right looks for – and finds – protection in the right of free speech.

Although there are differences between reactions to student protest and the more general defamation of the life of the mind that targets faculty, there are also connections between them. These have to do with the status of criticism or critique in the national conversation. It was in defense of the university's role as the crucible of critique that the doctrine of academic freedom was formulated in the United States over a cen-

tury ago. When John Dewey and his colleagues founded the American Association of University Professors in 1915 they articulated a vision of academia that was at once immune to powerful economic and political interests and that promised to serve those interests, however indirectly, by producing new knowledge "for the common good." The university was defined as "an inviolable refuge from [the] tyranny of [public opinion] . . . an intellectual experiment station, where new ideas may germinate and where their fruit, though distasteful to the community as a whole, may be allowed to ripen."¹⁸ Scientific and social progress depended on the nonconformity protected, indeed fostered, by the university. The "well-being" of the place came from its ability to support critical thinkers, those who would challenge prevailing orthodoxy and stir students to think differently, to become "more self-critical," hence more likely to bring

If the production of knowledge was understood to be vital for the progress of the nation and the guarantee of "the wealth, peace, independence and happiness of [the] people," then intellectualism is our best answer to anti-intellectualism.

about change. The role of professors was to be, in the words of one university president, "a contagious center of intellectual enthusiasm." He went on: "It is better for students to think about heresies than not to think at all; better for them to climb new trails and stumble over error if need be, than to ride forever in upholstered ease on the overcrowded highway."¹⁹

The century-old notion of academic freedom insists on the expertise of scholars and the importance of that expertise for advancing "the common good." The same no-

tion of the relationship between knowledge and the common good inspired the founding in 1780 of the American Academy of Arts and Sciences. "The Arts and Sciences," the Academy's Charter of Incorporation reads, "are necessary to the wealth, peace, independence and happiness of a people." "From its beginnings," its current history notes, "the Academy has engaged in the critical questions of the day. It has brought together the nation's and the world's most distinguished citizens to address social and intellectual issues of common concern and above all, to develop ways to translate knowledge into action."²⁰

The Academy's mandate, like the principle of academic freedom, to be sure, is full of so-called elitist implications – intellectuals in general, the faculty in particular – that are corporate, self-regulating (disciplined) bodies whose training to produce new knowledge guarantees a certain auton-

omy and a share in the governance of the university and the regard of the nation. In this view, the faculty is capable of inspiring, inculcating, and judging student mastery of subjects being taught. Student free speech is appropriately limited in the university classroom, subject to the disciplinary tutelage of the professor in charge – a professor who has been subjected to and certified by a disciplined formation of his or her own. This does not mean silent acquiescence in the face of indoctrination, far from it. It does mean learning how to evaluate things

critically, how to question orthodoxy and challenge it from a position of knowledge rather than one of unexamined belief. This training in the rigors of critical thought is not without its difficulties, and it is more often characterized by strong differences and contentious argument than it is by consensus and singular conclusions. But this is

severely compromised as the mission of the university, replaced by an emphasis on vocational preparation, on the comfort and security of students, on the avoidance of controversy lest students, parents, trustees, legislators, and donors find offense. Its absence in the university curriculum has produced some of the problems we now face.

The pursuit of knowledge is not an elitist activity, but a practice vital for the exercise of democracy and the promotion of the common good. Those values – knowledge, democracy, and the common good – seem to me worth reasserting, even in the face of their corruption and neglect.

what makes it the preparation required for the exercise – inside and outside the classroom – of free speech. Academic freedom – the right of teachers to teach as they choose, without outside interference – is, I am arguing, the key to the exercise of free speech. Free speech not as the expression of the unruly id, but as the voice given to reasoned argument. That voice can be angry, insistent, condemnatory; there is no contradiction between reason and outrage.

That is why exhorting students to respect the ideas of individuals with whom they disagree is not the solution to their purported misbehavior: we can respect the rights of free speech without having to respect the ideas being uttered. Critical thinking is precisely not a program of neutrality, not tolerance of all opinion, not an endorsement of the idea that anything goes. It is about how one brings knowledge to bear on criticism; it is a procedure, a method that shapes and disciplines thought. This kind of critical thinking has been discouraged in university classrooms in recent years; it has been

The lack of training in critical thinking extends beyond subject matter in courses to strategic planning for political action. If students haven't learned how to analyze texts and historical arguments, they won't be able to bring critical thinking to political engagements; they will tend to act more impulsively, venting their rage rather than directing it to considered strategic ends. They will underestimate the power of the opposition to discredit their aims along with their actions. They will end up – as in the Middlebury case – the bad guys, while the racism of Charles Murray they were legitimately protesting is eclipsed by his first amendment martyrdom.

I know it's unfashionable to look to the past for answers to the present; unrealistic not to pragmatically accept the corporate neoliberal university as a *fait accompli*. But I want to end this talk by suggesting that there is some value in conserving the principles that inaugurated our democracy and that informed the articulation of the mission of the colleges and universities of this

country. If the production of knowledge was understood to be vital for the progress of the nation and the guarantee of “the wealth, peace, independence and happiness of [the] people,” then intellectualism is our best answer to anti-intellectualism. Not the watering down of ideas or the search for popular consensus, not the notion that all ideas are worthy of respect, but the more difficult task of honing our critical capabilities, cultivating them in our students, and insisting on their value even in the face of ridicule, harassment, and repression.

In 1954, Leslie Fiedler described McCarthyism as a “psychological disorder compounded of the sour dregs of populism [and] the fear of excellence, difference and culture.”²¹ It's time, I think, to reassert the authority of knowledge in the face of the Trump administration's attempt to elevate mediocrity to a heroic virtue. The pursuit of knowledge is not an elitist activity, but a practice vital for the exercise of democracy and the promotion of the common good. Those values – knowledge, democracy, and the common good – seem to me worth reasserting, even in the face of their corruption and neglect. The university was once considered the crucible of those values; its mission has been severely compromised over the course of the last twenty or thirty years. Still we have no choice but to hold on to that vision and to find ways to reanimate it, so that it can inspire our thinking in the difficult days that lie ahead. ■

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ENDNOTES

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A Reading and Discussion of *Paradise*, a play by Laura Maria Censabella

On February 15, 2017, members of the Catalyst Collaborative@MIT performed a staged reading of *Paradise*, a play by Laura Maria Censabella. The program, which served as the Academy's 2050th Stated Meeting, included a panel discussion featuring Paula T. Hammond (David H. Koch Chair Professor in Engineering and Head of the Department of Chemical Engineering at MIT), Rebecca Saxe (Professor of Cognitive Neuroscience in the Department of Brain and Cognitive Sciences at MIT), and Saba Valadkhan (Assistant Professor in the Department of Biochemistry at Case Western Reserve University). The conversation was moderated by Carey Goldberg (Editor of the CommonHealth blog at WBUR) and featured introductory remarks by Debra Wise (Codirector of the Catalyst Collaborative@MIT and Artistic Director of the Underground Railway Theater) and Jonathan F. Fanton (President of the American Academy of Arts and Sciences). The following is an edited transcript of that discussion.



Paula T. Hammond

Paula T. Hammond is the David H. Koch Chair Professor in Engineering and Head of the Department of Chemical Engineering at MIT. She was elected a Fellow of the American Academy in 2013.

I would like to talk a little bit about my own experiences and what really got me about the play *Paradise*. I grew up in Detroit, Michigan – which is Motown – in the 1960s and 70s. I had very well-educated parents and lived in a middle-class neighborhood. My parents had a lot of high expectations of me when I was growing up, and they told

Sometimes you experience inner conflict when aspects of your new scientific environment clash with your upbringing, your culture, your family, or your faith. You might feel that you have to take sides.

me that I could – and should – do whatever I wanted. So I was very enabled.

My culture, my African-American culture, is a little different in that, especially at that time, there was a bit of duality. I received a lot of encouragement to achieve at the highest levels but, at the same time, I was the oddball and the loner in the classroom and at school. Being different meant not minding that being smart was not cool and that loving learning was something that wasn't going to get you a lot of friends. I had one friend from grades one through eight. It was one of those experiences where you realize you're different.

When I got to MIT as an undergraduate student, I thought that I had come into my own. I discovered people who were just like me, and yet I was still different from most of my classmates. So I can really relate to the theme of differentness that the character Yasmeen experiences in the play.

As I got older, I came to understand that my differentness was a tool, rather than a burden. Like Yasmeen, I'm a very surprising person, and I came to embrace that. When

I walk into a room, someone might assume that I'm not the person in charge, and I end up defying those expectations. And to embrace that is something that you have to be able to do to continue in a career in science and technology. Because no one is expecting you.

Another theme I connected with in the play was how faith, culture, and family experience make you who you are, whereas the culture of science, the ability to get in there and do what you need to do to perform at the topmost levels, does not. But I have found that, throughout my life, I always felt that I carried several identities with me. The whole Detroit thing. The whole African-American thing. The fact that I'm Christian and a person of faith, but I'm also a scientist. I'm a liberal, somebody who believes that we should live in a fact-based world, and I can say hallelujah to that at the same time. That is something that is unique to who I am.

But part of being able to embrace that is recognizing that sometimes you will experience inner conflict when aspects of your

new scientific environment clash with your upbringing, your culture, your family, or your faith. You might feel that you have to take sides. And those feelings are very real; they're conflicts that can tear you apart.

As I've gone through life, I've wondered: are those choices real, or are they only conflicts I feel? In reality, we don't have such clear choices. We have to be ourselves, and we carry ourselves with us. When I walk into a classroom, I'm taking the African-American kid who didn't have a lot of friends. I'm taking the Christian part. I'm taking all of those parts with me. And at some point, I have to feel comfortable with that. But that means confrontations, and sometimes it means losing groups of friends.

When I was growing up, I was told that I acted white. When I then began to enter the scientific world, I was asked about my life in the ghetto growing up. So there are times when you realize that there's not any one particular place for you; you have to find that place or create it. You have to find your allies and your friends. Find the cohorts who will be with you for that journey. And allow yourself to bring all those elements in, recognizing that sometimes there will be a fight, but that the fight will be worth it.



Rebecca Saxe

Rebecca Saxe is Professor of Cognitive Neuroscience in the Department of Brain and Cognitive Sciences at MIT.

I want to first thank the actors. I had read the play and it was so much more interesting and more meaningful to see it performed. It brought a lot of it to life in a really powerful way. So thank you for that beautiful performance.

The play also spoke to me very personally. It's almost uncanny the various ways in which the play speaks to themes that I feel like I have experienced or lived. Yasmeen's motivation for being a scientist is essentially my motivation for being a scientist, and for being the specific kind of scientist I am. In fact, it's a little bit unnerving how much her research program actually looks like mine.

Yasmeen tries to articulate an idea of wanting to be a neuroscientist in order to help people. And then she says, "Not with disease. But with how to live." This is the core question of my professional life: is it possible to approach the human brain scientifically and do so with the intent of under-

standing better how to live? What would that look like?

She grapples with that puzzle throughout the play. One question that she faces is about what a life of value is. What does it mean as an individual to choose how to live? And she feels that she is being asked to choose between two kinds of value. The value in which she is a part of a whole she's inherited: she is valuable insofar as she carries on and honors the traditions of her family and her culture. Or the value that she creates by earning it through science: by creating new knowledge or new experiments.

And I felt like I had that choice. I was also religious as a child. I'm Jewish and, like Yasmeen, I also dressed distinctively, in ways that marked me as a religious woman. For me that meant wearing long skirts. And when I was her age, and then for years afterward, I felt there was a choice of value in either living according to the ideas of what a Jewish woman is or living according to the idea of what a scientist is. It's an odd position that, retrospectively, can be hard to understand.

For example, one of the strange positions Judaism can put you in is that there's an explicit way of counting people in which women are not counted. And, as a young woman, I argued, with all of the intellectual capacity Yasmeen brings, for not being counted as a person, which is a little hard for me to remember or admit. But Yasmeen says something that reminds me of who I was then: she says she dresses the way she does and uses her call to prayer to remind her of who she is. She says, "That's who I am." And I resonate with that sense that you do have to decide who you are, which is almost the opposite of what Paula just said.

Another way the play spoke to me is through Royston, who said that there's always a personal reason behind what you choose to study. And I have wondered whether that was true for me and have fought with

Is it possible to approach the human brain scientifically and do so with the intent of understanding better how to live? What would that look like?

it. Is science always personal? Are the questions we're asking always personal?

My dad used to tease me that I studied theory of mind because my mother didn't have one. I hope she's not listening. But I thought for a long time that my science wasn't personal. And I thought that actually, that was a flaw of mine as a scientist – assuming that my questions were purely intellectual. Then, coincidentally, I started studying human brain development and had a baby, and I spent my maternity leave in an MRI machine with my newborn son. There was suddenly this creature that mattered more to me than anything else, and I got to know him as much as anywhere while scanning his brain on an MRI machine. Suddenly science got very personal.

And then it got more personal. I was studying his brain partly because babies' brains are very resilient to injury. And then my dad had a stroke. Suddenly science can come back and bite you in the most personal ways you least expected.

The last thing that I wanted to reflect on is the play as science communication. Like I mentioned, the experiment Yasmeen is designing is an experiment that could be at home in my lab, but when I first read the play, the conversation between the two of them didn't sound real to me; it didn't sound like the way scientists talk to their students. And I didn't know whether to be bothered by that or not. Should a play be veridical in that way? Should it sound like what it would sound like to have that conversation in my lab?

I'll share one last thought on the play's merits. The play articulates a scientific

view of adolescents: that they are reckless, have problems with impulse control; that they are passionate, but make poor choices. That's what Yasmeen says is their earth-shattering theory of adolescents. But in reality, I think Yasmeen herself is a much better portrait of what science suggests about adolescents, which is that they are not simply governed by impulse, but that they are extremely black-and-white in their motivations, driven by needs for authenticity, for resisting adult control, and for serving the ultimate greater good in all-or-none terms. That's actually what science currently suggests about adolescents, and it's what Yasmeen is, even though she doesn't describe herself that way when thinking scientifically. And somewhere in there is the interface between art and science.



Saba Valadkhan

Saba Valadkhan is Assistant Professor in the Department of Biochemistry at Case Western Reserve University.

I also feel very connected to the play. I wonder if it's because the experience of being a minority, no matter what kind of minority you are, is one and the same. The sense of disempowerment, of being an impostor is a shared experience of minority groups. So the need for empowerment, for receiving positive outside messages, is really paramount for a minority person to flourish.

But there are a lot of factors that continue to disempower minorities: a lack of mentorship, a lack of role models, cultural restrictions, and, often in scientific society, a lack of facilities. For example, not a long time ago, women were a minority in science. Things are becoming a lot better, but we are still falling behind. At one time, women weren't allowed to study at male colleges. Slowly women made progress and gained access to study side by side with men. Slowly, they started to go into higher education and earn their PhDs. Right now, at least in some subjects, for example in biology, we

Improving the culture by reducing prejudice against women, or maybe even just improving the situation of women in terms of having childcare, being allowed to have a family at the same time as their careers, can help mend the existing leaky pipeline.

see that they are gaining a lot of ground. And so among biology PhD graduates, the proportion of women is now not that much lower than men. So that's fantastic ground that we have covered.

But it seems that after that, the pipeline becomes leaky. In the transition from a graduate student to a postdoc, we seem to lose a lot of women. And there's an even bigger gap when women transition from postdoc status to a professorship. After that, going up the academic ladder, the pipeline becomes more and more leaky.

Viewing progress from when women were not allowed to be in the same schools as men, clearly the situation is a lot better; but there is still a lot to be done. Improving the culture by reducing prejudice against women, or maybe even just improving the situation of women in terms of having childcare, being allowed to have a family at the same time as their careers, can help mend the existing leaky pipeline. And other minority groups, for example people of different ethnicities and religions, are experiencing the same problems. And it's very likely that the same interventions that brought women to this point would work for other groups, like Muslim women or women of color, as well.

So just to share some interesting statistics. In the United States, women are graduating from colleges at a reasonable rate, but they're still underrepresented in a number of subjects, like engineering. It's the same thing in Muslim countries, except much worse. There, women are actually graduating at a higher rate, believe it or not, com-

pared to men: 50 to 60 percent of college students are women. But they are all in arts and humanities; there are very few women in STEM. So that reflects what we had here before, just three decades behind.

My hope is that the interventions that helped here – better mentorship, better empowerment, the presence of role models – may be the same type of interventions that would help down the road elsewhere. And, hopefully, we would be able to see this gap bridged in coming decades.

I'm not an expert on this, but experts always seem to emphasize that high school, where Yasmeen is, and middle school are extremely important in creating an image of empowerment for going into STEM subjects. And I think all of us have had a similar experience of empowerment during this critical period of our life. So how can we make this happen for future generations?

A lot of people think it comes down to science policy or educational policy, but that isn't enough. There is an enormous amount of talent here in this room. People in real positions of power are here. So, I ask you: how much does it take, for example, to ask all the active scientists to spend two hours a year going into high schools with minority students and try to empower them? This is not going to kill your career, but it could make a life-or-death difference in terms of their careers. I don't know how difficult this would be to implement, but I think waiting for the government – especially this administration – to do something about this is just wasting our time. We have to be the ones to

do something if we care about it. It doesn't take an arm and a leg, just a little effort from each and every one of us.

Discussion

Audience Question

I was raised in the Muslim faith and my whole family is Muslim. I have both experienced and witnessed how sometimes faith has to be left behind to pursue professional goals. And you have all said that you are religious or were religious in some way. So I'm curious to hear about your experience transitioning from your family life to your professional life with your religion.

Paula T. Hammond

I work with nanotechnology and chemical engineering, which sounds very technical and impersonal. But there is the idea

Our lives are built around the nurturing of young scientists who are trying to branch their careers. What we experience every day is people; we're not surrounded by walls and test tubes, but by people and their relationships with us.

that you can bring molecules together and create something new, and to me, that is an inspiration. And at the same time it is a celebration. From my perspective, my faith, going into the lab and creating is a gift. I always thought that all of the scientific theories in the world, including evolution, are just beautiful transcripts from how god created the world. But it's also true that many people of my faith wouldn't see it that way.

For me, though, these things don't have to be separated. It can certainly be challenging, but I don't mind being challenged.

Audience Question

I think it's important to understand and communicate to your students the cultural context in which they're caught. Can you comment on that?

Rebecca Saxe

One thing we didn't explicitly talk about in our discussion, which the play is centered on, is about the relationship between a student and a mentor, which is a profound and defining relationship in everyone's scientific career. Each student often has multiple mentors, and then, if they're lucky, will have multiple students they will mentor. It can sometimes feel like marriage after a short blind date: I meet somebody for half an hour, check their CV, and make a lifelong commitment to them. Which is insane.

And we put so much at stake in one another when we make that commitment. My grad students' careers depend on me in a profoundly feudal and kind of creepy way. And my life satisfaction, never mind my success, every aspect of my day-to-day life is now contingent on them because I don't do science anymore. I mentor people who do science. Any aspect of science I get to do, I do through other people. There's no question

that being a professional scientist, in my experience, has defined me through relationships more than any other part of my life except my children. I think about how to handle mentorship relationships much more than I think about how the brain works. Much more.

Paula T. Hammond

Rebecca's comments resonate with me as well. Our lives are built around the nurturing of young scientists who are trying to branch their careers. What we experience every day is people; we're not surrounded by walls and test tubes, but by people and their relationships with us. Our relationships with them are the defining characteristic of what we do.

Rebecca Saxe

Some people might experience science as a lonely endeavor, but for most of us, it's profoundly social. In complicated ways, in good ways, in bad ways, but nevertheless, non-stop social.

Saba Valadkhan

This goes to show that the reality of being a scientist doesn't always match the external image that we project. People think that scientists are these crazy people who are hiding themselves in labs and offices. But that's not the case. Like it or not, we have to interact with people all the time.

Audience Question

Something we've all wondered as a mentee or a mentor is, what's the right way to do it? And how personal do you get? We have not seen the whole play here, but this teacher is an odd person. And he's getting, in my opinion, close to being inappropriate in his

assumptions about the young woman and where she’s coming from. And yet I’m sure we’ve all experienced degrees of that in our mentor-mentee relationships. And sometimes even with that inappropriate behavior, you can still benefit, as Yasmeen seems to be doing. So I’m just wondering if you guys can each pick an example from your own lives of both the challenge but then the benefit.

Saba Valadkhan

It’s tough. I realize that when I have mentors that expect me to perform extremely well I do perform extremely well. The problem is when mentors start to see the otherness in me and treat me as different from themselves. Maybe less of a capable person. So this otherness problem is very detrimental. Many of the women in my institution – especially junior women – feel they are being treated as slightly different. For example, there was this really nice, well-meaning, very senior gentleman, a very good scientist. Every time he saw me, he felt the need to talk to me about being pregnant, but in a supportive way. He would say he supported me, assuming I was going to get pregnant and that it would hurt my career. That’s weird, and inappropriate to say, especially in front of my graduate students. Just don’t do it!

Paula T. Hammond

I’ve had some great mentors that didn’t look anything like me. And I feel very lucky for that. But the ones who were most effective for me were the faculty members who said, “Why aren’t you thinking about doing that? Why aren’t you putting yourself up for that? Why didn’t you?” They looked at me and said, “I see what you can do. Why aren’t you doing it?” But I’ve also encountered others who had low expectations of me. And you can tell. We’re all very smart;

young people are very smart. They can tell when you anticipate that they’re just going to make it through, or be somewhere in the middle. That doesn’t leave you with a feeling of capability. And while sometimes that can drive you to want to achieve more just to show them you can, I think we need to

How do we make science culture one that embraces everybody and hears everybody and allows you to stumble and rise back up without a huge retaliation?

be aware of our unconscious assumptions about people. And I think it’s about learning: dropping the guise of what you think this person is and where they come from and realizing that they’re just another brilliant person.

Rebecca Saxe

I was extremely lucky with the mentors that I had. And I’ve never known whether I was just lucky that I got three fabulous mentors or if it’s the fact that they were all women. My undergraduate research, my graduate research, and my postdoc research were all in the labs of women. And I can’t remember a time at any point in my education when anybody had low expectations of me because I was a woman. In regards to how personal to get, I think there are tons of gray areas and complexities. And, for me, that comes up as a mentor all the time. It can be hard to know how personal to be in caring for my students when I know something is going on in their lives; I want to be supportive but not invasive. If you’re going through a difficult breakup, for example, it could be weird for your boss to ask you about that. Or it could be nice. And so I’m trying to figure out how to express that I’m open to them telling me what’s going on, but I don’t need them to tell me what’s going on. That is part of the com-

plexity of being an appropriate mentor. And, on the other side, one thing that I struggled with in particular was how personal to be about my own unhappiness. If I’m unhappy or if I’m struggling, if personal issues in my life or my ability to be enthusiastic about science are affecting me day to day, how much

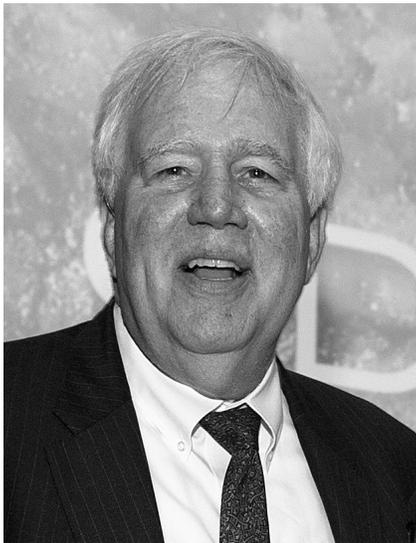
should I talk about that or be open about that with my lab? My feelings of failure. Or my impostor syndrome. How open should I be?

And I see two sides to that. On the one hand, I felt like being open with it normalizes it. So if everybody knows that I also experience impostor syndrome, I also get depressed, I also have days when my personal life prevents me from working, perhaps that destigmatizes it. On the other hand, I feel like a key role that I play for my students is in helping them to stay enthusiastic and to shore up their energy for the next assault. And certainly a key role my mentor played in my life was that every time I lost faith in science, she reminded me why I was doing it. And so about a year ago at a lab meeting, I asked, “What would you guys like me to do? Do you want me to tell you when I’m feeling depressed and distracted and can’t get the will to live and don’t remember why we’re doing these experiments? Or do you want me not to tell you?” And there was much discussion; it was a very intense lab meeting. And the end consensus was to talk about past feelings of impostor syndrome and depression, but not present ones. I thought that was really insightful. ■

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Communicating Science in an Age of Disbelief in Experts

On May 18, 2017, the American Academy, in partnership with the Carnegie Institution for Science, hosted a meeting at the Carnegie Institution in Washington, D.C., on “Communicating Science in an Age of Disbelief in Experts.” The program, which served as the Academy’s 2055th Stated Meeting, included presentations by Mary Sue Coleman (President, Association of American Universities), Alan I. Leshner (Chief Executive Officer, Emeritus, American Association for the Advancement of Science), Joe Palca (Science Correspondent, National Public Radio), and Matthew P. Scott (President, Carnegie Institution for Science). Richard A. Meserve (Senior Of Counsel, Covington & Burling LLP; President Emeritus, Carnegie Institution for Science) moderated the program, which included introductory remarks by Jonathan F. Fanton (President, American Academy of Arts and Sciences). The following is an edited transcript of the discussion.



Richard A. Meserve

Richard A. Meserve is Senior Of Counsel at Covington & Burling LLP and President Emeritus of the Carnegie Institution for Science. He was elected a Fellow of the American Academy in 1994 and serves on the Academy’s Council and Trust.

The subject of our discussion tonight is the challenge of communicating science in an age of disbelief in experts. Many of us in this audience recognize that there are public and personal issues in which scientific facts and scientific information should be at the core of sound decision-making. But we have some challenges in providing accu-

Although the public thinks highly of scientists, there are many issues in which there are very stark differences between the perspectives of the scientific community and those of the general public.

rate scientific information in a way that the public accepts and then applies when making choices. Fortunately, data on public attitudes collected by the Pew Research Center show that the American public holds scientists in very high regard. The only sector that is held in higher regard is the military. And as you might expect, politicians are at the very bottom of the list.

The paradoxical thing is that the Pew Research Center’s evaluations of public attitudes show that there is a gulf between what scientists understand about certain issues and what the general public thinks about them. We all know about the gap between scientists and many members of the public on climate change and the safety of vaccines. There are also very different attitudes about the safety of genetically modified organisms and genetically modified crops, the use of animals in research, and a whole variety of energy-related issues. Although the public thinks highly of scientists, there are many issues in which there are very stark differences between the perspectives of

the scientific community and those of the general public. The differences in many instances are correlated with age, gender, political party (as you might expect), ethnicity, educational attainment, or wealth.

One of the challenges we confront is that when people in the scientific community try to engage with the public, we sometimes observe a “boomerang effect”: the speaker may express an accurate consensus of the scientific view on something like climate change, and the perspective of the person who is listening, and who disagrees, becomes stronger as a result of that interaction. There is not a true dialogue, and therefore communication provides little possibility for convergence.

So we have some real challenges on how the scientific experts should engage with the public. We are going to explore that tonight.



Mary Sue Coleman

Mary Sue Coleman is President of the Association of American Universities. She served as President of the University of Michigan from 2002–2014 and as President of the University of Iowa from 1995–2002. She was elected a Fellow of the American Academy in 2001.

I am not sure that we really are in a new age of disbelief, since we have long had a challenge communicating science and its inherent uncertainty. We know that what we believe may be subject to change as we discover new things. But it is especially challenging with newly emerging insights about individual belief systems, and how these affect the acceptance of scientific evidence. In an influential paper that came out in 2012 in *Nature Climate Change*, Yale psychologist Dan Kahan and his colleagues found that beliefs about climate change risk were not positively associated with science literacy or with a measure of numeracy. Rather, beliefs about climate change were largely determined by the values of the community with which people identified. Perhaps these kinds of studies and others can give us clues about how best to communicate. Commu-

Communicating science has never been easy, but in today's world of the Internet and 24-hour news cycles, the issues are more distinct and the audience is more fractured.

nicating science has never been easy, but in today's world of the Internet and 24-hour news cycles, the issues are more distinct and the audience is more fractured.

So I prefer to believe that we live in a more pronounced age of disbelief. And my own experience about this is telling. While I was president of the University of Michigan, I found that people were willing to listen and learn about difficult emotional matters related to science. Midway through my presidency, in 2008, the state of Michigan was confronted with a ballot initiative to change the state's constitution to permit embryonic stem cell research. If enacted, this amendment would have reversed an existing ban that was based on a poorly worded section of the constitution written in the 1970s to outlaw fetal tissue research.

As a university, we believed that it was crucial for policy-makers, the news media, and the public to educate and inform themselves about embryonic stem cell research so that they could be full participants in this important public policy debate. As one of the top research universities in the country, U-M was obligated to play a central role in public education about the science underlying the research. We were fortunate to have the support of a deeply committed philanthropist, who gave millions of dollars to help us disseminate educational materials.

We explained in lay terms the science of embryonic stem cell research and the medical benefits that might accrue. We always discussed the ethical dimensions of embryo donations to emphasize that this must be an individual, informed decision. And

we made each discussion relatable to a human experience. We developed a comprehensive website that included a simple but informative tutorial on stem cell research. We held day-long workshops for journalists to explain the science, explore the ethical questions, and review the legal and political landscape. We explained how the research holds great promise in treating serious diseases such as diabetes, Parkinson's, certain cancers, and Alzheimer's disease. I am sure that there is hardly a person in our audience who has not been affected in some way by one of these diseases.

We also stressed the economic impact of life sciences research. Remember this was in 2008, and the state of Michigan at the time was ground zero for the recession, so the state had a lot to lose in this arena. We had invested significant resources to develop a thriving life sciences industry, but those efforts were at risk if the scientists in the state could not pursue the promising avenues of research. We were already losing our auto workers to other states and did not want to add highly educated scientists to the list. Again, people could really relate to this potential risk. They understood it. But we also acknowledged the opposition to embryonic stem cell research and that the decision confronting voters was deeply personal. So we did more than simply talk about the science.

I am pleased to say that Michigan voters approved the amendment and thus the ability of researchers to use embryonic stem cells in investigating fundamental developmental issues. I would never point specifically to the university's work, but I do be-

lieve that educating the public was important and ultimately influential.

The debate really brought home to me why we need to be concerned about science education for nonscientists. And there is some positive news about how higher education institutions can help promote science literacy. At the University of Michigan, researcher Jon D. Miller directs the International Center for the Advancement of Scientific Literacy at the Institute for Social Research. Civic science literacy is the ability of people to understand and use scientific or technological information in public policy discussions and decisions, which is really key to our democracy. Our civic scientific literacy stands now at about 28 percent in the country, and that is based on a straightforward eleven-question science facts test. And it has been at that level for about the past decade.

College-level science courses are critical to building civic scientific literacy, particularly among nonscience majors. The United States happens to be the only nation whose universities require students to take at least one science course as part of their general education curriculum.

Professor Miller finds it troubling that the number has been so stagnant, yet one bright spot is that college-level science courses are critical to building civic scientific literacy, particularly among nonscience majors. The United States happens to be the only nation whose universities require students to take at least one science course as part of their general education curriculum. Professor Miller's research shows that exposure to these courses builds civic scientific literacy. I think department chairs and deans should take seriously these science courses for non-

science majors. University scientists should realize a science course for nonmajors may be the last time they have a chance to talk to future senators or congresspeople about science before they are elected to office. And it may be the only chance scientists have to talk to the country's newest voters.

It is becoming increasingly important that we need to understand our audiences better: their beliefs, their backgrounds, and their traditions. As I indicated earlier, we are facing a lot of complexities when trying to reach people. Here the work of Skip Lupia, a political scientist at Michigan, is particularly insightful. He makes the point that much of the science information that is conveyed to policy-makers and the public is ignored or misinterpreted because of two challenges. First, people have less capacity to pay attention to scientific presentations than is generally understood. And second, people

images at all, the posts with original images had 160 percent more page views. NPR's response? Increase the budget for photography, videos, GIFs, and other animations. And this is from a radio network. At Harvard, the media relations team is using Facebook Live to provide behind-the-scenes tours of laboratories. The quality may be lacking, but the authenticity is not.

Perhaps we as educators need to adjust our attitude about communicating science. A 2016 survey of members of the American Association for the Advancement of Science asked scientists about their objectives in communicating with the public. Their number-one priority: defending science. That was followed by informing others and exciting them about science. The lowest priorities were building trust and tailoring messages to the audience. I found that sad and a little troubling. Maybe our thinking should be reversed. The highest priority should be exciting people about science, and then working to gain their trust. If we approached communications that way, and if we thought more about our audience, would defending science become less a priority? Maybe.

in politicized environments often make different choices about whom to believe than do people in other settings.

Skip posits that research about attention and source credibility can help scientists and science communicators adapt to these challenges. Some critical factors, for example, are being memorable in the presentation and believable as a presenter. We live in a visual era. NPR has learned this with its *Shots* health blog: visuals matter. When comparing the blog's posts that featured original art with those that had clipart or no



Alan I. Leshner

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I have subtitled my remarks “Communicating Science Effectively,” and I am going to talk about two things: one, what I have learned after forty-some years trying to communicate science with the public; and two, what we learned during a recent committee I had the pleasure to chair for the National Academy of Sciences on communicating science effectively. I, like Dr. Meserve and Dr. Coleman, am a little uneasy about the title of our program since it is not clear to me that we are in a special age of disbelief, although I will say that the level of tension between science and the rest of society feels to be at its highest, at least in my scientific lifetime.

Let me highlight some of the data that Dr. Meserve referred to. In terms of public confidence in institutional leaders, the scientific community is the second-most respected

Society’s need for science communication has never been greater. And effective science communication is both complex and a learned skill, especially when the science relates to controversial issues.

behind the military. The press and the Congress are at the bottom of the list. The other data point that Dick made reference to is that no matter what, the public remains largely positive about the contribution of science to the rest of society.

Now, it is true that we do have, at the moment, a large number of science-related issues that are controversial. Some are controversial within science itself; others are controversial within the broader society. And controversy, of course, can lead to or undermine the influence of science, which in turn can create tension and disbelief. Now, my view is that most controversy comes from conflicts with things that are either economically convenient, politically convenient – which are often also economically convenient – or are core human values and norms. My own sense is that the issue around climate change is really one of economics: “It is expensive to fix the climate, and I don’t want to spend that kind of money.”

Some current scientific issues that abut against core values include embryonic stem cell research; studying “personal” topics, such as sex; teaching evolution in science classrooms; the origins of the universe; synthetic biology; and neuroscience (meaning mind/body issues). The objection to embryonic stem cell research has nothing to do with whether people believe that, in fact, it will lead to better diagnostics or better cures. The objection to embryonic stem cell research has to do with when you believe life begins.

Now, the problem here is that we cannot actually “educate” our way out of this ten-

sion between science and society. The problem is not just a lack of understanding. People do, in many cases, understand what is going on, and they don’t like it. The conflict with their core values and beliefs trumps their view of the societal benefits. The following may be the most important thing I am going to say: only scientists are stuck with what science says. The rest of the public can disregard, deny, or distort the findings with relatively little immediate consequences. Yet if I violate a scientific fact, I will be struck by lightning and lose my scientific credibility.

Let me give you a very quick anecdote. I had a good friend, who was a physicist, and one night at dinner he said to me: “Climate change, not true.” I went into my speech on climate: “Ten thousand studies, converging evidence, 97 percent of the scientific community agrees.” And at the end he said, “You know what? I just don’t believe it.” And he did not get struck by lightning.

Anyway, what we learned is that we have to do more and a much better job of communicating science with the public. This led to the National Academies study that I chaired on *Communicating Science Effectively*. The purpose for the report, I think, is obvious. Society’s need for science communication has never been greater. And effective science communication is both complex and a learned skill, especially when the science relates to controversial issues. The charge to our committee was as follows: What is now known about effective science communication? What additional research might make science communication more effective?

We came up with several cross-cutting themes: One, align the communication strategy with the goals (that is, know what you are trying to accomplish) – share the findings and excitement of science; increase the appreciation for science; increase the knowledge of a specific issue; influence the opinions or behavior of the public; and consider the public perspectives and find common ground. Two, what we call the “deficit model” is wrong. Many people, particularly scientists, believe if we just communicated better, everything would be all right – people would make choices that are more consistent with the scientific evidence. And the truth is that is not going to happen. People rarely make decisions based only on science; they consider their own goals, knowledge, values, and beliefs. Three, it is difficult to communicate science because scientific information can be complex and uncertain;

As we have alluded to already, today’s media environment is competitive and complex, fragmented and fast paced. There are many voices competing for attention, and you have to figure out how to include accurate scientific information in those conversations. “Public engagement” with science is different from just communicating about science to the public, and what the data are showing is that engaging formally with the public works. But it is a different model; we are changing not only the style and content but also the intent of the conversation – changing from a monologue to a dialogue with the public, and Dr. Coleman made reference to that. Yet effective public engagement is not easy: many scientists are not prepared to talk about their work with the public, and listening to and respecting public concerns can sometimes be difficult for scientists.

People rarely make decisions based only on science; they consider their own goals, knowledge, values, and beliefs.

people process information in diverse ways; and social influences, such as social networks, communities, norms, and loyalties, are very powerful. Four, “mental models” turn out to matter. When interpreting new information, people tend to draw on their own beliefs about the world. They use their own analogies, metaphors, and prior experiences. They also are assessing the communicator’s values and motivations.

How the issue is “framed” is critical in communication. How you talk about a subject is vitally important. One takeaway word from my presentation is “glocal.” People care about things that matter to them personally or locally. Therefore, the issues have to be communicated in a way that is personally meaningful to the audience.

In-person engagement works best and there are a variety of ways of doing it. “Over the neighbor’s fence” is actually my favorite, but working in groups works well as do hands-on exhibits or demonstrations, lab visits, science camps, museums, science fairs, and science cafés. The data show that town meetings and big public lectures do not work, so don’t bother with them. We are learning more about what works (and doesn’t work) in science communication. It is an acquired skill, and one of the good things is there is a rising evidence base (the science itself) that can help us do it better.



Joe Palca

Joe Palca is a Science Correspondent for National Public Radio.

One thing I have heard this evening from both Mary Sue and Alan is that communicating science is difficult. But I have always found it easy, or not as hard as people make it out to be. Many people think that part of the problem may be educating the public. But there seems to be this implicit suggestion that the public will believe whatever it wants to believe, and so don't think that by educating them you are going to get them to change their belief structure. I personally do not think it is an education problem, but I agree with Mary Sue and Alan that we are not living in an age of disbelief in experts. I think that the people who tend to disbelieve in the experts have been validated by some leaders of our country recently, and maybe that is the problem.

But in the end, people make decisions for reasons other than their clarity, or lack thereof, of the scientific issues. To me, embryonic stem cells are one of the great examples of this. You could talk until you are blue in the face about educating the public

People need to become more familiar with what science is, and not hear about the science from the experts. And so I am very encouraged by these nontraditional communication methods of “over the neighbor’s fence,” or “science cafés” and “science bars.”

about embryonic stem cells, but if they believe that life begins at conception, then it is a nonstarter. No amount of education is going to change their belief system.

And that is one of the things that I find so discouraging. I hear people on both sides of the debate: “Oh, it’s just a collection of cells.” Well, excuse me, but so are the cells I shave off in the morning when I use my razor. They are *just* a collection of cells. It makes a difference whether they are capable of going on to form an entire human being or not. Now, of course, when you get to cloning and you can make an entire human being from the cells that you shave off of your face, that makes the whole thing much more complicated.

Let’s say we live in an age in which it is important to become better communicators. Well, what does it mean to be a good communicator? If you are getting paid to be a communicator, then that is one good way of telling. Another is if you are awarded prizes from other communicators, but in the end, what do they know? They live in the same bubble that I am in. We think we are doing a good job because we did just what we thought we should do. But it doesn’t get you very far.

So what should we do? Well, let’s say the National Academies report on *Communicating Science Effectively*, which Alan chaired, provides us with a series of very clear steps of how to become better communicators. I can tell you that we in the media

– even the science correspondents – will ignore it. We think we know better, and a bunch of scientists cannot tell us what to do. And that is the reality. I have worked in media for thirty years; I have a science background. I was shocked that when people made decisions about what to cover in the media, they didn’t rank the stories on their importance. It was haphazard and hard to decipher. It is particularly difficult when it comes to science stories, because nobody knows what is really important in science.

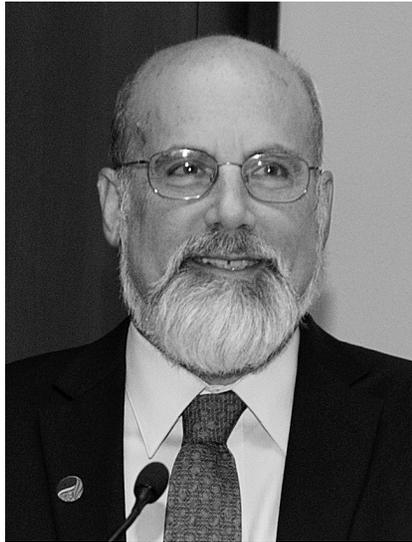
Another thing that always bothers me is that I do not have any way of knowing whether I am a good communicator. The people who study what I do never tell me if I am doing anything wrong. People have written articles about the way I frame stories, but I couldn’t tell you how I do it. So I would love to have these people come back and tell me what to do.

I fundamentally agree that people need to become more familiar with what science is, and not hear about the science from the experts. This is one of the things that is causing a lot of trouble: we tend to put all our hope into an expert explaining something. And so I am very encouraged by these nontraditional communication methods of “over the neighbor’s fence,” or “science cafés” and “science bars.” Now to that end, I have started something new: “Joe’s Big Idea,” which is a series that explores the mind and motivations of scientists and inventors.

I have also decided to reach out to young scientists, to ask them to help me with my Facebook page. I created this thing called “Friends of Joe’s Big Idea,” or “FOJBI.”

FOJBI are graduate students who are interested in becoming better science communicators. We now have four hundred FOJBIs all over the country, sharing ideas about best practices for engaging with people about science. And I think that is where the hope is because these people have parents, cousins, and friends, and they want to spread the word not to the believers – the individuals who go to the science museums or come to presentations at the Carnegie Institution – but to the people who just aren’t into science but might be if they were told science stories in an interesting way.

And so my little contribution to this world is these FOJBIs, and I think they are going to make a big difference, but we may never know because nobody measures that.



Matthew P. Scott

Matthew P. Scott is President of the Carnegie Institution for Science. He was elected a Fellow of the American Academy of Arts and Sciences in 1996.

When I see a person who routinely produces extraordinary art, I am always curious how he or she does it. People are curious about how someone makes a discovery, has an adventure, and so on. If you watch a video of Mark Morris working with Yo-Yo Ma to put a Cello Suite to a dance, or you watch a video of Andy Goldsworthy creating his sculptures, it is incredible to see the process. What are they thinking about? Where does their inspiration come from?

And so for scientists, when we think about engaging the public, that is the kind of thing we ought to do. We ought to bring them along with us. Unfortunately, we usually set up all sorts of obstacles in how we communicate by making things seem boring, esoteric, stagnant, and the like.

But we have examples of things that work. For example, make your presentations visually interesting. For instance, in a talk about transposons (jumping genes), you should

People are curious about how someone makes a discovery. . . . What are they thinking about? Where does their inspiration come from?

show things jumping. One of the interesting things in evolution is often illustrated by a diagram that portrays how genes might jump between organisms, what we call horizontal gene transfer or lateral gene transfer. Through this process, you could have an acceleration of evolution, in which genes that are invented, essentially, by one organism get transferred to another.

So how do we destroy our communication efforts? We start with titles that say nothing and that are dull. For example, “Studies of a” But if you play with the words and add visuals, you can start to get people’s attention.

One thing you don’t want to do is to show a lot of lines of text that are animated one by one on the screen. You should also avoid extraneous text and reading the slides that people could read for themselves. Do you want people to read the text or to listen to your presentation?

And you want to use the simplest diagrams to show your data, which you can explain very quickly.

Now your presentation can foster some debate, for instance, nature versus nurture, which is not a simple question and does not offer a simple answer. You could use a mystery to tell the story and use historical drama that grabs people’s attention. You can be upbeat in the face of grim history; you can point out that there are relatively simple solutions to some problems, like a vaccine for the flu, for example.

Discussion

Richard A. Meserve

Well, I want to start off by apologizing to the Academy for the title of this program. My fellow panelists have questioned whether we live in an unusual age of disbelief in experts. I should explain that we wanted a title that would grab people's attention. I came up with "Communicating Science in an Age of Disbelief in Experts." It sounded profound. And its purpose was to try to draw a big audience. Fortunately, it did.

Let me start off the discussion with the assertion that has been made by several of our speakers about the difficulty of communicating science when the scientific information conflicts with the recipient's belief system. When you have that conflict, the capacity for the scientific information to have much effect on a person's views is

At least in my experience and in the studies that I have looked at, if you really want to find common ground, you have to truly engage with the public and have a meaningful dialogue.

actually very slim. But I think we may be making a mistake by lumping a series of issues together. It may be true that issues like stem cell research and evolution can impact a belief system directly. Yet there are many issues where it is not so obvious that a belief system would be affected. The safety of vaccines or of GMOs may not threaten a belief system. Climate change perhaps is another in which the controversy does not so much arise from a conflict with a belief system, but rather is impacted by economic and political considerations. So we may be making a mistake by lumping together a variety of different challenges in

analyzing the gulf between scientists and the public.

Alan I. Leshner

So that is a part of the complexity that is called "know before whom you stand." If you want to find common ground, you need to start by listening, but listening is not an innate skill for scientists. Scientists are really good at talking. And at least in my experience and in the studies that I have looked at, if you really want to find this common ground, you have to truly engage with the public and have a meaningful dialogue.

Mary Sue Coleman

So I agree with that, but I disagree with Joe that if people have a belief system, they cannot change. One of the things that we found at Michigan with the embryonic stem cell

research, when we put it in the context that these were embryos that were going to be destroyed, was that people could have a choice – it was like donating an organ after death. The decision was totally up to the individual parents who had created the embryo. What we were particularly interested in doing, because nobody had done it yet, was creating cell lines from embryos that had defects because that would actually be helpful to the research. So these were never embryos that could be used to create life. We found there were ways to talk in very simple terms to people about what's going on. We understood that some people would

never agree; and that was fine. But we never stopped looking for a way to find common ground. And I think that is what we need to do, especially with issues that are emotionally highly charged.

Audience Question

I have been involved in teaching undergraduate nonscience majors for several decades. One thing that we don't really focus on has to do with the larger academic community. If we were to ask people in this room, "Have you ever read a work of Shakespeare?" and your answer is no, I think there would be some feeling that your education was lacking. But at the same time, if we asked, "What do you think about the second law of thermodynamics?" or "How do you feel about modern plate tectonics?" historians, philosophers, and people in the arts would say, "Oh, I don't really know much about science." To me, asking "What do you think about the second law of thermodynamics?" is analogous to asking "Have you read a work of Shakespeare?" Why do we think it is okay if you are not a scientist to be less informed about basic science knowledge?

Mary Sue Coleman

In this country, most universities have a science requirement for nonscience majors. So as a nation, we have tried to ensure that everyone has a general science education. But we may not be serving the nonscientist as well as we should be.

Alan I. Leshner

I have a slightly different take on this. I am not sure it really matters for the big public to understand that there is a second law of thermodynamics. I discovered many years ago that, in fact, nobody would fall off the Earth if they didn't understand that law.

Science education focuses too much on individual facts; it is much more important for the general public to have an understanding of the process.

And the truth is that all the studies that have been done about what has not worked in science education have shown not that the public doesn't understand individual facts, or even individual theories, but they don't understand the nature of science, they don't understand the nature of the enterprise, and in order to function in the modern world, that is what they need. So I would put the question somewhat differently: what is it that we want to educate people about? What do we want to communicate to them?

Richard A. Meserve

Let me just note that there was a recent editorial in *Science* magazine by Bruce Alberts that made the point that science education focuses too much on individual facts, and that it is much more important for the general public to have an understanding of the process. That is, we should teach what it means to try to get evidence and draw conclusions from evidence. We should explain how scientists revisit issues as time goes on based on new evidence and how that expands our understanding. Making science an accumulation of facts discourages people from really understanding what the scientific enterprise is about.

Audience Question

Why do you think that the public, while it respects scientists, still does not accept what they say?

Matthew P. Scott

I think part of it is that many people do not have an opportunity to try out the scientific process for themselves. Let me give you an analogy. When you build something as a kid, when you actually assemble something – whether you copy it from somewhere or invent it on your own – you realize you can change something, you can create something, and that experience gives you a sense of comfort, self-confidence, and fulfillment. I think there are not enough people having that experience with the scientific process. They are not asking a question without knowing what it says in the textbooks. Imagine saying, “I wonder how this works?” I am a geneticist and we break stuff. We break one gene at a time to see what may go wrong. We don't always understand how things work; we just find out that this gene is necessary for that purpose. And you could work on cars in the same way. You wouldn't be paid very much, but if you disconnect this wire, you can find out what stops working. Having those kinds of experiences, where you are tracing what is wrong with a car by a series of scientific deductions – it's not this because I tried that, and that didn't work – goes a very long way to making the whole process seem more sensible. ■

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To view or listen to the presentations, visit <https://www.amacad.org/disbelief-in-experts>.

Green Infrastructure through the Revival of Ancient Wisdom

Kongjian Yu

This essay argues that the gray infrastructures made of steel and concrete, which we built to connect our physical world, are shallow or even fake constructs that are destroying the real and deep connections between human beings and nature, and among various natural processes and flows. The alternative is green infrastructure, or ecological infrastructure, the construction of which can be inspired by the ancient wisdoms of peasantry. For the past twenty years, the author has tried to revive some of these peasantry wisdoms, and combine them with modern sciences and technologies to solve some of the most annoying problems in today's urban environment, particularly around water. The solutions are simple, inexpensive, and beautiful and have been applied on a massive and extensive scale in over two hundred cities in China and beyond.

Gray Infrastructure and Broken Connections

Some people may think that our world, through our built infrastructure, is more connected digitally and physically than ever before: we have Facebook and WeChat on the one hand, and ubiquitous highways and pipelines on the other. But actually the opposite is true. More than ever we are disconnected from the communities we belong to, and we have alienated ourselves from our neighbors and from those we love.

Physically, the landscapes that we inhabit are visibly interconnected: motorways connect urban and rural settlements; power lines that transport energy connect power stations to individual families; pipelines that drain waste water connect our toilets to sewage treatment plants; aqueducts that transport drinking water connect reservoirs to our kitchens; airlines that transport food connect the farm in the southern hemisphere to the refrigerators in the north; trucks that carry fertilizers and herbicides on the highways connect city factories in the east with the peasants who farm in the rice paddies in the mountainous west. We have created a connected world, but these connections are false: the landscape matrix and its invisible processes are fragmented and disconnected. The movement and cycles of water, nutrients, food, energy, species, and people are broken. The interconnected relationship between air, water, soil, nutrient, species, and people is being interrupted, and in a harmful way, more than ever before.

Let me offer an example concerning water. Over 75 percent of the surface water in China is polluted; 50 percent of China's more than 660 cities are facing floods and urban inundation; and over 60 percent of China's cities do not have enough water for drinking and for other uses. The groundwater table in the North China Plain drops over one meter each year; and over 50 percent of the wetland habitats have been

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lost in the past fifty years. All these water-cycle related issues that impact our cities and our landscapes are actually interconnected, but the conventional infrastructural solutions designed to solve these problems are fragmented, isolated, and single-minded: We build water treatment plants to remove the nutrients that could be used in fertilizers for farming; billions of dollars are spent yearly on the construction of concrete dikes, dams, and pipes to control floods and stormwaters, but these structures eventually produce fiercer droughts, declines in groundwater levels, and habitat loss; a thousand-mile-long aqueduct built to divert water from Southern to Northern China caused serious damage to the ecosystem in the lower and middle reaches of the Yangtze River; ornamental gardens and landscapes as well as agricultural fields are over-fertilized and all those nutrients flush into the water system, polluting the rivers and the lakes. And again, the conventional solution is single-minded – build expensive water treatment plants that need huge amounts of energy (mainly from coal burning) to operate, which in turn create more air pollution.

An alternative solution might be the construction of green infrastructure, or ecological infrastructure, which creates a deep and true connection between man and nature and among various natural processes and flows.

The Ancient Wisdom of Peasantry

The connections between peasants and their farmlands illustrate the timeless interdependence of human culture and nature. One alternative to rebuilding the deep connections between human beings and nature and among various natural processes comes from the wisdom of peasantry, of field-making, irrigating, fertilizing, growing, and harvesting, which have transformed landscapes on a large scale and sustained humanity for thousands of years.

One category of peasantry wisdom is the making of fields through a cut-and-fill action. The peasant's approach to cut and fill is one integrated action, meaning the earthworks created for farming happen on-site, with minimum costs for labor and minimum



Figures 1 and 2. The preexisting and the built landscapes: “Green Sponge” for a Water-Resilient City, Qunli Stormwater Park in Harbin City, Heilongjiang Province, China.



Figures 3 and 4. The preexisting and the built landscapes: Tianjin Qiaoyuan Park, China.

transportation of material to or from the site. It has, therefore, a minimum impact on the natural processes and patterns in the region. This tactic has been implemented by peasants in almost all parts of the world as a way to transform their otherwise unsuitable environments into productive and livable landscapes.

The second category of ancient peasantry wisdom lies in managing water and irrigating the fields. Modern methods of irrigation used in both farming and landscaping are represented by a system of pipes and pumps that is nearly invisible. It doesn't relate to surrounding terrain and available water resources. The peasant's approach to irrigation is deeply rooted in natural processes and patterns. Thousands of years of farming experience have made irrigation one of the most sophisticated techniques in agricultural societies. The use of gravity to irrigate the field requires precise knowledge, and the harmony between nature and subtle human in-

tervention can turn such a serious science into an art form, an interactive medium of community building, and even a spiritual force.

The third category of peasantry wisdom is fertilizing. It is a magical component of traditional farming and a critical link, closing the circle by reusing the materials of human living. All wastes from humans and domestic animals as well as vegetative materials are recycled into fertilizers. Such a nutrient cycle is broken in our urbanized and industrialized settings. What peasants call fertilizers are today defined as “pollutants” in our lakes and rivers.

The fourth category of peasantry wisdom is growing and harvesting. Unlike planting and pruning in gardening to create a pleasant ornamental form, the peasant's approach to planting is focused on productivity. Planting begins with the sowing of seeds, and the management process follows nature's rhythm as a strategy of adaptation to the surrounding climate and conditions. Again, the



Figures 5 and 6. A Resilient Landscape: Yanweizhou Park, Jinhua City, Zhejiang Province, China.



Figures 7 and 8. The preexisting and the built landscapes: Liupanshui Minghu Wetland Park, Guizhou Province, China.

self-sufficient nature of ancient agricultural economies requires each household to grow diverse crops, including grains, vegetables, fibers, medicines, fruits, timber, fuel, and even fertilizer proportionately to the seasonal needs of the family, and within the limits of nature and human capabilities. The meaning of harvest goes far beyond the production of foods and products. Harvests are productive in terms of their capacity to enrich the soil, purify the water, and make the land healthy. In other words, the peasant's fields are net producers instead of net consumers of energy and resources.

This is not to say that one should give up the comfort of urbanization and go back to a peasant's primitive life. These essential features of peasantry illuminate the underlying basis for rebuilding the connections between nature and human desires, balancing natural processes and cultural intervention, and help us to reclaim the harmonious relationships between human beings and nature.

Revival of the Ancient Wisdom to Create an Alternative Infrastructure

Imagine what our cities would look like if we did not drain the rainwater away through pipes and pumps, but instead used the ancient wisdom of peasantry in field-making to create a green sponge in the city that retains the rain water, creating diverse habitats and recharging the aquifer. In this way, the green spaces in the city become an ecological infrastructure that provides multiple ecosystem services that regulate the urban environment to be resilient to flood or drought, allowing clean water and food to be produced right in the middle of the city. Biodiversity would be enhanced dramatically; urban residents would have a green network for jogging, commuting, and relaxing; and real estate values would increase because of the beauty of, and access to, nature! That is what we have tried to



Figures 9 and 10. The preexisting and the built landscapes: Qian'an Sanlihe Greenway, a recovered mother river in Hebei Province, China.



Figures 11 and 12. The preexisting and the built landscapes: Shanghai Houtan Park, China.

do in many cities in the past twenty years: to transform the city into a sponge city (see figures 1–4).

Imagine what our cities would look like if we abandon the high and rigid concrete flood walls and instead revive the ancient wisdom of peasantry and create vegetated terraces at the river banks that adapt to the up and down of the water flow. Ecofriendly solutions like ponds and low weirs are designed to slow down the flow of water and let nature take time to nourish itself, so that diverse habitats can be created that enrich vegetation and wild life, allowing nutrients to be absorbed by the biological processes! That is what we have done to transform the mother rivers in many Chinese cities (see figures 5–10).

Imagine what our cities would look like if the nutrient-rich (eutrophic) river and lake water could be cleansed through the landscape as a living system, in the way that peasants have recycled organic waste, instead of using expensive sewage plants to remove the

nutrients. We could produce clean water and nourish the lush vegetation. Native biodiversity could be improved. We could turn recreational spaces into urban parks and, in this way, urban parks could become producers instead of consumers of energy and water. That is what we have done to transform the landscape into a living system that mediates polluted water (see figures 11 and 12).

Imagine what our cities would look like if the brown fields of industrial sites are recovered by the processes of nature, where the ancient wisdom of the pond-and-dyke system is adapted to create a terrain that collects rainwater (instead of draining it away through pipes) and initiates the evolution of a plant community, remediating the contaminated soil during this process. At the same time, the industrial structures are preserved as sites of cultural heritage in the city. A unique landscape is created, featuring dynamic native vegetation and a touchable memory of the past, which attract urban residents because of its beauty as well as the diverse wild life that



Figures 13 and 14. The preexisting and the built landscapes: Zhongshan Shipyard Park, Guangdong Province, China.



Figures 15 and 16. The preexisting and the built landscapes: Quzhou Luming Park, Zhejiang Province, China.

it maintains in the middle of the city. This is what we have done in several industrial cities (see figures 13 and 14).

Imagine what our cities would look like if we turn some of the urban land back into productive landscapes instead of into expensive lawns or ornamental gardens, so that the long-distance transportation of food can be reduced. Let the rice, sunflowers, beans, and vegetables be grown in the city, let the sun and moon tell the time for sowing and harvesting, let the seasonal change be noticed by the urban residents, let the process of food growing be known to the young, and let the beauty of crops be appreciated! This will not only make our city more productive and sustainable, but nourish a new aesthetic and a new ethics of land and food. This is what we have done in some Chinese cities (see figures 15 and 16).

By reviving the ancient wisdom of field making, irrigating, fertilizing, growing, and harvesting, and integrating this wisdom with the contemporary sciences and arts, we are able to build alterna-

tive infrastructures – nature-based green infrastructures replacing the conventional gray infrastructures – that are able to solve some of the problems in today’s urban environment, particularly around water, which are difficult or very expensive to solve through conventional means. Living with nature is inexpensive and easy, comfortable and beautiful, and an art of survival. ■

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Memory Processes and Aging

Fergus Craik

In this essay, I review some of my work that attempts to understand the changes in human memory that take place from young adulthood to old age. I am an experimental psychologist by training, so the research and ideas I will describe are at the level of experience and behavior rather than at the levels of brain function or molecular changes, although I will make occasional references to how changes in mental function may relate to underlying changes in the brain.

I take a “processing view” of memory and cognition. Basically, this means that I think of memory processes as *activities* of the mind and brain rather than as structural entities. When we experience an event for the first time, the various sights, sounds, smells, and other senses evoke complex patterns of activity in the brain. These sensory patterns are interpreted in terms of our previous experiences, and the resulting perceptual and conceptual activities are gradually “consolidated” over time to form structural records whose correlates are presumably molecular changes in neurons and their interconnections.

In my view, the learning or “encoding” aspects of memory are nothing more than those initial perceptual and conceptual processes; memory retrieval consists essentially of the attempt to reinstate the same pattern of perceptual/conceptual processing that took place during initial encoding. In this scheme, then, remembering is a form of perceiving rather than a separate “mental faculty.” Memories reflect the information we attend to, and the level of meaningful interpretation that we apply to our perceptions.

Successful retrieval of the original event depends on how well and how fully the original patterns of neural activity can be reinstated. In turn, successful reinstatement depends on such things as being in the same place and in the same frame of mind at the time of retrieval as when we first experienced the event. The same context at retrieval evokes part of the initial complex of neural activity, and we assume that the brain has an inherent tendency to carry out “pattern completion” processing on partial representations of well-encoded previous experiences, and so it reinstates the original pattern to some extent at least.

Memory loss is one of the most frequent complaints of people as they age, although there are wide individual differences in the amount of age-related loss, and also substantial differences depending on the type of memory used in a particular situation. The experiments carried out in my laboratory over the years have attempted to illustrate these differences and provide a coherent account of them in terms of the processing notions described earlier. With regard to differential age-related losses as a function of differ-

ent memory tasks, what we and others have shown is that age decrements are substantial in tasks involving episodic memory, working memory, source memory, and prospective memory. Episodic memory is the label for remembering events that occurred anytime from minutes to years ago; it is memory as we normally think of it, that is, memory of personal experiences. Working memory refers to information held in conscious awareness, especially if we carry out some operation – like mental arithmetic – on the material we are holding. Source memory is the ability to remember where and when some event occurred or the circumstances in which we learned some new information. It is obviously possible to remember a fact, but be unable to recollect where and when we learned the fact. Finally, prospective memory is remembering to carry out an intention at a future time, either when some event is encountered (e.g., conveying information to a friend when you meet her) or after some specified time (e.g., “I must phone my wife in thirty minutes”). These types of memory all show substantial losses and inefficiencies in older adults.

On the other hand, some memory tasks are performed almost as well by individuals in their seventies and eighties as by those in their twenties and thirties. Such tasks include recognition memory, procedural memory, and memory for facts and accrued knowledge – referred to by cognitive psychologists as “semantic memory.” Recognition memory involves re-providing items or events to the experimental participant; for example, “which of these forty words are the twenty words that I recently had you learn?” The task thus differs from a recall task in which the participant is simply asked to recall the twenty words without any hints or reminders. Procedural memory refers to remembering some mental or physical skilled procedure, such as skating, driving a car, playing a musical instrument, or playing chess. Success at these tasks does not require that you remember where and when you learned the skill, only that you are still able to perform the task successfully. Similarly, semantic memory – remembering a body of learned knowledge – does not require memory of the time and place of original learning but simply error-free access to the facts themselves.

One way that I have characterized differences between these two classes of memory tasks is in terms of the degree of “environmental support” that each task involves. The idea here is that aspects of the current context, or aspects of the task itself, can help to reinstate

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the appropriate pattern of mental and neural processes at the time of retrieval. So if a learned item is re-presented in a recognition test it helps to drive the system back into the same configuration that it held during the encoding process. Similarly, remembering details of an earlier event is aided by returning to “the scene of the crime.” On the other hand, it is clearly possible to remember events in contexts far removed from the original happening – we can reminisce about childhood episodes or recent vacations in our present-day living rooms. I have suggested that this aspect of remembering relies on “self-initiated activities” of the mind/brain, and that such self-initiated processing helps to bootstrap the system into the configuration that yields the experience of confident remembering. Thus, as many people have suggested, memory retrieval is a process of reconstruction. In my view, the processes of environmental support and self-initiated activities play complementary roles in achieving this reconstruction. It follows that as environmental support increases, there is less need for self-initiated processing; the two sources of support trade off against each other.

With regard to aging, my suggestion is that self-initiated processing becomes progressively more difficult to accomplish as a person grows older, and therefore older adults must rely progressively more on environmental support for successful remembering. Age-related difficulties with self-initiation are attributed to inefficiencies of frontal lobe functioning; it is well established that the frontal lobes are among the earliest brain regions to suffer the negative effects of aging. The suggestion, then, is that the memory tasks performed poorly by older adults, especially unaided recall of episodic memories, recollection of the source of factual information, and prospective remembering at a later time, are all tasks that are not well supported by the external environment and therefore require substantial amounts of self-initiated activity, which older adults find more difficult to carry out.

Other researchers have pointed out that this greater age-related dependence on environmental support comes at a cost – a loss of internal control. Whereas I have talked in terms of the environment playing a greater role in reinstating memories, other colleagues have shown that increased environmental support helps older adults establish and maintain the cognitive representations necessary for thought and action. While younger adults are able to rely on frontal brain processes to provide self-initiated or internal control, older adults lose this ability to some degree and must therefore rely more on the external environment to provide control of cognitive operations. In many ways, this age-related reversion of control to the environment reverses a general evolutionary trend for control of behavior to become progressively more internalized in higher organisms. That is, the behavior of simpler organisms is

often triggered or guided by external stimuli, whereas the behavior of more evolved species is increasingly controlled internally. In this sense, then, the processes of human aging force older adults a notch down the evolutionary ladder!

Various colleagues in my area of research have pointed to other age-related problems of cognitive processing. One such notion is that older adults are less able to inhibit unwanted material; this is seen in less efficient focusing of attention (“lack of concentration”), resulting in poorer memory encoding, and a greater vulnerability to interfering sources of information during memory retrieval. Others have illustrated the undeniable fact that mental processes slow with age, and have suggested ways in which this slowing may affect memory. Still others have shown that older adults have a particular problem with associative information – linking names to faces, for example. Unlike some other problems of aging, the decrement in associative information may be attributable to medial-temporal regions of the brain, especially the hippocampus. A final theory of age-related changes in memory is therefore likely to embrace a number of ideas at the level of cognitive psychology and also a number of structures and processes at the level of brain anatomy and physiology. This greater knowledge will enable us to understand memory pathologies more fully and may hopefully provide us with techniques and devices to compensate the cognitive losses that accompany aging. Speaking as an older adult myself, I hope this happens soon! ■

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The Time Inconsistency of Long Constitutions

George Tsebelis

The articles of the constitution that specify the requirements for amendment have been considered for centuries as “the most important part of the constitution.”¹ There are two reasons for the importance of amending clauses in a constitution. First, more stringent requirements will lead to a more rigid constitution. Second, a rigid constitution gives the constitutional courts more discretion to interpret the constitution (without fear that they will be overruled).

Figure 1 provides a graphical representation of these arguments. Let’s assume that constitutional amendment requires the agreement of three different actors (which I call “constitutional veto players,” such as the President, the House, and the Senate).² The figure represents the ideal points of the three constitutional veto players in a two-dimensional space. Each player prefers points closer to his ideal point over points farther away (giving each a “circular indifference curve,” which is not depicted in the figure). These preferences define the triangle 123, which constitutes the “constitutional core” of the country: that is, the set of constitutional provisions that cannot be amended given the rules of the game, but *also* the preferences of the constitutional veto players.³ Indeed, at least one of the constitutional veto players will object to a modification of the constitution from one point inside the triangle to another. For example, player 1 would block a movement from point L1 to L2. On the other hand, all three players would agree to a modification of a point outside the core to one within the core. For example, a movement of point J or K to J’ or K’, respectively, is constitutionally feasible and desirable.

Unlike constitutional veto players, constitutional courts (for example, the U.S. Supreme Court) can unilaterally move (through constitutional interpretation) from any point outside or inside the constitutional core to any point inside the core (such as a movement from point L1 to L2) without the possibility of interference from the constitutional veto players. Movements from outside to inside the core would have the unanimous support of the constitutional veto players, while movements within the core would be unstoppable (because the veto players cannot agree on an alternative movement to the one initiated by the court).

Constitutional change, therefore, can happen in two basic ways. First, it can occur with movements from points outside the consti-

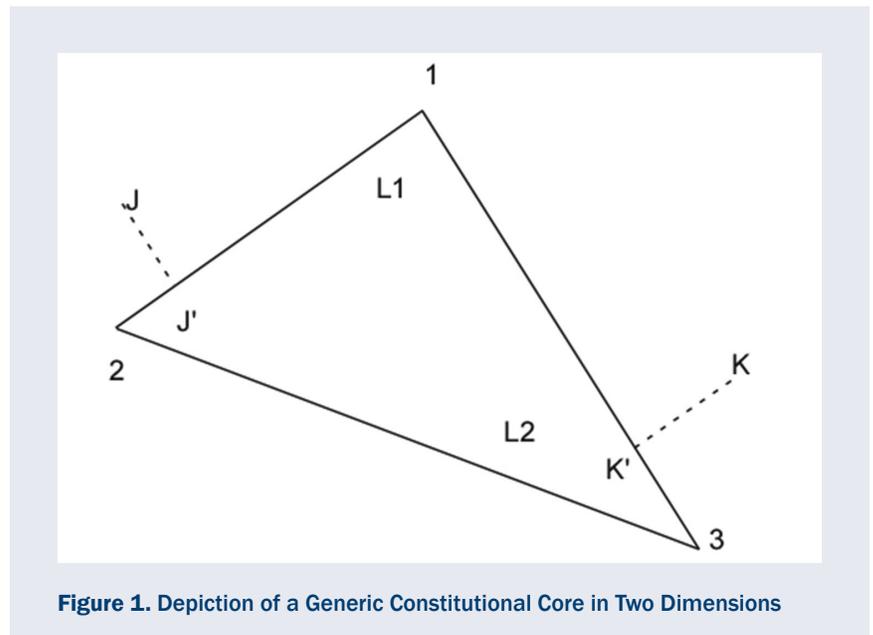


Figure 1. Depiction of a Generic Constitutional Core in Two Dimensions

tutional core to inside the core. Such movements can be performed either by the constitutional veto players or by the courts. Second, constitutional change can occur within the core; however, movements within the core can occur only through court decisions. Movements from inside the core to the outside are *not* possible, as such movements would never be initiated by the political system (as one of the required players would always disagree). Similarly, if attempted by the court, such changes would be aborted by the constitutional veto players.

This analysis indicates that, in democratic countries where the constitution is the basic rule of law, the size of the constitutional core affects whether constitutional modifications will be made through the constitutional court (as interpretations) or by the political system (as amendments). The larger the core, the more discretion is given to the courts, and the fewer possibilities for the political system to amend. For example, the exceptionally large constitutional core of the United States has allowed the Supreme Court to render decisions on major issues such as school segregation, abortion, and marriage equality.

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The size of the constitutional core is defined by the constitutional amendment rules and by the preferences of the constitutional veto players. More specifically, increasing the number of constitutional veto players (for instance, by adding a referendum to the amendment requirements), raising the required majorities of collective actors (from, for instance, one-half to three-fifths or two-thirds), requiring a second vote of the same legislature after an election, or widening the differences in the preferences of different actors (political polarization) will each result in an increase in the size of the constitutional core. Consequently, any such conditions render constitutional amendments more difficult to undertake and increase the discretion of constitutional courts.

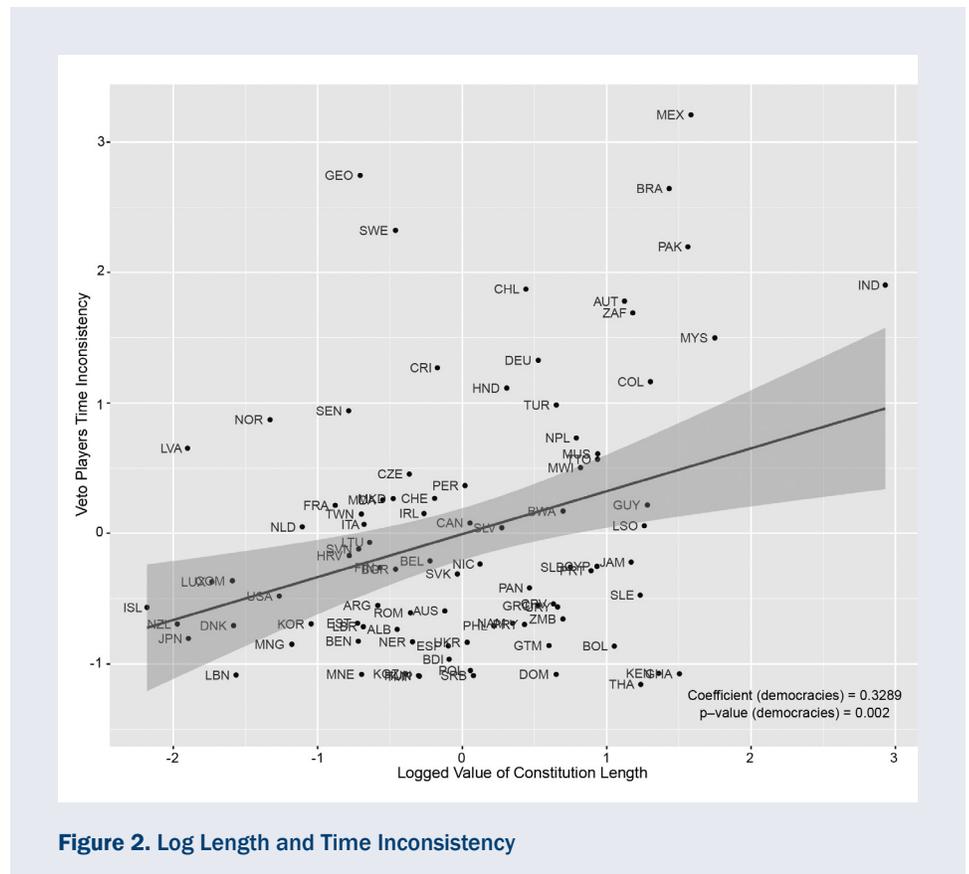
In the empirical literature, researchers have developed a variety of indicators of constitutional rigidity, which they define generally as the difficulty of constitutional amendment within a country. Most are based on constitutional rules alone, such as the requirement of qualified majorities, the requirement of multiple actors to approve an amendment, or a combination of the two.⁴ Others combine the rules and the actual frequency of amendments.⁵ These measures correspond poorly with one another, but they all share the common feature that they present a low level of correlation between the constitutional rules and the actual frequency of amendments. This puzzling lack of correspondence between theoretical arguments and empirical reality has been identified a number of times in the literature, leading some scholars to argue that institutions do not matter at all.⁶ Others abandon the use of rules altogether and refer only to the (in)frequency of amendments as their measure of rigidity or “entrenchment.”⁷

However, instead of abandoning the concept of rigidity, I argue it is more useful to focus on the discrepancy between theoretical expectations and empirical reality and to try to identify the conditions under which there is a high level of this discrepancy. Following the analysis of constitutional rigidity developed above, I proposed the concept of “time inconsistency”⁸ as a measure of the discrepancy between the intentions of the

framers of the constitution and the empirical reality of the constitutional life a country experiences – that is, the difference between the actual and the expected (on constitutional grounds) frequency of amendments. A high degree of time inconsistency characterizes rigid or “locked” constitutions that nevertheless change frequently.

Characteristic examples of countries with high levels of time inconsistency include Mexico and Brazil, which, despite the stringent constitutional amendment rules, pass many constitutional modifications almost every year (close to one hundred successful amendments in each one of these countries from 1990 until today). These constitutions are highly time-inconsistent, in that provisions have been locked inside these constitutions that are considered inappropriate by the current veto players (concurrent qualified majorities in both chambers, as well as a majority of states in Mexico).

Similarly, the Pinochet constitution currently in effect in Chile, besides being difficult to amend,⁹ creates a special class of legislation in Article 63 called “organic laws” that function almost iden-



tically to formal constitutional amendments. Such laws require a vote by four-sevenths in each chamber of the bicameral legislature and the approval of the President of the Republic. This particularly rigid kind of legislation is mandated in the constitution sixty-nine times.

When writing the constitution, the framers must make a series of decisions: whether to include an item, how detailed the rules related to the new item should be, and how locked (protected) the rules will be from future modifications. The first two decisions are connected with the length of the constitution, and the last with the amendment rules. Time inconsistency emerges by locking too many items, and/or providing too much detail. In Jeremy Waldron's terms, "any alternative conception that might be concocted by elected legislators next year or in ten years' time is so likely to be wrong-headed or ill motivated that his own formulation is to be elevated immediately beyond the reach of ordinary legislative revision."¹⁰

Using three different indicators of rigidity,¹¹ I calculate three different measures of time inconsistency (the difference between the actual frequency of the amendments and the institutionally predicted frequency). All these measures are positively and significantly correlated with the length of the constitutions. Figure 2 provides a graphical representation of the time inconsistency as a function of constitutional length using a new measure of constitutional rigidity¹² based on a veto-player's analysis of the amendment provisions of ninety-two democracies.¹³ This indicator of rigidity, besides covering a larger number of countries than all other institutions-only indicators, produces a small negative correlation with the frequency of amendments (as theoretically expected). Using this measure of rigidity, time inconsistency is calculated as the difference between the actual frequency of amendments and the expected frequency generated from this indicator of rigidity. In the graph, the variables are standardized, so that the slope does not depend on the units of analysis. The reader can verify that this coefficient is highly statistically significant ($p=.002$), indicating that long constitutions are time inconsistent.

For those interested in reducing time inconsistency, there are two different options: decreasing the number of items in a constitution or the amount of detail in each item will reduce the length of the constitution; and unlocking the constitution makes it more flexible. The empirical literature has followed these two directions.

One branch has focused on the frequency of amendments alone, and has noticed that this frequency has increased dramatically after 1950. Researchers have coined the terms "statutory constitutions"¹⁴ or "unentrenched constitutions."¹⁵ The underlying assumption is that political time has become denser and more amendments are required. If this assumption is true, the constitutional design

should take these findings into account and reduce the locking of constitutions.

The second direction is based on Waldron's analysis that the combination of long length and locking generates time inconsistency and indicates policy-making through the constitution. If lengthy and locked constitutions are frequently revised despite the difficulties specified in the locking mechanisms, it must mean that they are considered serious impediments in the countries that they regulate.¹⁶ In this case, constitutional length should be negatively correlated with undesirable aggregate indicators. Tsebelis and Nardi have found that, in OECD countries, longer constitutions are associated with lower GDP per capita and higher corruption.¹⁷ Tsebelis corroborates these findings with data from all (ninety-two) democracies.¹⁸ Brown goes one step further: with a time-series analysis on U.S. states for over a twenty-year period, and controlling for economic, demographic, and political variables, the author finds that there is a causal link (in the sense of Granger causality) between longer state constitutions and low GDP per capita.¹⁹

In conclusion, time inconsistency is associated with long constitutions. It may be generated out of unforeseeable conditions, in which case unlocking the constitutions would be a good remedy; but it may also have a systematic component, deriving from the excessive zeal of the framers to impose their preferences on future generations and perform policy-making through constitutional means. In this case, reducing the scope and the detail (i.e., the length) of constitutions would be the primary means to remedy time inconsistency. ■

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ENDNOTES

1. John W. Burgess, *Political Science and Constitutional Law*, 2 vols. (Boston and London: Ginn & Company, 1890), 137.
2. Here I present the most simplified version of the argument, in which I do not consider that two of these veto players are collective (House and Senate) and that the rules may require a qualified majority (three-fifths or two-thirds) for decision. These complications do not modify the essence of the argument and are addressed in George Tsebelis, *Veto Players: How Political Institutions Work* (Princeton: Princeton University Press, 2002) and George Tsebelis, "The Time Inconsistency of Long Constitutions: Evidence from the World," *European Journal of Political Research* (2017); available at <http://sites.lsa.umich.edu/tsebelis/wp-content/uploads/sites/246/2017/04/EJPR-file-for-website.pdf>.
3. This is a different definition than the one used by lawyers, who consider as "core" only the articles that *cannot be amended regardless of preferences* of the constitutional veto players. R. Albert, "The Unamendable Core of the United States Constitution," *Boston College Law School Faculty Papers*, 2015.

4. A. Lijphart, *Patterns of Democracy: Government Forms and Performance in Thirty-Six Democracies*, 2nd ed. (New Haven, Conn.: Yale University Press, 1999); D. S. Lutz, "Toward a Theory of Constitutional Amendment," *American Political Science Review* 88 (2) (1994): 355–370; D. Anckar and L. Karvonen, "Constitutional Amendment Methods in the Democracies of the World," paper delivered at the 13th Nordic Political Science Congress, Aalborg, Denmark, August 15–17, 2002; R. La Porta, F. Lopez-de-Silanes, C. Pop-Eleches, and A. Shleifer, "Judicial Checks and Balances," *Journal of Political Economy* 112 (2) (2004): 445–470; B. E. Rasch and R. D. Congleton, "Amendment Procedures and Constitutional Stability," in *Democratic Constitutional Design and Public Policy: Analysis and Evidence*, ed. Roger D. Congleton and Birgitta Swedenborg (Cambridge, Mass.: MIT Press, 2006), 319–342.
5. Z. Elkins, T. Ginsburg, and J. Melton, *The Endurance of National Constitutions* (Cambridge: Cambridge University Press, 2009); and G. Tsebelis and D. J. Nardi, "A Long Constitution is a (Positively) Bad Constitution: Evidence from OECD Countries," *British Journal of Political Science* 46 (2) (2016): 457–480.
6. See T. Ginsburg and J. Melton, "Does the Constitutional Amendment Rule Matter At All? Amendment Cultures and the Challenges of Measuring Amendment Difficulty," *International Journal of Constitutional Law* 13 (3) (2015): 686–713.
7. See M. Versteeg and E. Zackin, "Constitutions Unentrenched: Toward an Alternative Theory of Constitutional Design," *American Political Science Review* 110 (4) (2016): 657–674.
8. Tsebelis, "The Time Inconsistency of Long Constitutions: Evidence from the World."
9. Its principal mode of modification is the agreement of concurrent majorities of three-fifths of the House and Senate along with the President. For a more detailed discussion of the Chilean constitution and its "creative" amendment rules, see G. Tsebelis, "Can the Pinochet Constitution Be Unlocked?" 2017, available at http://sites.lsa.umich.edu/tsebelis/wp-content/uploads/sites/246/2017/04/chileconstitution_submission.docx.
10. J. Waldron, *Law and Disagreement* (Oxford: Oxford University Press, 1999), 222.
11. Tsebelis, "The Time Inconsistency of Long Constitutions: Evidence from the World."
12. Tsebelis, "Can the Pinochet Constitution Be Unlocked?"
13. Countries scoring above 6 in the Polity2 scores; updated scores available at <http://www.systemicpeace.org/inscrdata.html>.
14. Ginsburg and Melton, "Does the Constitutional Amendment Rule Matter at All?"
15. Versteeg and Zackin, "Constitutions Unentrenched: Toward an Alternative Theory of Constitutional Design."
16. This is not the only explanation in the literature. Ginsburg and Melton, in "Does the Constitutional Amendment Rule Matter at All?" have provided a cultural explanation, arguing that the frequency of amendments is not affected by amendment rules, but by "amendment culture." For a critical review of this approach see Tsebelis, "The Time Inconsistency of Long Constitutions: Evidence from the World."
17. Tsebelis and Nardi, "A Long Constitution is a (Positively) Bad Constitution: Evidence from OECD Countries."
18. Tsebelis, "The Time Inconsistency of Long Constitutions: Evidence from the World."
19. Adam R. Brown, "Hands Tied: How Lengthy Constitutions Hurt Government Performance," paper presented at the annual meeting of the Midwest Political Science Association, Chicago, Illinois, April 6–9, 2017.

Henri A. Termeer: A Tribute



Henri A. Termeer, elected to the American Academy of Arts and Sciences in 1999 and a member of the Academy's Trust, died unexpectedly on May 12, 2017, at his home in Marblehead, Massachusetts. Henri was a highly respected business leader and entrepreneur, greatly admired for his energetic engagement in biotechnology, community, service, and philanthropy.

Educated in the Netherlands, he immigrated to the United States and earned a master's degree in business administration at the University of Virginia. Joining Baxter International in international marketing, he became responsible for the blood product division, which likely set the stage for his decision to join Genzyme in 1983 as president. He became CEO of Genzyme in 1985 and redirected the newly established company to develop a treatment for the rare genetic disorder Gaucher's disease. Following the federal Orphan Drug Act of 1983, which for the first time made it attractive for American companies to develop treatments for diseases of such rarity, Genzyme – through Henri's leadership – essentially created the biotech orphan disease sector that has greatly improved the health of those afflicted by these devastating diseases.

Genzyme first isolated from human placentas the replacement enzyme for patients with Gaucher's disease, caused by a deficiency in the enzyme β -glucocerebrosidase, and the FDA approved the drug in 1991. Henri came to know personally many of these patients and could tell their remarkable stories, which helped him to communicate effectively to the stakeholders the importance of these types of medications. By 1994, Genzyme introduced a version of the enzyme produced through the genetic engineering of cells, which broadened the availability of the treatment and freed production from the possibility of introducing human pathogens. Soon treatments for the orphan diseases Pompe and Fabry were added to Genzyme's stable of therapeutics. Genzyme grew to over eight thousand employees, many located at its headquarters in Cambridge's Kendall Square neighborhood and at its facilities in Framingham, Massachusetts.

Henri's charm, humor, empathy, insight, and commitment to creating a better future drew people to him. He recruited a remarkable set of colleagues to Genzyme during his twenty-seven years as CEO – colleagues who in turn went on to become leaders of biotech companies and founders of innovative start-ups across New England and throughout the world. He was one of a few business leaders who created the biotech sector and the unique cluster of firms that have come to define Kendall Square. Henri's imprint on the landscape remains apparent in two architectural landmarks built by Genzyme in the Boston area: the Allston plant that dominates Storrow Drive along the banks of the Charles River adjacent to Harvard University; and the Genzyme Center in Kendall Square, an energy efficient, "green" building designed to take full advantage of fresh air and natural light.

Henri embraced life with gusto and shared his time generously with many CEOs and public leaders; after leaving Genzyme he con-

tinued to serve as the reigning dean of biotechnology in New England. The future was his focus, not the past. To highlight a few of his leadership activities, he led the national Biotechnology Innovation Organization in 1997 with great effectiveness and served as a member of the Federal Reserve Bank of Boston from 2007–2011, acting as Chairman from 2010–2011. Aware of the importance of educational and medical institutions, Henri supported many of these institutions generously. He served on the Board of Trustees of the Massachusetts General Hospital, the Massachusetts Institute of Technology Corporation, and the Fellows of Harvard Medical School, to name a few. After leaving Genzyme, he served as a board member, advisor, and investor in numerous early-phase technology companies.

Henri leaves his wife, Belinda, and daughter, Adriana, who were with him at the family home when he passed away. In addition, he leaves a son, Nick, and extended family in the Netherlands. At an MIT event celebrating Henri's life, his daughter, Adriana, spoke of her father in terms of Shel Silverstein's fable *The Giving Tree*. She said: "You give and give until you have nothing left and then you give some more." That was Henri's spirit – as true of his personal and professional life as it was of his family life. Adriana was involved with ballet and Belinda and Henri enthusiastically supported the Boston Ballet. As with many of the other organizations that he supported – for example, WGBH, the Museum of Science, and Project Hope – as soon as Henri appeared on the scene, he was asked to join the board. With Henri's unexpected death, we have lost a truly remarkable friend, entirely too early.

Phillip A. Sharp
Institute Professor, MIT

Select Prizes and Awards to Members

Daron Acemoglu (Massachusetts Institute of Technology) was named a 2017 Andrew Carnegie Fellow.

James P. Allison (University of Texas MD Anderson Cancer Center) has been named one of *TIME* magazine's 100 most influential people.

Kwame Anthony Appiah (New York University) has been named by Carnegie Corporation of New York as one of its 2017 "Great Immigrants."

Margaret Atwood (Toronto, Canada) was awarded the Franz Kafka Prize.

Carolyn R. Bertozzi (Stanford University) was inducted into the National Inventors Hall of Fame.

David Bromwich (Yale University) was named a 2017 Andrew Carnegie Fellow.

Henry N. Cobb (Pei Cobb Freed & Partners) was awarded a 2017 Harvard Medal.

Rita Colwell (University of Maryland) is the recipient of the 2017 Vannevar Bush Award.

Philippe de Montebello (New York University) received the Edmund Burke Award for Service to Culture and Society, given by *The New Criterion*.

Rita Dove (University of Virginia) is among the recipients of the inaugural Roosevelt "Rosey" Thompson Awards, given by the U.S. Presidential Scholars Foundation.

Stephen J. Elledge (Harvard Medical School) was awarded the 2017 Gruber Prize in Genetics.

Louise Erdrich (Minneapolis, Minnesota) is the recipient of a 2017 Women's National Book Association Award.

Sandra M. Faber (University of California, Santa Cruz) was awarded the 2017 Gruber Prize in Cosmology.

David Grossman (Jerusalem, Israel) was awarded the Man Booker International Prize for the novel *A Horse Walks Into a Bar*.

Naomi Halas (Rice University) is the recipient of the 2017 Weizmann Women and Science Award.

James Earl Jones (Pawling, New York) received a Special Tony Award for Lifetime Achievement in the Theatre.

Carl June (University of Pennsylvania Perelman School of Medicine) is the recipient of the 2017 David A. Karnofsky Memorial Award, given by the American Society of Clinical Oncology.

Matthew Karp (Princeton University; Visiting Scholar, 2012–2013) received the 2017 Stuart L. Bernath Book Prize from the Society for Historians of American Foreign Relations and the 2017 Book Award from the North Jersey Civil War Round Table for *This Vast Southern Empire: Slaveholders at the Helm of American Foreign Policy*.

János Kollár (Princeton University) was awarded the 2017 Shaw Prize in Mathematical Sciences. He shares the prize with Claire Voisin (Collège de France).

Naomi Lamoreaux (Yale University) received a Lifetime Achievement Award from the Business History Conference.

Charles Manski (Northwestern University) was named a Distinguished Fellow of the American Economic Association.

Bruce McEwen (The Rockefeller University) was awarded the Foundation IPSEN Endocrine Regulations Prize.

Russell A. Mittermeier (Conservation International) was awarded a Centennial Medal by Harvard University.

Diana C. Mutz (University of Pennsylvania) was named a 2017 Andrew Carnegie Fellow.

Peter Paret (Institute for Advanced Study) is the recipient of the 2017 Pritzker Military Museum & Library Literature Award for Lifetime Achievement in Military Writing.

Michele Parrinello (Università della Svizzera italiana; Eidgenössische Technische Hochschule Zürich) was awarded the 2017 Dreyfus Prize in the Chemical Sciences.

Alvin Plantinga (University of Notre Dame) was awarded the 2017 Templeton Prize.

Sean F. Reardon (Stanford University) was named a 2017 Andrew Carnegie Fellow.

Kenneth A. Ribet (University of California, Berkeley) was awarded the 2017 L.E.J. Brouwer Medal by the Royal Dutch Mathematical Society.

Dana L. Robert (Boston University) received the Lifetime Achievement Award of the American Society of Missiology.

Joshua Sanes (Harvard University) was awarded the 2017 Gruber Prize in Neuroscience.

Robert Schoelkopf (Yale University) was awarded the 2017 Connecticut Medal of Science.

Richard Schrock (Massachusetts Institute of Technology) is the recipient of the 2017–2018 James R. Killian Jr. Faculty Award, given by the Massachusetts Institute of Technology.

Helmut Schwarz (Technische Universität Berlin) was elected an Honorary Fellow of the Accademia delle Scienze dell'Istituto di Bologna.

Laurence Senelick (Tufts University) was inducted into the College of Fellows of the American Theatre.

Richard Sennett (London School of Economics and Political Science) was awarded a Centennial Medal by Harvard University.

Charles Stewart III (Massachusetts Institute of Technology) was named a 2017 Andrew Carnegie Fellow.

Colm Tóibín (Columbia University) is the recipient of the 2017 Richard C. Holbrooke Distinguished Achievement Award.

Neil deGrasse Tyson (American Museum of Natural History) received the Stephen Hawking Medal for Science Communication.

Ronald D. Vale (University of California, San Francisco) was awarded the 2017 Shaw Prize in Life Science and Medicine. He shares the award with Ian R. Gibbons (University of California, Berkeley).

Douglas Wallace (Children's Hospital of Philadelphia) received the 2017 Dr. Paul Janssen Award for Biomedical Research.

Malcolm H. Wiener (The Institute for Aegean Prehistory) was awarded the Athens Prize by the American School of Classical Studies at Athens.

James Wolfensohn (Wolfensohn & Company) received a 2017 Carnegie Medal of Philanthropy.

Judy Woodruff (PBS NewsHour) was awarded the 2017 Radcliffe Medal. She shares the award with the late **Gwen Ifill** (WETA).

New Appointments

Manjul Bhargava (Princeton University) has been appointed to the Board of Trustees of the Institute for Advanced Study.

Michael Botchan (University of California, Berkeley) has been appointed Dean of the Division of Biological Sciences in the College of Letters and Science at the University of California, Berkeley.

Alan M. Garber (Harvard University) has been elected as an independent member of the Board of Directors of Vertex Pharmaceuticals Inc.

Laurie Glimcher (Dana-Farber Cancer Institute) has been appointed to the Board of GlaxoSmithKline.

David J. Lipman (National Institutes of Health) was appointed Chief Science Officer of Impossible Foods.

John F. Manning (Harvard Law School) was named Dean of Harvard Law School.

Todd J. Martinez (Stanford University) has been appointed to the Scientific Advisory Board of Silicon Therapeutics.

Jerry Melillo (Marine Biological Laboratory) has been named Chairman of the Advisory Board of the Gulf Research Program.

Ernest Moniz (Massachusetts Institute of Technology; Nuclear Threat Initiative) has been elected to the Board of Directors of Tri Alpha Energy.

Jeffrey Moore (University of Illinois at Urbana-Champaign) was named Director of the Beckman Institute for Advanced Science and Technology.

David Scadden (Harvard University; Massachusetts General Hospital) has been appointed to the Board of Directors of Agios Pharmaceuticals, Inc.

Ralph Snyderman (Duke University) has been appointed to the Board of Directors of iRhythm Technologies, Inc.

Subra Suresh (Carnegie Mellon University) has been named President of Nanyang Technological University in Singapore.

John Fabian Witt (Yale University) was named Head of Davenport College.

Select Publications

Poetry

Susan Howe (State University of New York at Buffalo). *Debths*. New Directions, June 2017

Charles Simic (University of New Hampshire). *Scribbled in the Dark: Poems*. Ecco, June 2017

Fiction

Ann Beattie (University of Virginia). *The Accomplished Guest: Stories*. Scribner, June 2017

Roz Chast (*The New Yorker*). *Going Into Town: A Love Letter to New York*. Bloomsbury USA, October 2017

Orhan Pamuk (Istanbul, Turkey). *The Red-Haired Woman: A Novel*. Knopf, August 2017

Joanna Scott (University of Rochester). *Careers for Women: A Novel*. Little, Brown and Company, July 2017

Nonfiction

Kwame Anthony Appiah (New York University). *As If: Idealization and Ideals*. Harvard University Press, August 2017

Sarah Binder (George Washington University; Brookings Institution) and Mark Spindel (Potomac River Capital). *The Myth of Independence: How Congress Governs the Federal Reserve*. Princeton University Press, September 2017

Francis Ford Coppola (American Zoetrope; Francis Ford Coppola Presents, LLC). *Live Cinema and Its Techniques*. Liveright, September 2017

Robbert Dijkgraaf (Institute for Advanced Study). *The Usefulness of Useless Knowledge*. Princeton University Press, February 2017

Joel L. Fleishman (Duke University). *Putting Wealth to Work: Philanthropy for Today or Investing for Tomorrow?* PublicAffairs, September 2017

Stephen Greenblatt (Harvard University). *The Rise and Fall of Adam and Eve*. W.W. Norton & Company, September 2017

Linda Greenhouse (Yale Law School). *Just a Journalist: On the Press, Life, and the Spaces Between*. Harvard University Press, October 2017

Jonathan B. Losos (Harvard University). *Improbable Destinies: Fate, Chance, and the Future of Evolution*. Riverhead, August 2017

Daniel Mendelsohn (New York, New York). *An Odyssey: A Father, a Son, and an Epic*. Knopf, September 2017

Toni Morrison (Princeton University). *The Origin of Others*. Harvard University Press, September 2017

Richard A. Posner (U.S. Court of Appeals, Seventh Circuit). *The Federal Judiciary: Strengths and Weaknesses*. Harvard University Press, August 2017

Robert I. Rotberg (Harvard Kennedy School; World Peace Foundation). *The Corruption Cure: How Citizens and Leaders Can Combat Graft*. Princeton University Press, May 2017

Alice Waters (Chez Panisse Foundation; Chez Panisse). *Coming to My Senses: The Making of a Counterculture Cook*. Clarkson Potter, September 2017

We invite all Fellows and International Honorary Members to send notices about their recent and forthcoming publications, scientific findings, exhibitions and performances, films and documentaries, and honors and prizes to bulletin@amacad.org. ■

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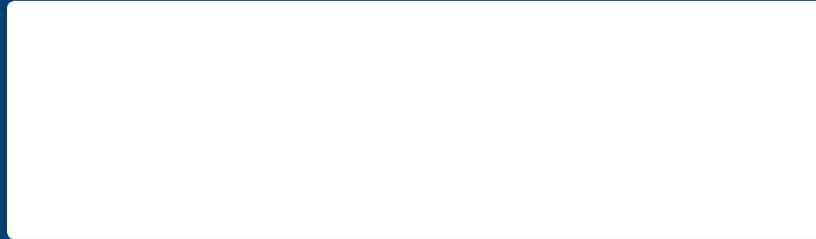
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