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Bulletin

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Academy Inducts 232nd Class of Members

Class speakers: *Penny Pritzker, Margaret J. McFall-Ngai, Steven H. Strogatz, Maureen E. Mahoney, and David Blight*

Challenges to American Institutions

Karl Eikenberry, Judy Woodruff, Martin Baron, Diane P. Wood, Norman J. Ornstein, Philip Bredesen, and Alex S. Jones

ALSO:

Upcoming Events

MARCH

18th

Cosmos Club, Washington, D.C.

Reception for Washington Area Academy Fellows

APRIL

18th

House of the Academy, Cambridge

The Third Wave of Immigration

Featuring:

Douglas Massey, Professor of Sociology, Princeton University

Jorge G. Castañeda, former Secretary of Foreign Affairs of Mexico; Global Distinguished Professor of Politics and Latin American Studies, New York University

MAY

8th

House of the Academy, Cambridge

On Energy

Introduction: **Richard A. Meserve**, President, Carnegie Institution for Science

Speaker: **Steven Chu**, Secretary of Energy, U.S. Department of Energy (outgoing)

MAY

9th

New York City

Reception for New York Area American Academy Fellows

For updates and additions to the calendar, visit http://www.amacad.org/event.aspx.

Reminder to Members

The Annual Fund

This year's Annual Fund will close on March 31. Chair of the Board Louis Cabot and Development and Public Relations Committee Chair Alan Dachs hope to surpass the record $1.6 million raised last year.

Your gift to the Annual Fund helps support Academy projects, publications and the website, outreach, meetings, and other activities for members in Cambridge and around the country. Every gift counts toward reaching our ambitious goal. If you have already made a gift to the Annual Fund, thank you. If not, we urge you to participate by March 31.

For assistance in making a gift to the Academy, please contact the Development Office: dev@amacad.org; 617-576-5057. ■

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Clockwise from top left: Steven H. Strogatz, Maureen E. Mahoney, Judy Woodruff, Patrick C. Walsh, Annette Gordon-Reed, Richard Freeman, Robert J. Birgeneau, and Karl Eikenberry

2012 Induction Ceremony Class Speakers

On October 6, 2012, the American Academy inducted its 232nd class of Fellows and Foreign Honorary Members at a ceremony held in Cambridge, Massachusetts. The ceremony featured historical readings by **Daniel Day-Lewis** (actor), new member **Bonnie Berger** (MIT), and **Tom Leighton** (MIT and Akamai Technologies). It also included presentations by five new members: **Steven H. Strogatz** (Cornell University), **Margaret J. McFall-Ngai** (University of Wisconsin-Madison), **Maureen E. Mahoney** (Latham & Watkins), **David Blight** (Yale University), and **Penny Pritzker** (PSP Capital Partners and Pritzker Realty Group); their remarks appear below. The ceremony concluded with a memorable performance by **Thomas Hampson** (baritone).

Steven H. Strogatz

Steven H. Strogatz is the Jacob Gould Schurman Professor of Applied Mathematics at Cornell University. He was elected a Fellow of the American Academy in 2012.

A Mathematical Love Story

When you think about mathematicians, physicists, chemists, astronomers, engineers, and computer scientists, what one adjective comes to mind?[1] How about *romantic*? Not the word you were thinking of? Come on, we're a very romantic bunch! And I want to tell you a love story from my own life to show you something of what I mean. I have a feeling that it will connect to the experience of many of you here today.

As a kid, I always loved math, but my family couldn't really understand that. "You like math and science, you should be a doctor," they would say. "You could do anything with medicine, and some parts of it are even mathematical, like radiology." ("And you have such nice hands," my mother would add.) Despite all kinds of compelling arguments, none of them really convinced me until I got in a car one day with my big brother Ian, the lawyer. It was my sophomore year of college, and we were driving home for Thanksgiving.

"What are you thinking of doing?" he asked. "It's getting to be time for you to have a clear idea of your future. How about being a doctor?"

"Well, I really like math."

"Now hold on a second, why don't you take all the pre-med courses next year, when you're a junior. It would be much easier to take biology and chemistry now rather than later, and it doesn't commit you to being a doctor. Besides, you might actually like the science."

I thought this was a good argument, and so in my junior year, I took freshman chemistry, freshman biology, and organic chemistry (which supposedly depended on freshman chemistry as a prerequisite) in addition to all the math courses I had to take as a math major. Those three science courses put me in the lab three days a week – something I was not good at. My organic chemistry teaching assistant hated me; I was always the last one to leave, and the TA

I want to thank the citizens of the United States for your trust in us. By supporting agencies like the National Science Foundation through your taxes, you give us the most precious gift we could ask for: the chance to do what we love and to follow our hearts – and imaginations – wherever they may lead. We will do our best to pay you back by contributing in our own small ways to the welfare of this country and the world.

[1] Some of the content of these remarks first appeared in Steven Strogatz, *The Calculus of Friendship: What a Teacher and a Student Learned about Life while Corresponding about Math* (Princeton, N.J.: Princeton University Press, 2009).

didn't hide her frustration: "What's wrong with you? This is just like cooking." But I had never cooked.

Needless to say, I found my junior year to be difficult. When I got home for spring vacation, my mother took one look at me and said, "There's something wrong with you. Your face doesn't look right."

"What do you mean?"

"Your face looks wrong," she continued. "You look unhappy. What's the matter?"

"I don't know. I don't think my face looks that bad."

"You seem like you're very unhappy."

"Well, I'm working very hard," I said, "and I have all these labs."

"I don't think that's it. What about next year when you're a senior, what courses are you going to take?"

I explained to her that because I switched to pre-med very late, I had to take vertebrate physiology, I had to catch up on biochemistry, I had a senior thesis to prepare, and I had to fit in the English courses that pre-med students are supposed to take.

"It looks like it's going to be a very busy year," I said. "And what really makes me sad, now that you mention it, is that I'll never be able to take quantum mechanics with my schedule being so full." My mother, who had not gone to college, asked, "What's quantum mechanics?"

"Quantum mechanics! I've been reading about this since I was little – Niels Bohr, Heisenberg, Schrödinger, Einstein! I now know enough math that I could actually understand what they did and wouldn't have to rely on verbal analogies or metaphors. But I'm never going to be able to learn those things because I'll be in medical school cutting cadavers."

We sat quietly for a bit until she turned and caught the look in my eyes. "What if you could say right now, 'God damn it, I love math and physics! I'm not going to be a doctor, I'm going to be the best math professor I can be.'" And just like that, I burst out crying thinking about this freedom that she gave me. It was as if a tremendous weight had been lifted. It was a moment of truth, and I never looked back. I'm very thankful that I had such a good mother, and that I was able to find my passion by denying it for a while.

So that's my love story – a story about my love of math and my mother's love for me. Now, thirty-three years later, here I am and here you are. I have a feeling that most, if not all, of you love your fields as much as I love mine. And on this wonderful occasion, I want to say thank you to all the parents, families, and friends who have let us do what we love.

I also want to thank the citizens of the United States for your trust in us. By supporting agencies like the National Science Foundation through your taxes, you give us the most precious gift we could ask for, which is the same gift my mother gave me: the chance to do what we love and to follow our hearts – and imaginations – wherever they may lead. We will do our best to pay you back by contributing in our own small ways to the welfare of this country and the world.

Margaret J. McFall-Ngai

Margaret J. McFall-Ngai is Professor of Medical Microbiology and Immunology at the University of Wisconsin-Madison. She was elected a Fellow of the American Academy in 2012.

A Revolution in Biology: The Microbial World Front and Center

Until relatively recently, most biologists considered microbes to be of two sorts: pathogens, compromising the health of animals and plants, or environmental organisms that break down materials in soil, seawater, and other habitats. In addition, the number of microbial species was thought to be comparatively small – fewer even than the number of species of snakes, for example. Because of these assumptions, microbes were generally not considered central to basic biology, and most biologists did not factor them into their thinking about their particular research focus.

In the 1980s, molecular biologists developed the capability to use gene sequences to study the diversity and structure of the biological world. As the story unfolded with the accumulation of large data sets of DNA sequences, biologists were in for a huge surprise. Beginning in the early 1990s, they started to realize that their notions of the form and function of the biosphere were flawed. At that time, most biologists divided life into five kingdoms: animals, fungi, plants, protists (single-celled nucleate organisms), and monerans (smaller single-celled organisms without nuclei, such as bacteria). The molecular data, however, were calling this conceptual framework into question, and as the twentieth century came to a close, a new organization of the biosphere was recognized. The data were demonstrating beyond a shadow of a doubt that the vast majority of Earth's biological diversity exists within the microbial world. Currently, the tree of life is divided into three main branches, or domains: the Bacteria, the Archaea, and the Eukarya, all of which are principally microbial; the animals, plants, and fungi are very closely related and occur as a cluster of small twigs on a single branch of the Eukarya.

Another key revelation came in the late 1990s. The biomedical community had begun to apply these DNA sequencing methods to identify the human microbiota: that is, the microbes that normally associate with our bodies. Biologists knew that we have microbes with us, but they did not have a way to study what they are or what they are doing until these sequencing approaches provided a new path to that knowledge. This endeavor, coming soon after the first human genome was sequenced, led in recent years to one of the National Institutes of Health's major road map initiatives, the Human Microbiome Project. The discoveries in this arena were striking and transformative. Not only did scientists find a vast diversity of microbes in association with the human body, the data obtained in these studies showed that the consortia of microbes live in site-specific, stable communities. For example, the bacterial communities that reside on the palm of the hand, the wrist, and the axle of the arm are different from one another, and each maintains essentially the same composition day after day, month after month.

In the last decade, biomedical research has also determined that the microbes that evolved with us, and live in and on our bodies, dramatically influence our metabolic profiles; that is, the molecules shed by these microbes are present in surprisingly high concentrations in body fluids, such as blood. What is remarkable about these findings is the recognition that each and every cell of the human body that is serviced by the circulatory system – in other words, the vast majority of the body – is, and throughout human evolution has been, influenced by the activities of our normal microbial partners.

The evidence of microbes' profound influence on our overall health is accumulating at a fierce pace. Strong data now demonstrate that maintaining our microbiota in balance is critical for everything from brain development and behavior, such as our sleep cycles, to maintenance of healthy weight and immune function. Taken together, the hundreds of studies done in the last ten years show that our health depends on the maintenance of dynamic yet stable partnerships with thousands of microbial species that live with us from shortly after birth until death. We also now know that pathogens are often members of the normal microbiota that "go to the dark side" when the body's homeostasis is out of balance. In other cases, these pathogens are closely related to members of the normal microbiota but are impostors, fooling the host into thinking that they are friend rather than foe.

In view of this daunting complexity, biologists are developing ways to approach the basic questions of how we establish partnerships with microbes, how we maintain them in balance, and how these healthy alliances respond to infection by microbial pathogens.

As biologists often do, they look for simple experimental systems that serve as models for understanding more complex systems. For example, research with fruit flies has provided tremendous insight into the basic principles of animal development. Studies of the molecular and cellular language between animal and microbial cells are highly amenable to such approaches because not only are they ancient, they are also highly conserved.

I've been privileged in my career to be involved with the development of such a model system for the study of animal-microbe interactions. The association that I study involves a marine animal that has the advantage of naturally associating with only one microbial species. The binary nature of the association provides simplicity and high resolution to our studies. Recently, we have found that the same molecules that these bacterial symbionts use to trigger normal tissue development in their host also trigger development in distantly related animals like humans. These results underscore the conservation of mechanisms underlying symbiotic partnerships across the animal kingdom.

Perhaps more remarkable, some pathogens have evolved to subvert this host-symbiont conversation by inappropriately presenting these same molecules to tissues they seek to invade; they appear to be normal symbionts but instead trigger events that promote tissue invasion. In fact many, if not most, microbial pathogens may similarly behave like impostors, using the same molecular language as the host's beneficial bacterial partners. However, the outcome is different because the language is used in a different way, much as how a friendly interchange and an argument may use the same words, but differently or with a different intensity.

The results of these studies designed to understand human-microbial partnerships promise to transform approaches to all aspects of biomedicine; however, the finding that the responses are evolutionarily conserved is important in the larger arena. As with humans, it is likely that *all* animals and plants rely for their health on coevolved partnerships of varying intimacy with members of the microbial world.

The results of studies designed to understand human-microbial partnerships promise to transform approaches to all aspects of biomedicine; however, the finding that the responses are evolutionarily conserved is important in the larger arena. As with humans, it is likely that all animals and plants rely for their health on coevolved partnerships of varying intimacy with members of the microbial world.

I have focused here principally on symbioses, but we are becoming aware that the critical roles of microbes are much more extensive. If we fail to incorporate a new understanding of the centrality of microbes, we do so at our own peril. The U.S. National Research Council recently published *A New Biology for the 21st Century*, which identifies four critical societal challenges: (i) promoting a sustainable environment; (ii) meeting growing energy needs; (iii) feeding an expanding population; and (iv) maintaining that population's health. At the foundation of each challenge is the microbial world, a fact that compels us to integrate microbiology more fully with other fields of biology, removing the intellectual silos that are reflected in the narrow focus of university departments, professional societies, and funding agencies. Consider this one concrete example: while introductory biology textbooks have extensive coverage of microbes as tools that have revealed the basic principles of molecular biology, the typical 1,000+-page introductory biology text has only a couple of dozen pages devoted to microbes as organisms. A good start to refocusing the field of biology would be to structure an undergraduate biology curriculum with the microbial world as the starting point for each and every topic. In short, no scholar should leave college with an undergraduate degree in biology without a firm understanding of microbiology.

This kind of revolution will not come easily. It calls for unprecedented levels of collaboration and openness among biologists, and people are resistant to change. However, because the idea of the centrality of microbes is a more accurate vision of the biological world than what we have had until now, I believe biology will undergo this dramatic revolution in the coming years. One of my most cherished mentors has a philosophy about controversial discoveries; he feels that their acceptance has three phases: 1) it's not true; 2) it's true, but it's not important; 3) it's important and I knew it all the time. Depending on the current position of a particular biologist within the field, an individual will find herself or himself somewhere along this spectrum. But I predict that as compelling data continue to accumulate, these revolutionary ideas will take their rightful place within the discipline of biology.

Maureen E. Mahoney

Maureen E. Mahoney is founder and member of the Supreme Court and Appellate Practice Group in the Washington, D.C., office of Latham & Watkins, LLP. She was elected a Fellow of the American Academy in 2012.

When Compromise is More Pernicious than Polarization: The Special Role of the Supreme Court

Let us be content with the blessings of Supreme Court justices who decide cases based on their study of the law whether we like the outcome or not. And when the Court issues divided opinions in cases where unity was paramount, let us ask why the dissenters did not put down their pens.

The founders of this Academy understood that a democracy cannot thrive without leaders practiced in the unifying art of compromise. John Adams warned that "the greatest political evil under our Constitution" would be the "division of the republic" into two political factions. In his farewell address, George Washington similarly instructed that it is the "duty of a wise people" to bridge our differences because polarization leads to the "ruin of public liberty."

Two centuries later, political leaders with the wisdom and courage to compromise are seldom seen. This probably explains why some commentators have been quick to herald a Fellow of this Academy, Chief Justice John Roberts, for joining with the Democratic appointees on the Supreme Court to uphold the constitutionality of core provisions of the Affordable Care Act. It has been said that the Chief Justice was "inspired by a simple noble leadership impulse at a critical juncture in our history" to resolve the case through a bipartisan compromise. He supposedly sacrificed his own view of the law in order to protect the Court from public criticism and charges of partisanship. But I do not share the view that Chief Justice Roberts voted to uphold a statute that he believed to be unconstitutional, and I would ask others to pause and reflect before they join this chorus. As a nation, we must take care to look for compromise in the right places.

Let me first explain why compromise on the issue of a statute's validity would undermine our constitutional structure. Supreme Court justices are not politicians. They are not supposed to resolve cases through horse-trading behind the Court's velvet curtain. As the Federalist Papers explain, federal jurists are given life tenure to insulate them from public criticism so that they will have the "fortitude" to decide cases based on their best reading of the law. It is important for all of us to remember that the Supreme Court's decision to strike down segregation laws in *Brown v. Board of Education* was met with public outrage, massive defiance, and violence. One hundred congressmen signed a proclamation denouncing the decision as a "clear abuse of judicial power." What if the justices had permitted their very real fear of public disrespect for the Court to dissuade them from striking down segregation laws? Just as in *Brown*, if a majority of the Court believed that the Affordable Care Act was unconstitutional, it was their duty to invalidate it. From the standpoint of a justice's obligations, there is no difference between an unconstitutional law that segregates schools and an unconstitutional law that requires Americans to purchase products they do not want. Both must be struck down.

This conception of the Court's constitutional duties does not leave it powerless to combat the perception of partisan decision-making. This is an important concern for the Court in every era. But there is no need to sabotage the Constitution to address that problem. The appearance of partisan alignment could be erased through the revival of a historic practice: justices in the minority could hold their tongues when unity is important for the country. Chief Justice Marshall, another Fellow of this Academy, explained that it was his custom to acquiesce silently in the Court's opinions when he failed to persuade four other members of the Court to adopt his view. Other justices often followed suit to promote respect for the Court's opinions. This practice also explains how the Court secured the final vote needed for unanimity in *Brown*. Silent acquiescence

is a legitimate form of compromise because justices have no constitutional duty to dissent. But they do have a duty not to cast the deciding vote to uphold a law that they believe is unconstitutional.

Against this backdrop, we should be reticent to embrace the view that Chief Justice Roberts bargained to uphold the health care act in order to protect the Court from public criticism. And the available facts suggest that he did no such thing. We can first look to his own explanation of the proper role of a jurist. As he testified during his Senate confirmation proceedings, "about the worst thing you can say about a judge" is that he did not "apply the law to [determine] what the result should be." He pointed to the decision in *Dred Scott* as a historical example of the disastrous consequences that can ensue when the Supreme Court is not constrained by legal principles and instead attempts to resolve a public controversy in the "way that it [thinks is] best for the nation."

Nor is there sufficient cause to doubt the Chief's adherence to his beliefs in the health care case. Careful review of his opinion reveals that his disagreement with the dissenters was quite narrow. It centered on competing interpretations of Supreme Court precedents relating to the weight that should be given to the labels Congress attaches to taxes and penalties. Whether his legal analysis was right or wrong, it was sufficiently well reasoned to support the conclusion that he genuinely disagreed with the dissenters on a close legal question. That conclusion is not undermined by the fact – reported in the press – that he may have initially voted to invalidate the statute. The Chief Justice's opinion relies on several precedents that were not cited in the government's briefs on the taxing power, which suggests that he changed his view as he became more immersed in the law. Some choose to ignore this straightforward explanation because Roberts has expressed an intention to emulate the leadership style of Chief Justice Marshall. But if Chief Justice Roberts was emulating Marshall, he would not have bargained to uphold a statute that he believed to be unconstitutional. Roberts has told us that, in his view, Chief Justice Marshall was "not a deal maker, not a broker" – just an extraordinary leader who could forge consensus through persuasion.

It is imperative for our nation to end the polarizing partisanship that threatens our future, and we are right to demand and reward leaders with the courage to compromise. But the resolution of judicial proceedings through deals forged by politicians in black robes would lead – in the words of our first president – to the ruin of public liberty. Let us be content with the blessings of Supreme Court justices who decide cases based on their study of the law whether we like the outcome or not. And when the Court issues divided opinions in cases where unity was paramount, let us ask why the dissenters did not put down their pens.

David W. Blight

David W. Blight is the Class of '54 Professor of American History at Yale University. He was elected a Fellow of the American Academy in 2012.

The Pleasure and Pain of History

We can garner enormous pleasure and joy from doing history; but in learning it, if we really face it, we also can encounter enormous pain, even terror from history. As in personal memory, so also in the collective memory that historians assemble, resist, narrate, and interpret, the past is that thing we cannot live without, but also sometimes the thing we cannot live with.

The opening sentence of the oldest book of history in Western civilization has always inspired me. I read it aloud at the beginning of every class I teach, whether the undergraduate lecture course or the graduate research seminar. In Herodotus's *The History*, he declares: "I, Herodotus of Halicarnassus, am here setting forth my history, that time may not draw the color from what man has brought into being, nor those great and wonderful deeds, manifested by both Greeks and Barbarians, fail of their report, and, together with all this, the reason why they fought one another." Many have tried endlessly to improve on this, but here, Herodotus captures the dual nature and purpose of learning, knowing, and writing history: on the one hand, the color, the deeds, the narrative, the drama of the *story*; and on the other, the reasons why people did what they did, thought what they thought, created what they created, destroyed what they destroyed – in other words, the explanation or *interpretation*. However my students react to my eccentric reading of this quote, it always moves me to feel just how old, how valued, how indispensable and alive my craft really is not only to the humanities, but to our entire world of knowledge.

We can garner enormous pleasure and joy from doing history; but in learning it, if we really face it, we also can encounter enormous pain, even terror from history. As in personal memory, so also in the collective memory that historians assemble, resist, narrate, and interpret, the past is that thing we cannot live without, but also sometimes the thing we cannot live with. "History," Robert Penn Warren once warned in a single line of poetry, "is the thing you cannot resign from." Like Warren, one of my other favorite writers, James Baldwin, never stopped probing the nature of the past, the irresistible if at times debilitating hold that history and memory can have on any thoughtful person's consciousness. "History," said Baldwin in a 1965 essay,

> is not merely something to be read. And it does not refer merely, or even principally, to the past. On the contrary, the great force of history comes from the fact that we carry it within us, are unconsciously controlled by it in many ways, and history is literally *present* in all that we do. It could scarcely be otherwise, since it is to history that we owe our frames of reference, our identities, and our aspirations.

For Baldwin, the nonfiction voice – the Jeremiah – of the civil rights movement, if Americans ever really began to learn and face their past with slavery and racism, they would be entering into "a dialogue with that terrifying deity . . . called history." Most Americans do not wish to see their history as a terrifying deity, a source of painful, unfinished lessons and challenges; collectively, we prefer a progressive, triumphal history, the grand narrative of a problem-solving people, a nation, as someone once put it, born perfect, and which then launched its career of improvement.

In this country we will likely forever struggle as on this teeter-totter between such opposite views of history – the one bracing, restorative, redemptive, inspiring, and the other authentically tragic, chastening, and yet also potentially redemptive and inspiring. One view demands bright horizons from the vantage of a World War II victory parade, John Trumbull's painting *The Declaration of Independence*, Emanuel Leutze's mural *Westward the Course of Empire Takes Its Way*, or Lincoln's signing of the Emancipa-

tion Proclamation. The other view suggests we look from the vantage of perhaps the hold of a slave ship, the Union and Confederate dead heaped in piles at Antietam or Gettysburg, the eyes in the photo of a child worker in an American factory, or a woman who cannot feed the children gripping her apron in the depths of the Great Depression. Tragedy and triumph, pain and pleasure – we have infinite supplies of both views in our history if we look for them.

If we seek the unpleasant, or even the horrible or embarrassing in the past, it does not necessarily deprive us of history's pleasures of discovery, of illumination, of simply practicing the craft. After the historian Nathan Huggins (one of my mentors) died in 1989, I wrote a retrospective essay on the whole of his life's writings, which were largely in the field of African American history. Just for curiosity, I looked at his entry in *Who's Who*, where I found this wonderful statement about why he was a historian. "I find in the study of history," wrote Huggins, "the special discipline which forces me to consider peoples and ages, not my own. . . . It is the most humane of disciplines, and in ways the most humbling. For one cannot ignore those historians of the future who will look back on us in the same way." *Humane* and *humbled*: I have always believed both are good and proper elements of a true scholar's temperament.

One of the best, and certainly most heroic, books ever written on the historian's craft (by that very title, *The Historian's Craft*) was that of Marc Bloch. The great French historian of feudalism and other broad subjects, Bloch, a veteran of World War I, fled from his professorship at the Sorbonne into hiding in Strasbourg after the fall of France to the Nazis in 1940. He began writing his masterful meditation on the historian's art in 1941 as he also joined the French resistance. Chased further into hiding, he finished perhaps only about two-thirds of the book he had planned, until the Nazis captured, imprisoned and tortured him, and finally shot him in an open field with twenty-six other French patriots in June 1944. But in that text he left, Bloch could write under these circumstances with such a sense of humor. "A good cataclysm," he said, "suits our business." Moreover, he wrote so movingly about the "pleasure" of what all of us do. "To anyone who is not a blockhead," he declared, "all the sciences are interesting; yet each scholar finds but one that absorbs him. Finding it, in order further to devote himself to it, he terms it his 'vocation,' his 'calling.'"

To Bloch, history "has its peculiar aesthetic pleasures. The spectacle of human activity which forms its particular object is, more than any other, designed to seduce the imagination – above all when, thanks to its remoteness in time or space, it is adorned with the subtle enchantment of the unfamiliar." Ah, Bloch seemed to be saying, the wonderful pastness of the past, as it also becomes available and familiar to our imagination. Then, beautifully, while writing under what seem unbearable pressures, he urged historians never to forget that they are *writers*. "Let us guard against stripping our science of its share of poetry," he warned. "Let us also beware of the inclination, which I have detected in some, to be ashamed of this poetic quality. It would be sheer folly to suppose that history, because it appeals strongly to the emotions, is less capable of satisfying the intellect." Bloch deeply understood the pain and pleasure of knowing and doing history, as well as the marvelous joy of transforming research into writing.

Let me end by using another of my heroes to make this point. Walt Whitman wrote a short poem entitled "To a Historian." I read it as Whitman's challenge but also invitation to historians to dare to join him in his enterprise.

You who celebrate bygones,
Who have explored the outward, the surfaces of the races, the life that has exhibited itself,
Who have treated of man as the creature of politics, aggregates, rulers and priests,
I, habitan of the Alleghanies, treating of him as he is in himself in his own rights,
Pressing the pulse of the life that has seldom exhibited itself, (the great pride of man in himself,)
Chanter of Personality, outlining what is yet to be,
I project the history of the future.

Historians should answer Whitman and say, really? You think as poet you are the only one who can get to where you get in the human predicament? Just watch us try, Walt!

Neither poets nor historians can ever stand alone in exploring, using, and explaining the past. Since all memory, however painful or pleasurable, is in some way prelude, we have to chant together.

Penny Pritzker

Penny Pritzker is Founder, Chairman, and Chief Executive Officer of PSP Capital Partners and its affiliate, Pritzker Realty Group. She was elected a Fellow of the American Academy in 2012.

Critical Investments for America's Future: Education and Skills

To me, our responsibility as Americans is summed up in a story – a story that is uniquely American, but by no means unique.

Like most families, mine came here from somewhere else. When my 10-year-old great-grandfather arrived in Chicago from czarist Russia in 1881, this Academy was already 101 years old. True to its founding mission, the Academy had presided over a century of great American scholarship and advancement. The progress of knowledge in the United States was well under way.

But my great-grandfather was an immigrant. He spoke no English and had no money. He taught himself English by reading the newspaper and studying dictionaries. To make ends meet, he sold newspapers, worked as a tailor's assistant, and even became a licensed pharmacist. He attended law school at night, received his J.D. at age thirty, and opened a law practice. That practice grew into a family firm that eventually diversified into corporate and real estate investing, the business in which I have been actively involved for the past two decades.

This process goes by many names: social mobility, economic opportunity, and, most frequently, the American dream. We must now recognize – and remedy – the fact that the American dream may not hold the same promise for young Americans today.

Our educational system is failing the very kids who need it most. I have spent the last decade immersed in education issues: looking for ways to improve student performance, creating new training programs for principals to run our most challenging schools, and promoting skills training after high school. In May of last year, Mayor Emanuel appointed me to Chicago's Board of Education. Between my work on the school board and my many years in business, I have seen the education crisis now from several angles.

Even in this tough economy, with so many people looking for work, three million jobs stand open because employers cannot find workers with the skills they need to do the job. The demands of a global economy require that our schools do better, and that we, as leaders, insist on equal access to a quality education for all of America's children.

In Chicago, the nation's third largest public school system, four out of every ten students fail to graduate from high school. Those young people have a difficult road ahead. Nationally, the unemployment rate for those without a high school diploma is 12 percent, versus 8.8 percent for those who have one. For college graduates, the unemployment rate is about 4 percent.

We have to do more than keep our kids in school – though that is necessary. We must also ensure that our schools are teaching the skills necessary to succeed in the twenty-first-century economy: English and reading as well as science, math, engineering, and technology.

I'll share with you, by way of example, some of the progress we have made in Chicago. We have agreed with our teachers to extend the school day so that elementary school children have an hour and fifteen minutes more of learning each day. And we have lengthened the school year by ten days. We have linked teacher evaluation in part to student achievement. We are giving parents more and better schools to choose from by adding five science, technology, engineering, and math high schools, and increasing the number of International Baccalaureate schools. These are first steps toward improving the quality of educational opportunity that we offer our young people in Chicago.

Beyond high school – and beyond Chicago – we need to recognize a changing reality: nearly half of America's undergraduates, thirteen million students, attend community colleges. Skills for America's Future, an organization whose advisory board I chair, brings together community colleges with businesses, local governments, and other training organizations to provide unemployed workers and students with the skills that today's businesses need. This effort to bridge the skills gap is helping individuals make the most of themselves – and strengthening our economy in the process.

There are as many different paths to the American dream as there are people in this room. But one thing every journey has in common is educational opportunity. My grandfather, my father, and especially my mother used to tell me over and over again: "There are two things no one can take away from you: your education and your reputation."

They may not have known it, but they were echoing one of the Academy's earliest members, Benjamin Franklin. He said, "If a

Even in this tough economy, with so many people looking for work, three million jobs stand open because employers cannot find workers with the skills they need to do the job. The demands of a global economy require that our schools do better, and that we, as leaders, insist on equal access to a quality education for all of America's children.

man empties his purse into his own head, no man can take it away from him." Education is the great portable wealth that this Academy has nourished since 1780.

As I said at the beginning, my family's story is not unique. I refuse to accept a future in which stories like ours are a thing of the past.

Thank you for the opportunity, and the honor, of joining this august academy. I leave you with the hope that twenty, fifty, or a hundred years from now, we will say that our efforts gave the children of this century the opportunity to do the same. ■

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Challenges to American Institutions

Institutions of Democracy and the Public Good

Norman J. Ornstein

Norman J. Ornstein is Resident Scholar at the American Enterprise Institute for Public Policy Research. He was elected a Fellow of the American Academy in 2004 and is Chair of the Academy's Stewarding America project.

Our panel this morning has two parts. On the one side, we have Judge Diane Wood, Governor Phil Bredesen, and Ambassador Karl Eikenberry, each of whom will comment on challenges facing American institutions, including the judiciary, our political process and government in general, and American diplomacy and the military. On the other side, Judy Woodruff, Alex Jones, and Marty Baron – each a distinguished member of the press – will discuss challenges for American journalism, whether in print, on-air, or online.

We have decided to bring all the panelists together as one group because many of the challenges faced by one side either overlap or interact with challenges on the other. After we hear from the first group of panelists, we will invite observations from those who are part of our mass media. We will then turn to a direct discussion of media and journalism, after which those from the first group, who themselves are affected by the coverage and the nature of the media, will be given a chance to comment.

We have a remarkable group of panelists. Diane Wood, who is a federal judge on the Seventh Circuit Court of Appeals, also has a long and distinguished career as a law professor, which she continues in addition to her judgeship. Phil Bredesen, a problem-solving, popular, and successful former governor of Tennessee, was before that a problem-solving, popular mayor of Nashville. Karl Eikenberry, now at Stanford University, was U.S. Ambassador to Afghanistan during one of the most challenging times for the nation and the world. He also served for thirty-five years in the U.S. Army, rising to the rank of Lieutenant General. Alex Jones, who heads the Shorenstein Center on the Press, Politics and Public Policy at Harvard University, has had a long career in journalism and has authored several marvelous books based on his work at *The New York Times* and other places. Judy Woodruff is known to many of us for her work as a television news anchor, currently at *PBS NewsHour*. I met Judy in 1976, when she came from Atlanta to cover what was then an obscure campaign by a governor named Jimmy Carter. She moved on to a career in journalism that is one of the most respected in our time, especially in the area of broadcast journalism. And Marty Baron, editor of *The Boston Globe*, has had a distinguished career with a variety of newspapers, including *The Miami Herald*, where he also served as editor; *The New York Times*; and *Los Angeles Times*.

The United States always faces challenges, but they are particularly acute now. They are not just fiscal challenges, but social challenges as well. They are about whether we can create a vibrant workforce for the future, given an economy that is not recovering very easily from deep downturns caused by recent financial crises. They are about immigration and about whether we can integrate into the population a substantial group of people, many of whom have been in the United States for decades but have been here illegally. They are about how to deal with an aging society, in which people are not just getting older but living longer.

In the forty-three years that I have been immersed in Washington politics, from one end of Pennsylvania Avenue to the other, I have never seen things as dysfunctional as they are now. The kind of political system that the framers created was not designed to be smooth and easy; it was meant to be contentious and difficult. But today the level of polarization, partisan and ideological, is of a very different character than when I first arrived in Washington in 1969. Divisions then were over the Vietnam War, but they were not along strict party lines. Some of the strongest supporters of President Nixon's approach to Vietnam were conservative Democrats, mostly from the South; and some of the most ardent opponents were moderate Republicans, like Mark Hatfield of Oregon and Jack Javits of New York. Before Vietnam, there had been deep divisions over civil rights. Those who have read Robert Caro's masterful works on this subject will know that while Lyndon Johnson was a great national hero, progress on civil rights never could have been made without prominent Republicans, like Everett Dirksen of Illinois and Bill McCulloch of Ohio, who fought

against conventional wisdom in their own party to make those things happen. The strongest opponents of moving forward on civil rights were, again, conservative Democrats in the South.

The parties now are much more unified. There is no longer a center, a prominent and vibrant part of the progress seen in earlier eras. The parties are vehemently oppositional, which would work just fine if we had a parliamentary system or parliamentary culture – but we have neither. In a parliamentary culture, where a majority acts and the minority vociferously opposes, everyone accepts the legitimacy of those actions. In our system, when a majority acts over the vehement, unified opposition of a minority, half the country sees those actions as illegitimate, and consistent efforts are made to delegitimize them. We saw a lot of that in the first two years of the Obama administration, but it was mild compared to what we have had the last two: a system of divided government, because of the separation of powers, with a minority party that votes in unison, leading to near gridlock. That is no easy – or good – way to run a political system.

If that were the only set of problems, we might be able to weather them, but it is clear that some of the polarization is more than partisan or ideological; it's now tribal. You can imagine many areas where we could find common ground and come together across ideological and party lines: think of the Simpson-Bowles Commission or the Rivlin-Domenici Commission. But in a tribal atmosphere, where it is not about what the ideas are, but rather who is expressing them ("if you're for them, we're against them"), you run into a larger problem. And this problem is not limited to Congress. It has metastasized out to many states and has begun to infect other institutions, including the judiciary. Indeed, it has begun to move into the general public as well.

We have a crisis of confidence and legitimacy across almost all our major institutions, partly driven by scandals that taint our view of leaders. Other than the military, no institution has faced scandal yet still enjoys a great deal of confidence from the American people. This situation makes it difficult to reach consensus or make decisions with broad bipartisan support.

We must add to this problem another element of our culture, populism, which is built into the DNA of America. Our framers looked at government and at the accumulation of power in institutions with a jaundiced eye, and Americans have grown up with that mindset. It is a strength of our system that we do not automatically convey enormous power to individuals or groups, which can lead to tyranny. However, populism emerges full-blown whenever there are economic difficulties, and it then moves out to other institutions beyond the governing ones. Right now, we have a crisis of confidence and legitimacy across almost all our major institutions, partly driven by scandals – whether in religion or education or sports – that taint our view of leaders. Other than the military, no institution has faced scandal yet still enjoys a great deal of confidence from the American people. This situation makes it difficult to reach consensus or make decisions with broad bipartisan support.

We can overcome some of the difficulties that are endemic in the political process if we have leaders that Americans can trust, leaders from outside the fray who provide some of the glue to hold things together. But without them and without that kind of leadership, it becomes even harder to act because action means requiring people to accept policies that may involve short-term pain for the promise, often ephemeral, of a longer-term gain.

Asking these things of the American people has become more difficult in the wake of developments such as the 2010 *Citizens United* decision, in which the Supreme Court held that you cannot have corruption if political contributions are independent of campaigns or candidates. However, the *SpeechNow* decision, made by the D.C. Circuit Court of Appeals soon after *Citizens United*, blew a hole through the notion of independence. The combined effect of these rulings has intensified concerns over judicial elections. While it may take a lot of money to influence a presidential election or a Senate campaign, it does not take a whole lot of money to sway a judicial election.

Direct challenges to judges began in Iowa over the issue of same-sex marriage, but the problem has spread to Texas and many other

states. *The New York Times* recently ran an editorial about Americans for Prosperity, a group formed by David and Charles Koch that has been very active with regard to judicial elections. In Florida, the group is targeting three state supreme court judges who are up for retention. Florida's governor has promised that if the judges are removed, his picks to replace them will have very different viewpoints. I just came from Kansas, where a judge has been targeted. Americans for Prosperity has also focused on state legislatures, trying to remove moderate Republicans and replace them with more conservative Republicans.

As recently as the 2009 *Caperton* case, involving a mining company's attempts to influence a judicial election in West Virginia, Justice Anthony Kennedy wrote for the majority that he was appalled by the idea. Now, post-*Citizens United*, we see massive efforts to have money change state and municipal judicial elections.

Judge Wood, could you reflect on what this means and whether there is anything good about it.

Diane P. Wood

Diane P. Wood is a federal judge on the U.S. Court of Appeals for the Seventh Circuit and a Senior Lecturer at the University of Chicago Law School. She was elected a Fellow of the American Academy in 2004 and serves as a member of the Academy's Council, Trust, and Midwest Regional Committee.

I find very little good about it. The *Caperton* case involved a state supreme court judge who received $3 million (you can decide for yourself whether that's a big or small number) from a company that had been handed a $50 million judgment against itself. That judgment was on appeal to the West Virginia Supreme Court. The U.S. Supreme Court decided that this transgressed the fundamental principle that judges are supposed to be independent. The Court held that the judge who received the money should have recused himself.

So that's one thread of this, but I want to throw in a second one. In 2002, the Supreme Court decided a case, *Republican Party of Minnesota v. White*, in which it held unconstitutional a state canon of judicial conduct that forbade candidates for judicial office from announcing their views on disputed issues.

The judiciary is a different kind of institution. Judges are not legislators in black robes. They are charged with doing something different, which is to decide what the law dictates in a particular instance.

The Court said that the restriction was not permissible because it violated various free speech rights. Now we have *Citizens United*, which indicates that judicial elections are like all other elections.

I have spent a lot of time traveling the world, talking to foreign colleagues about how important it is to have an independent judiciary: a body of people who decide cases objectively and who are not dependent on campaign money, or bribes, or other kinds of financial contributions. *Citizens United* does not seem to be a recipe for that independence and objectivity.

Moreover, the judiciary is a different kind of institution. Judges are not legislators in black robes. They are charged with doing something different, which is to decide what the law dictates in a particular instance, or maybe to measure a statute against the Constitution to see if it passes muster. Recent trends may lead the public to believe that judges are not sticking to that task – and may lead judges themselves not to do so. For example, there are some troublesome statistics about the length of criminal sentences meted out by state elected judges in the period leading up to an election. That should cause all of us to be very concerned.

Norman Ornstein

Governor Bredesen, you served at a time when, at least in your state of Tennessee, the focus on problem-solving transcended some of the partisan differences. You were a Democratic governor in a state with a significant Republican coloration. As you look at Tennessee today and talk to your former colleagues, how much do you think the polarization and tribalization that I talked about has metastasized out to the states?

Philip Bredesen

Philip Bredesen served as the 48th Governor of Tennessee from 2003 to 2011. He was elected a Fellow of the American Academy in 2012.

There is no question that some of it has moved out into the states. The polarization in Tennessee is not as strong but is growing steadily. I served for eight years, the last four of which were starting to move toward what Washington has become. The first four, though, were not. I managed to get all my budgets passed – including the last one, which was a very tough budget – with substantial majorities on both sides of the aisle.

What I see happening now is different; maybe it's the precursor to extreme polarization. Many states today seem to have embraced a strong reactionary trend. In Tennessee alone, we have recently seen the introduction of bills to make sure that Sharia law never becomes law in the state. We attempted to establish our own currency, so that when the federal government collapsed, we would be ready. And there must have been a template going around for "guns in [fill in the blank]," because innumerable such bills were filed.

It is important not to let this devolve into hand-wringing: "The barbarians are sacking Washington! What are we going to do?" The reality is that this kind of reaction is always with us; it's a facet of our psyche in this country. For a long time, we had political leaders from both parties who were good at managing it. Franklin Roosevelt, Dwight Eisenhower, and John Kennedy, who saw themselves as 52 percent presidents, understood that part of their job was to manage these other forces in society. That has been much less true of recent presidents. Neither Reagan nor Clinton (at least not in his first term) nor George W. Bush was like that. They all thought of themselves as 60 percent presidents. And Obama so far has continued the pattern.

When we consider the reasons for our problems, we may want to start by asking not only how our institutions have failed to provide what so many citizens apparently want, but also how our political leaders have failed in the task of managing unruly impulses.

Managing these other social forces is part of being a leader in a democracy like ours. When we consider the reasons for our problems, we may want to start by asking not only how our institutions have failed to provide what so many citizens apparently want, but also how our political leaders have failed

in this task of managing these unruly impulses. I mentioned the idea that some people are lamenting that the barbarians are sacking Washington. The barbarians, though, are always out there. They sacked Rome because Rome eventually made it possible for them to do so. Don't blame the barbarians, blame Rome. So we must ask: what is it about our institutions that is not meeting the needs of people, and therefore allowing these forces to come into play?

Norman Ornstein

You raise a good point that I think we will come back to on some level. What happens when voters are extremely unhappy with the state of things and are looking for people to hold accountable? Unlike in a parliamentary system, they do not have an easy way of figuring out who to hold accountable; and even when they do, given the system we have, it may not make much of a difference.

However, let me divert from this for a bit to talk about the one institution that seems to have that larger level of respect: the U.S. military. Every year, I visit the Army War College in Carlisle, Pennsylvania. I come away feeling so good about the experience, in part because of what I see in terms of how they are training the next generation of military leaders. The focus is not simply on making war, but on stepping back and looking at larger societal and historical perspectives. There is a conscious effort to place the military within the civil society.

In your experience, Ambassador Eikenberry, how much does that help explain why people view military leadership and our troops in a different light than other institutions, and also in a very different light than we did twenty-five years ago?

Karl Eikenberry

Karl Eikenberry is the William J. Perry Fellow in International Security at Stanford University. He is the former U.S. Ambassador to Afghanistan (2009 – 2011) and a retired U.S. Army Lieutenant General who also commanded the U.S.-led coalition forces in Afghanistan (2005 – 2007). He was elected a Fellow of the American Academy in 2012.

At a time when we have lost confidence in many of our institutions, the military helps satisfy our need to reclaim some ill-defined "American values" of the past.

Every year, Gallup polls show that the U.S. military is rated by the American people as one of our nation's most respected institutions. In 2011, 78 percent of Americans indicated that they had a great amount of confidence in the military. (Second was small business, at 64 percent.) Compare this to Congress, whose rating has been going down in recent years and is now at 12 percent. U.S. military: 78 percent; Congress: 12 percent. What explains this difference?

I believe there are three reasons. First, the military is looked at as the institution that provides the shield for the American people. The United States is a global power, and our military is doing very difficult things every day in far-off places. So it gets rightful credit for that. Second, if we look at who is coming out of today's military, we see men and women who have learned standards and discipline and who have received a high degree of technical training and quality education. The leadership and management skills that our soldiers, sailors, airmen, and marines develop while serving are highly valued. And third, the military is seen as a repository of American values. At a time when we have lost confidence in many of our institutions, the military helps satisfy our need to reclaim some ill-defined "American values" of the past. Thomas Friedman and Michael Mandelbaum, in their 2011 book *That Used To Be Us*, talk about how, before the game begins at some sporting events in the United States, there is a spotlight put on a group of soldiers. They argue that it is almost as if a spotlight is being put on an American museum, something that has been lost.

Having said this, I'll mention three concerns. First, the U.S. military is an extraordinarily expensive enterprise. Our defense budget dwarfs that of any other nation; indeed, it is larger than the next ten biggest defense spenders *combined*. Forty-five percent of global defense spending is by the U.S. military. That level of expenditure should lead us to revisit President Eisenhower's concern about the military-industrial complex. Make no mistake, there is huge corporate interest behind the U.S. military, as well as huge political interest. A second concern is the unintended consequences that arise from the frequent use of our military. It is a powerful institution with great capabilities, and thus we employ it frequently. But that has consequences in terms of foreign policy, international reputation, and the welfare of our forces. My third concern involves the political ownership and accountability of our armed forces. For many years now, we have had an all-volunteer force, not a conscript force. Are the bonds between our military and the American people being frayed as a result? As I walk through airports, I will often see an American citizen stop a uniformed American soldier, shake his hand, and thank him for his service. Sometimes I wonder if the subtext is "thank you for making it possible for me not to serve."

Dexter Filkins, previously of *The New York Times* and now at *The New Yorker*, has done some first-class reporting on Afghanistan and Pakistan. He was interviewed by NPR after the publication of an especially powerful piece he wrote about where we are headed in Afghanistan. He was asked, "Why is it, with all the money we've spent in Afghanistan, that we aren't getting better results?" He paused and then replied, "Well, you have to consider that in a place like Afghanistan, when we're trying to do development work or military work, it's like building an outpost on the moon." We would of course admire any force – volunteer or draft – trying to build an outpost on the moon. But I would argue that it is only because we have a volunteer force that harder questions are not being asked – such as, why are we trying to build an outpost on the moon in the first place?

Discussion

Norman Ornstein

A series of sex scandals has recently reverberated through the military academies and other places. In the past, we have had questions about misuse of funds and bloated budgets. As we go through our current period of fiscal retrenchment, there are questions about whether military spending entails taking money away from other things. Might the American people have a different reaction to the military once the wars end and people have time to reflect? Our enormous respect for the military relative to other institutions has not been consistent throughout the nation's history. We have witnessed hostility and backlash before. Do you see any signs that we might go from a 78 percent approval rating to a somewhat lower figure? How significant is it to people within the military to have this strong standing with the American public?

Karl Eikenberry

Two points about what is going wrong. The first involves the issue of oversight: that is, congressional oversight of the military as well as the media's role in examining our military in order to bring problems to light. I would reiterate that some of the problem here relates to the disconnect between the volunteer force and the greater society. For example, in the last year, more than fifty American and coalition (NATO) soldiers have been murdered by their purported allies from the Afghan army and police forces. To date, there has been no serious congressional hearing on the topic. Let's suppose that a draft army could do in Afghanistan what the volunteer force is doing. If we had a draft army there and there had been more than fifty American and NATO soldiers dead at the hands of Afghan soldiers and policemen, wouldn't there have been a congressional hearing by now? Wouldn't the American people have demanded a hearing?

My second point has to do with accountability within the military. The wars we are fighting right now are the kind that may drag on for many years. They are also wars taking place in the context of 24/7 communications, where anyone with an iPhone can capture something that in the past probably never would have been widely shared or remarked upon. We are in a new era in terms of accountability of our senior leadership. General Charles Krulak, the Commandant of the Marine Corps in the late 1990s, wrote an article called "The Strategic Corporal." He argued that in today's world, the misconduct of a corporal – a junior, noncommissioned officer – could have strategic consequences for a military campaign. Think about the recent example of an American sergeant who reportedly went outside his forward operating base and killed sixteen Afghans. At what point do strategic commanders have to take responsibility for the missteps of strategic corporals, and at what point must they go back to the president, the commander-in-chief, and admit that a strategy being pursued is too high-risk? When the U.S. president has to apologize publicly three times in one month, as he did in March 2012, for the misconduct of our armed forces, then neither he nor our country is being well served.

As we end our combat operations in Afghanistan, I believe that there will be some reevalution of our armed forces by the American people. We look at our forces very differently when we are at war than when we are at peace.

Norman Ornstein

In 2008, the fundamentalist religious group Focus on the Family released a report speculating about what the year 2012 would be like if Barack Obama won the 2008 election. The report included a section on how the repeal of Don't Ask, Don't Tell would doom society and the military. The complete lack of discussion following the end of Don't Ask, Don't Tell suggests that Focus on the Family was not only misguided, but completely off the mark. What are your observations of how the military has handled this change?

Karl Eikenberry

It was a set of norms that changed over time. Our younger officers and noncommissioned officers reflect mainstream America on this issue, and they are perfectly comfortable with it.

Norman Ornstein

I want to turn to the broader subject of polarization and the courts. I was at a panel at Yale Law School a few years ago, on the occasion of the fiftieth anniversary of *Brown v. Board of Education*. Six former clerks to justices from *Brown* talked about how the justices believed that their decision would have an earth-shaking effect on society, and therefore unanimity in the decision would be important not just for the Court and its integrity but for society as a whole. It wasn't silent acquiescence on the part of a minority.

Diane, how do you see political polarization affecting judges today? There is a perception that you can predict the behavior of judges based on who appointed them, more so than by the nature of the cases they are considering. This view seems to taint our opinion of the entire judiciary, from the

Supreme Court on down, and it affects overall public confidence in the courts.

Diane Wood

Since the time of *Brown*, a huge archive of materials has become available, showing exactly how the justices came to that decision. Each justice reached the conclusion that it was the right decision, and so not only were they unanimous in *Brown*, they were unanimous almost through the 1950s, up until *Cooper v. Aaron* in 1958, when each justice famously published under his individual name. After that, unanimity began to fall off.

ment. Or one could contrast this view with another that says judges should follow the old fashioned, common law approach of incrementalism, taking a small step here, a small step there, and waiting to see what happens. Sadly, judges do not have a better crystal ball than anyone else, and when courts try to write too broadly, the law of unintended consequences visits with a vengeance. That's in part what we are seeing with *Citizens United*. Nobody was talking about *Caperton* or the judicial speech case in Minnesota. Someone either needs to connect the dots much better or needs to stick to an incrementalist approach – which takes me back to the issue

The effort to find common ground has been devalued. Nobody thinks a thing of dissenting opinions, sometimes very sharp ones.

The norm of coming together as a unanimous Court is about finding common ground; it is not "I'll vote for you in this case because you'll vote for me in the next case." In my experience, that never happens, and I don't think it happens at the Supreme Court. Nevertheless, the effort to find common ground has been devalued. Nobody thinks a thing of dissenting opinions, sometimes very sharp ones. People write concurring opinions when they are so moved, and it deprives us of a sense that there is a clear answer in the law. Chief Justice Roberts, during his confirmation hearings and in some subsequent speeches, expressed the hope that he might be able to bring back a greater tradition of unanimity. This lasted for about a term, but once the Court started grappling with more difficult cases, it evaporated.

One could say that the role of judges is to "get the Constitution right," no matter how much china is broken in the process, and no matter what it does to the judiciary's relationship with the other branches of government. Or one could contrast this view with another that says judges should follow the old fashioned, common law approach of incrementalism, taking a small step here, a small step there, and waiting to see what happens. Sadly, judges do not have a better crystal ball than anyone else, and when courts try to write too broadly, the law of unintended consequences visits with a vengeance. That's in part what we are seeing with *Citizens United*. Nobody was talking about *Caperton* or the judicial speech case in Minnesota. Someone either needs to connect the dots much better or needs to stick to an incrementalist approach – which takes me back to the issue of unanimity. If you take only a small step, it is sometimes easier to get everyone marching in the same direction.

The problem has not affected the lower courts as much because we have mandatory jurisdiction. The dissent rate is about 3.5 percent in the lower courts, compared to something like 35 percent at the Supreme Court. The lower courts have to take all cases, a greater number of which have fairly clear answers. It does not matter which president appointed the judge; he or she is going to understand the case the same way.

Norman Ornstein

The *Citizens United* decision, which was written by Justice Kennedy, is breathtakingly naive about what happens in the real world of politics and the real world more generally. That must partly be because you have a justice who has never been in that real world. His entire life has been cloistered, whether in law firms or the judiciary. Justice Sandra Day O'Connor, who had a somewhat different view of these issues, had been an elected politician, the last such member of the Court. In contrast, a majority of the Warren Court had been politicians before serving as justices. We see this problem now at almost all levels of the federal judiciary.

No doubt, part of the reason why judges either come out of the academy or move from one level of the judiciary to the other is because it is easier to predict how they will rule from the bench, as opposed to a politician who would perhaps be more concerned with continuing his legacy for many years after serving. Could you reflect on whether it would be better if the judiciary had a wider range of people drawn from other professions, including, but not limited to, politics.

Diane Wood

It is very helpful to have judges from a variety of backgrounds, and there are a number of ways to secure a diversity of experience. Some people are involved in their communities, whether they have been working as prosecutors or judges or academics; other people have focused on other kinds of things. In our court, the Seventh Circuit, we have former prosecutors, former district judges, and some notable academics. Some people have served in the executive branch; other people, not. Collectively, we bring a fair amount of experience to the table.

But one of the reasons why diversity of experience seems to be diminishing at the Supreme Court level is the confirmation process, which is an aspect of our system that is close to broken. It's very distressing to me personally. Our court has had a vacancy for three years. How can that be? We are just a court of appeals in the middle of the country, and yet highly qualified people are refusing to allow their names to be considered for judgeships. Whenever there is a district court vacancy, Senators

Public officials must be able to convey that they have a genuine regard for and understanding of the issues that are important to the people they serve. We must resist the elitist insider game that politics has become in this country. If we aim for these goals, our leaders will generate public confidence despite differences in background, party, and ideology.

Dick Durbin and Mark Kirk in Illinois put together a committee, and people can submit résumés to the committee. But people are not sending in their résumés because they do not want to go through the confirmation process. They view the process as polarized, lengthy, and intrusive. So who is left to confirm? Somebody who has been cloistered, or someone who has never said anything. These are not people who have been living in the real world. It is very troublesome, and we at least need to acknowledge that we have created a very unsatisfactory bar for someone to pass before he or she can move into the federal courts.

Norman Ornstein

Phil, could you reflect on the American people's low approval rating for Congress and the challenge it poses. Have governors, state legislators, and mayors fared better than Congress? Is the problem getting bigger?

Philip Bredesen

I'm not quite as discouraged about the issue of the popularity of people in public life. It is perfectly possible for our leaders to conduct themselves in a way that leads to approval from the public. The trick is to approach the task with a fundamental respect for the points of view of all people. If you come into office and suddenly identify as a Democrat or Republican and then sign on to whatever the orthodoxy is, you will not get that kind of respect. But if you approach the job by saying, for example, "I know none of those tea party people will vote for me, but they have some points. Their issues about the size of government and the role of states ought to be discussed. I don't like the context in which they are coming up, but they are valid points."

Public officials must be able to convey that they have a genuine regard for and understanding of the issues that are important to the people they serve, who are the voters and taxpayers. We must resist the elitist insider game that politics has become in this country. If we aim for these goals, our leaders will generate public confidence despite differences in background, party, and ideology.

Judy Woodruff

Judy Woodruff is Co-Anchor and Senior Correspondent for PBS NewsHour. She was elected a Fellow of the American Academy in 2012.

I'm very proud that every few days or so on the *NewsHour*, at the end of the program, we list the names and pictures of those who have died while serving in Afghanistan (originally it was both Iraq and Afghanistan). But I'm increasingly struck by how those who have taken their own lives do not show up on that list. While we are starting to hear more about it, all of us in the media need to do a better job of dealing with post-traumatic stress disorder. It goes to the question of the all-volunteer force, as Ambassador Eikenberry discussed, and how multiple deployments affect the lives of people who otherwise are very dedicated. They are doing this for their country, but also sometimes to get an education. Repeated deployments may be something more than they can handle.

In terms of the judiciary, I wish there were a better way for the media to get a handle on what the courts do. We have some fantastic reporters who cover the Supreme Court, but we do not do a very good job of covering the rest of the judicial system.

All we can do is try to ask tough, appropriate questions on both sides and see where it lands – and even that is not always satisfying.

Finally, I want to pick up on Governor Bredesen's remarks about how our leaders can either inspire or undermine public confidence. What can a leader specifically do or say to rise above the extraordinary division that we have today?

Philip Bredesen

I think it has something to do with approaching leadership positions with a bit of humility and honest regard for the fact that someone from the right wing of the tea party, for instance, or the left wing of the Democratic party, has something to say. Despite disagreement over specific proposals, there will often be enormous tolerance or even support when the public understands that you are trying to solve a problem and move forward in an honest and cooperative way.

Consider the question about the relative role of the states and the federal government: how far should the power of each extend? Today, the tea party and others are insisting on an open discussion of this topic. Although states rights have historically been thought of in the unfortunate context of segregation, the issue is a legitimate one that ought to be talked about by smart people in this country.

When I was overseeing the Medicaid changes that we had to make in Tennessee, it was extraordinarily disruptive. I had sit-ins in my office, 24/7 for six months; I had a group of Democrats visit me and say that I would be a footnote in Tennessee history, that I wouldn't be reelected and wouldn't even be able to win the primary when it came around. Well, I ended up setting a record in the next election, and I believe that was because citizens are perfectly prepared to reward what they see as an honest effort to accommodate different points of view, to respect different points of view, and to solve problems. That, to me, is the path to success.

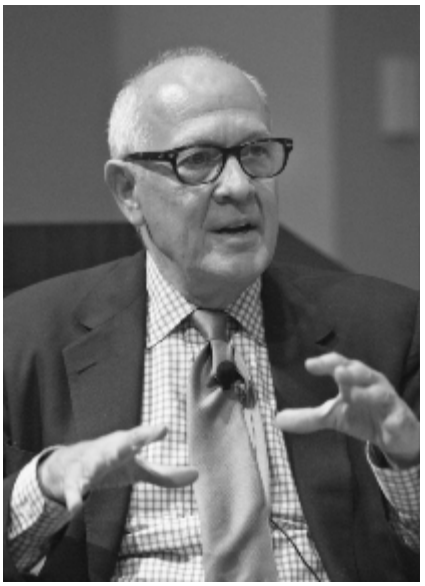
Norman Ornstein

Given our modern methods of communication and media, I disagree with you to some extent. I wish that our leadership could transcend some of the larger challenges and problems that we face, but we now live in a

world without the kind of public square that we had thirty or forty years ago, when we had only a few sources of communication and a shared set of facts. Our world is more polarized now, and it is not just because of partisan media, which we have had in many other eras of American history. Rather, our challenges are intensified by a mix of factors that extend beyond simple partisanship, including: the breadth, depth, reach, and immediacy of the 24-hour news cycle; the fact that people can easily shun sources of information that do not reinforce what they know or believe; the fact that it is much easier to perpetrate lies, with no hope of fact-checkers ever catching up; the opportunity for amplification that is inherent in social media; and the willingness, in an era of tribalization, to demonize people and leaders.

The challenges also relate to the fact that the business models have changed. Fox News, for example, has developed a business model that brings in more net profits with an audience of 2.5 million people at any given time than what the three networks can make combined, with an audience of 30 million people. Newspapers, struggling to attract readers, have had to turn to Web models, which so far are proving difficult to make financially feasible. Thus the wall that presumably exists between the news staff and the business staff is challenged every day by increasing pressure from commercial interests. In addition, journalism's watchdog role is being challenged because there is no easy (or affordable) way to support the work of investigative journalists as well as those who focus on congressional delegations and local or state politics.

So let me start with you, Alex; pick any of those challenges and reflect on it. I imagine that your perspective is shaped not only as someone who studies the journalism and media enterprises, but also as someone who teaches a generation of people looking to enter the profession.



Alex S. Jones

Alex S. Jones is Director of the Joan Shorenstein Center on the Press, Politics and Public Policy and the Laurence M. Lombard Lecturer in the Press and Public Policy at the Harvard Kennedy School. He was elected a Fellow of the American Academy in 2011.

I want to look at it from a slightly different perspective because I was struck by what Ambassador Eikenberry said about the difference between a volunteer army and a draft army. I was the last part of the American male population that was subject to the draft. I served in Vietnam, and I came to believe that the most democratic thing that happened in our country was forcing a group of men who had nothing whatsoever in common (except that they were all shaved and naked) to go through basic training together and get to know each other. With the loss of the draft army, we also lost one of the ways we became more mindful of other kinds of people. We live in cocoons now that insulate us not only from facts we do not like, but also from people who are different from us.

If the newspapers in this country do their job and give the people in their communities the news they value and need, they will find a way to stay afloat.

Today, the media include many different forms of communication, all of which have a hand in shaping who we are as a culture. In the 1960s and 1970s, as Norm mentioned, there was one set of facts that we learned from Walter Cronkite and the network news shows, which got their fundamental framework from a few institutions like *The New York Times*. You don't need me to tell you that it is a very different situation now.

Newspapers have a special role in society. (I'm from a newspaper background, so perhaps I'm prejudiced.) Their focus is local, and they work to identify the commonweal in a community. This is one of the reasons why, despite what you have heard about the newspaper business, the vast majority of newspapers are now making an operating profit. The newspapers that have gone out of business were, for the most part, the second newspaper in a town. People have generally understood that the institution of the newspaper is very important to the social fabric, not only because it tends to be an objective source of news but because it is the news utility.

Broadcast or local television has never been willing to take on the same kind of reportorial role as newspapers have. One exception is the *NewsHour*, which has been a bastion of even-minded reportage and commentary. To my astonishment, one of our presidential candidates has publicly said that if he is elected, he will cut off funding for PBS. That's astounding to contemplate as another piece in this

puzzle of the media's role in shaping who we are and what our values are.

That said, I think Governor Bredesen is onto something when he urges us not to lose our minds about something that is much more complicated than just the difficulties of the newspaper business, for example, or even the *Citizens United* decision. Think about how much public opinion in this country has changed on the issue of homosexuality, for instance. This was an absolutely radioactive issue when I was a child, but now our nation seems to have accepted the fact that homosexuality exists and that it should be accepted, even that same-sex couples should be allowed to marry. To me, this demonstrates just how fluid these kinds of things are when you get to where people live.

We have a new, digital world to adjust to. In this new world, people can reinforce their own judgments, their own preferences for what is truth, by relying on broadly defined media sources whose information may come from all different kinds of places. But at the same time, people can change their minds as well. They changed their minds about what the reality was in Iraq. They changed their minds about gay rights. It may be messy, but it is a good-faith process of figuring out what they think and what values they want to espouse. The future will undoubtedly be complicated – there will be things to argue about, to correct, to change and improve – but I do not think that the future will be catastrophic.

Newspapers in particular will not go out of business. They will not be as they were in the past, but they will still be there – and not just because publishers want to keep them, but because communities want them. If the newspapers in this country do their job and give the people in their communities the news they value and need, they will find a way to stay afloat.

Discussion

Norman Ornstein

My collaborator Tom Mann and I have taken journalists to task for what we call "the sin of false equivalence." Groups on the left and the right are ready to pounce anytime they think they are being treated unfairly. As a response to our criticism, I received an email message from a veteran reporter covering Congress who said, "You don't understand, it is our job to report both sides of the story." I replied: "I thought your job was to report the truth. Sometimes there are multiple sides of a story, sometimes there aren't." Judy, how worried are journalists about this problem? Is there any way out of the dilemma?

Judy Woodruff

It troubles us to different degrees, and I think it depends on where you sit and what news organization you are with. We think about it every day at the *NewsHour* as we consider how to address the main stories of that day. For example, you could argue that a story on immigration has ten sides, not just two. But if we are not turning the entire program over to immigration, and thus have only nine or ten minutes for the segment, we try to figure out the two spokespeople on either side (or maybe sometimes it's three or four) who will give a full sense of the argument.

I think what you are getting at, Norm, is a problem that I see in all the media at different times. It is the sense that if you put two people out there and then let them argue, you are going to learn something. That's not always the case because if they are simply repeating the party line on each side, then you haven't really advanced understanding. So it does require probing and pushing on the part of the interviewer. But the audience, which is already on the edge of its seat, and which is accustomed to seeing what is more accurately described as opinion journalism, is expecting the moderator to pick up on their point of view. They expect us to ask the questions that will elicit the answers they want to hear.

In the past, viewers and listeners would write letters to network ombudsmen and individual correspondents. Now we actively solicit audience responses, and they flood us with email messages and online comments. In many ways, it is terrific that we hear from so many members of the public. On the other hand, I sense that many of these people write because they want us to weigh in on their side. The left wants us to weigh in on the left; the right wants us to weigh in on the right. All we can do is try to ask tough, appropriate questions on both sides and see where it lands – and even that is not always satisfying.

The concept of "truth" is tricky because one side will say that it sees the truth this way, and the other side will say it sees the truth another way. For instance, you could state that the federal deficit is $1.6 trillion, but somebody might ask, "How did you get that figure?" Then you enter a never-ending discussion about numbers that leads you down a rabbit hole.

Norman Ornstein

Over the last fifteen years or so, public support for doing something about climate change has declined. I would argue that a good part of the reason for that is because news shows will feature one voice from the 99.5 percent of scientists who have reached consensus on what is happening in the world and one voice from the 0.5 percent who haven't, and then inevitably will treat them as if they are equal. My guess is that if we had a debate today about whether the world is flat, a news show would find the 0.5 percent of scientists who think the world is flat. And then we would begin to see skepticism in the broader public about whether the world is not flat.

Judy Woodruff

What we try to do when we begin a discussion on a topic such as climate change is say, "99 percent of scientists, according to this respected society, that respected institute, and this respected think tank, say X; but there is still a group arguing Y." We will put two or three people on the program, or we will do a report in which we interview several people, and we try to put the arguments in context. But believe me, no matter what you do, you hear from a very loud and unhappy other side. Just recently, there was a development in terms of climate change research, and a respected scientist who had been on the skeptical side moved to the other side. We tried to explain the background and put everything in context, but there were still screams from the skeptics saying that we had not given their side enough attention.

We can and should reflect what the public says, but we still have a job to do, which is to report the news and try to reflect as many different sides of an argument as possible. We can't collapse every day in anguish because not every person is happy with what we are doing.

Norman Ornstein

Marty, could you comment on this issue specifically from the perspective of newspaper journalism.

Martin Baron

Martin Baron became Executive Editor of The Washington Post in January 2013. Previously, he served as Editor of The Boston Globe. He was elected a Fellow of the American Academy in 2012.

We endeavor to find the truth and tell it to the public honestly, honorably, and accurately. But the public sees these things from a different perspective. A recent Pew study revealed that something like two-thirds of Republicans believe that Fox News tells the truth accurately and fairly, while only a third of Democrats believe that to be the case; and two-thirds of Democrats believe that *The New York Times* tells the truth, whereas only a third of Republicans believe that. We can tell the truth as we find it – and I think that is what we ought to be doing – but the public may view our results quite differently, depending on their preexisting points of view. Moreover, the public these days is drawn to media that present news affirming their preexisting points of view.

I take issue with your point that the reason why there is a difference of opinion about climate change is because the mainstream media, which is what I believe you are referring to, has framed the issue as "half the scientists say this, and half say that." Any objective evaluation of what mainstream media has done in this regard would show that we have not presented it as half and half by any means; instead, what is at play here is an alternative media that is at least as powerful, if not more powerful, than the mainstream media. By *alternative media*, I mean websites, blogs, social media, and other ways that people communicate with each other and pass along information to each other. Many people find these forms of communication more persuasive and more credible than what they read in mainstream media. And what you find in alternative media, to an even greater degree than what you find on cable news, is a lot of provocation and a lot of fabrication. That should be a far greater concern to the American public than the issue of balance and bias.

Newspapers are the primary source of original information in any local community, and there is more reporting happening at the local level than at the national level.

Discussion

Norman Ornstein

What are *The Boston Globe*'s rivals? Is it the *Boston Herald*? Politico? Is it the various and sundry blogs in some of these alternative media that you refer to? Has your view changed with regard to your rivals?

Martin Baron

It has changed. In the past, the primary rival would have been the other newspaper in town. But you have to define what you mean by *rival*. Do you mean rivals for getting stories and information, or do you mean a rival for revenue? Those are two different things. Many people have interpreted the decline of revenue for media outlets as a decline in audience, but in fact we have seen a dramatic increase. *The Boston Globe* now has an online audience of six to seven million unique visitors per month. That's an extraordinary number that we never would have had with a print paper alone. People around the country and the world now have access to information in the *Globe*.

Today our greatest rivals for revenue are websites such as Google News, Facebook, YouTube, and Yahoo. These sites are increasingly going after not just national advertisers but local advertisers, too. In terms of competition for information, I'm always tempted to say we have no competition; but we do of course have competition from other news outlets.

Newspapers are the primary source of original information in any local community, and there is more reporting happening at the local level than at the national level. Most investigative reporting, for instance, happens at the local level, and a newspaper typically has a reporting staff far larger than any other media outlet in its community. In fact, the newspaper's reporting staff is generally larger than that of all those other media outlets combined. Several years ago, Pew studied the question, how does news happen? Where does it come from? Who originates the stories? Focusing on the city of Baltimore, Pew determined that 95 percent of original stories came from newspapers in the city.

Norman Ornstein

The Washington Post used to have a stringer or a reporter go to every school board meeting in the counties around D.C. They do not do that anymore because they cannot afford it. How severe is the challenge to journalism's watchdog role, whether at the level of the school boards, which now have no one watching them (unless they are televised), or in Congress, where we no longer have reporters digging into the transactions of individual members.

Martin Baron

We are tremendously challenged. Many large metropolitan newspapers have eliminated their Washington bureaus over the last ten years, which means that they do not cover their congressional delegations. They may try to cover them from their hometown, but they typically do not. Many of these same newspapers have eliminated or sharply cut back coverage of their state legislatures and their governors. After I left *The Miami Herald*, where I had served as editor, the paper combined bureaus with the *St. Petersburg Times* (now the *Tampa Bay Times*). There are fewer people covering the legislature and the governor in the state of Florida, and that is a matter of great concern.

At the local level, institutions like school boards, courts, and police departments require not only day-to-day coverage but also deeper investigative reports. Many newspapers no longer have the resources to do that. Some others, much to their credit, continue to do that kind of work, and if you look at who receives the Pulitzer Prizes from year to year, you see that many local papers are still doing very important and courageous work investigating their local institutions. But a lot of that work is tremendously expensive. At the *Globe*, for example, we initiated the investigation into the cover-up of sexual abuse within the Catholic Church. That cost us well over $1 million in one year, and that's probably a minimum of what it

Judy Woodruff and **Alex Jones**

Many people in our country still do not have access to technologies that would allow them to get news online, yet they might be able to pick up a newspaper on the street. I worry that we are excluding them, and that this may be another example of how we are, in fact, spreading apart as opposed to coming together as a society.

cost us to do that work over the course of a year. Then you face the challenge of potential libel suits and court judgments. Many papers (and some newspaper owners) have decided that they do not want the flack or the expense that come with investigative reporting. They don't think it is necessary or that it can be, to use the word that is bandied about so often, *monetized* as a business proposition. Indeed, there is some question as to whether it can be monetized, whether the kind of money that is being spent can be earned back.

Alex Jones

There is no question about the muscle and bone being cut away from statehouse reporting or local beat reporting that leads to deeper investigations. However, some other entities have stepped in to fill the gap. For instance, journalism schools around the country are now doing serious reporting. Some foundations are funding specific projects that require the kinds of reporting that have suffered the most cuts.

Any news organization, but especially any newspaper, that thinks investigative journalism is not in its financial interest is headed for bankruptcy. The very thing that will keep these institutions in business is that brand of reporting.

Norman Ornstein

I want to invite those from the first part of our panel to add their comments or ask any questions they have.

Karl Eikenberry

David Ignatius, of *The Washington Post*, commented that embedded reporting "comes at a price." He continued: "We're observing these wars from just one perspective, not seeing them for the whole. When you see my byline from Kandahar, Kabul, Basra, you should not think of me going out among the ordinary people, asking questions on all sides. I'm usually inside an American military bubble, and that vantage point has value, but it's hardly the full picture. I fear that embedded media is becoming the norm, and not just when it comes to war." I'd like to hear any thoughts from fellow panelists on this.

Judy Woodruff

He is absolutely right to be concerned. When reporting from a war zone, it is incumbent on correspondents to make very clear what their limits are. I would also add that this is a casualty of money. So many news organizations covered the hot part of the Iraq War, but when it ground down, they pulled their reporters out. It cost so much to keep reporters there and to keep them safe. The same has been true in Afghanistan; I couldn't say how many reporters are really covering Afghanistan anymore. It is a function of revenue and money, and it is a much bigger question than we have time to deal with this morning. But I will say that ever since people learned that they can get the news for free online, the industry has been in a kind of crisis. We will figure it out, but it's a struggle.

Diane Wood

I want to go back to our broadest topic – stewarding democracy – to point out that the move online raises more questions than simply how news organizations can make money. Many people in our country still do not have access to technologies that would allow them to get news online, yet they might be able to pick up a newspaper on the street. I worry that we are excluding them, and that this may be another example of how we are, in fact, spreading apart as opposed to coming together as a society.

Philip Bredesen

In listening to the discussion, I was struck by the ease with which everyone slipped into this notion of reporting as being two-sided, with a spokesperson for one side and a spokesperson for the other. By casting stories in this way, do we immediately set up a "good versus bad" dichotomy that obscures the nuances of an issue and encourages head-butting between spokespeople?

Judy Woodruff

I was speaking in shorthand when I talked about getting the two sides of an issue. It's not as if we plunge in and take only the RNC talking points and the DNC talking points; we put more thought into it than that. But it is

absolutely true that the more folks we can talk to, the better. And this includes both those in the middle and those who are firmly on each side. We should not shut out the extremes, keeping in mind what percentage of the population they represent. We sometimes hear from viewers who ask, "Why don't you ever cover the far left? You're always covering the far right position on, say, the role of religion in politics, but you're not covering the far left."

Martin Baron

I hope I did not slip into the notion that we have two sides, because I don't see it that way. These stories have many sides or no sides. It is a matter of finding out what is really going on, and that is the bulk of what we try to do. We also have to be careful not to view all these stories in a political framework: that it's just talking heads debating political issues. In fact, the issues relate to what is happening in society at large. The more our news stories convey this, the better we serve the public.

Norman Ornstein

I have received several cards with questions from the audience, covering everything from WikiLeaks, to the military, to *Citizens United*. So, WikiLeaks: good or bad?

Alex Jones

As far as I'm concerned, *The New York Times* dealt with WikiLeaks in a responsible way. It took information that was made available, went through it carefully, and screened out anything it thought would put people's lives in danger; but it did not pretend that the information was not now available. The news media are supposed to tell us what they find out, and I think that is what happened.

Julian Assange and his organization made this information available, but he found that nothing was accomplished just by posting it. He had to give the information to *The New York Times*, *The Guardian*, and *Der Spiegel* in order for it to be noticed. And when he did so, he gave these papers the opportunity to treat the information responsibly, which I think they did.

Judy Woodruff

I think we need to remember that WikiLeaks is not journalism. It's somebody with an agenda who wanted to get information out into the open. You could argue that there was a lot of valuable information, but there was also a lot of harmful information.

Norman Ornstein

The New York Times, or *The Boston Globe*, or *The Washington Post* has to decide whether running a story or making information available would damage national security interests. I think most of us have been very comfortable with the fact that those decisions have so far been made by responsible, mature people who weigh the right to know against the needs of the nation. Are news organizations in danger of losing that role of gatekeeper, now that they no longer control the release of information?

Alex Jones

What's more of a danger is that, for instance, *The New York Times* has reported things that the Obama administration has not been happy about, and the administration has gone after the reporters to give up their sources. If you start putting people in jail for talking to reporters, you are going to have a real problem with reporters being able to do their job at the highest level, which is to tell the public things that people in power do not want them to know, for a variety of reasons. I think that problem could be much more dangerous than Julian Assange.

Karl Eikenberry

Having been on the receiving end of the pain that was felt from the WikiLeaks release, I have to tell you, I sat around with the embassy team and went through all the cables that had potentially been leaked. In the end, we asked ourselves, why are we

Karl Eikenberry, Philip Bredesen, and Norman Ornstein

writing all of this stuff? Who is even reading it? So I think that one of the lessons has to do with managing information.

Norman Ornstein

When we recruit for the volunteer force, we appeal to people by describing military service as a career-building move and an opportunity to make some money. Is this a positive development?

Karl Eikenberry

If you look at the demographics of our military, it is not a complete cross-section of American society. Both the Hispanic and Asian populations in the United States are under-represented in our military. Perhaps most surprising is that we tend to be over-represented in certain parts of the country. Alabama has ten recruiting stations for the armed forces; the Greater Los Angeles area has three. That's okay, except that the Greater Los Angeles area is about three times the population of Alabama. Geographically, we are not doing a good job of making our military represent American society.

Motivations for coming into the service are mixed. Certainly, the financial aspect is an important one, but the pricetag for our taxpayers is steadily increasing. Current health care costs in the military are about $50 billion a year, and they are going up. Judy mentioned post-traumatic stress disorder; that and other health issues from Afghanistan and Iraq are driving costs higher and higher. Retirement costs, too, are going up. The role that material benefit plays in building this magnificent force has to be looked at. I think it is an unsustainable model.

Norman Ornstein

Diane, how does *Citizens United* affect foreign corporations?

Diane Wood

For a long time, the United States (and most of the rest of the world) has followed the rule that a corporation is a citizen of the state, or if applicable, the country that incorporated it. In the United States, we have lots of Delaware corporate "citizens" in this sense; we also have a certain number of corporations that are citizens of other U.S. states. Typically we have not looked through the corporate structure to see where the shareholders come from. So a company incorporated in Delaware may be a wholly owned subsidiary of a Japanese corporation, or it may have foreign citizens as shareholders. Despite the foreign ownership, the Delaware incorporation means that it is still a U.S. "citizen." In fact, the United States has a network of treaties that make either of these scenarios perfectly lawful. But those treaties run into conflict with our election laws, which do not permit foreign influence in our elections. One of the many things the Supreme Court has to figure out is how to reconcile these two models.

In addition, it is worth recalling that Justice Kennedy approaches *Citizens United* as though a corporation is nothing more or less than a group of people. But if we look at the idea of a group more carefully, we see that there are at least three distinct scenarios. First, if those of us sitting here decided that we wanted to get together and send money to a certain political candidate, we could all chip in, say, $100 each and send that contribution as a group. Secondly, as Justice Kennedy points out, unions are a type of group. So unions can participate in the political process. Finally, a corporation can be thought of as a group. Here's the rub: the issue of agency is different in each situation. In the first scenario, we have collectively decided on a course of action, and every person had a direct say in the decision. In the case of unions, although the group is entitled to participate in the political process, the Supreme Court has insisted on a right to opt out of the union's political activities. If you belong to a union and it supports the Democratic candidate but you like the Republican candidate, you are entitled to a refund of your dues to the extent that the union participates in political activities. There is a whole line of Supreme Court cases about this. Corporations are even more complicated, but without going into all the details, suffice it to say that the Court was not looking at the differences in the agency model that might be appropriate for different kinds of groups. Going forward, there could be some room for development along those lines.

Norman Ornstein

I want to add one final twist on this topic. Not long after he was chosen as Governor Romney's running mate, Paul Ryan went to Las Vegas for a long and intimate private meeting with businessman and GOP donor Sheldon Adelson. The *SpeechNow* case that I mentioned earlier has blown a hole in the notion that these super PACs are independent of candidates, and now they can appear at fundraisers, among other things. Sheldon Adelson's money comes much less from the casino business in Las Vegas, which has tanked in recent years, but almost entirely from Macao and Singapore. If Sheldon Adelson calls someone to whom he has contributed "independently" tens of millions of dollars and asks for an appointment, you can be sure that he will get that appointment. And you can also be sure that the subject of policy toward China will come up. So there isn't much of a distinction here. ■

To view or listen to the presentations, visit http://www.amacad.org/events/Induction2012.

The Modern Concept of Substance

On November 8, 2012, at a Stated Meeting held in Cambridge, **Frank Wilczek**, the Herman Feshbach Professor of Physics at the Massachusetts Institute of Technology, discussed the modern concept of substance and the nature of the Higgs particle. His presentation and the introduction given by **Jerome Friedman**, Institute Professor and Professor of Physics Emeritus at the Massachusetts Institute of Technology, follow.

Introduction by Jerome Friedman

Jerome Friedman is Institute Professor and Professor of Physics Emeritus at the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy of Arts and Sciences in 1980.

Frank Wilczek is one of the most prominent theoretical physicists in the world. His theoretical work is characterized by its inventiveness, depth, and breadth.

He received his undergraduate education at the University of Chicago and did his graduate research at Princeton under the supervision of David Gross. He taught at Princeton University; the University of California, Santa Barbara; and the Institute for Advanced Study. In 2000 he was appointed as the Herman Feshbach Professor of Physics at MIT.

Frank has a number of significant achievements to his credit. But he is best known for his pioneering work in developing the theory of the strong interaction, known as quantum chromodynamics, or QCD for short. The strong force is the force that holds quarks together to form other particles, such as protons and neutrons; it also holds neutrons and protons together to form the atomic nucleus.

When I was a graduate student at the University of Chicago in the early 1950s, it was said that it would take a hundred years to understand the strong force. At the time there was a highly successful quantum theory of electromagnetism based on field theory. But field theory did not appear to be suitable for the strong interaction. However, in 1973 Frank, David Gross, and, independently, David Politzer discovered a field theory that successfully describes the strong interaction.

QCD predicts that the interaction between quarks will be weaker at short distances and get stronger at long distances. The first behavior is called asymptotic freedom. The latter feature is called infrared slavery, and it explains why individual quarks have not been found in nature, even though they have been seen inside the proton and neutron with the equivalent of a very powerful electron microscope.

QCD has been verified in numerous experiments over a wide range of energies. It is one of the pillars of the standard model, which is our highly successful theoretical description of the fundamental particles and their interaction. The standard model is considered one of the crowning achievements of twentieth-century physics.

For this pioneering work Frank was awarded the Nobel Prize in 2004, along with David Gross and David Politzer. In addition to the Nobel Prize, Frank has won many other honors. These include the Sakurai Prize, the Dirac Medal, the Lorentz Medal, the King Faisal Prize, the Lilienfeld Prize of the American Physical Society, and the Particle Physics Prize of the European Physical Society.

Frank's research has covered a broad range of topics in condensed matter physics, astrophysics, and particle physics. In addition to his work on QCD, he predicted the existence of a new particle in nature called the axion. This particle is a plausible candidate for dark matter, and various laboratories are searching for it.

Frank also invented a new form of quantum statistics that has important implications in condensed matter physics, and he has made a number of contributions to understanding deep issues in the implementation of QCD in particle physics and astrophysics.

His talents go well beyond his scholarly work. He has written a number of highly successful books that bring modern physics to the public. The latest of these is titled *The Lightness of Being*. He is currently finishing a novel. In addition, he plays the piano and the accordion and performs in rock bands.

Frank Wilczek

Frank Wilczek is the Herman Feshbach Professor of Physics at the Massachusetts Institute of Technology. He was elected a Fellow of the American Academy of Arts and Sciences in 1993.

A great achievement of nineteenth-century physics was to understand that light consists of wave-like disturbances in electric and magnetic fields. The fields, as dynamical entities, fill all space.

We learned in the twentieth century that matter is a very different thing than everyday experience suggests. To understand it deeply, we need entirely new concepts. These concepts have brought a new level of beauty and coherence to fundamental physics, a foundation of our world-picture. They also invite new questions and ambitions.

The modern understanding of matter has many aspects. I won't be able to do justice to all of them in the brief time available. Instead, I am going to focus on two big ideas. The first is that all matter is like light. The second is that space is a material.

Until recently people thought there was a basic dichotomy between matter and light. It seems obvious – so obvious, that it went unquestioned for centuries. But it is not so.

Many relics of outmoded ideas are embedded in everyday language, and so here. Since I – and modern physics – want to consider light and matter as one thing, in what follows I will use "substance" to denote that thing. I will use the word "matter" as it is traditionally used, to denote the kind of thing that makes rocks and people. In the literature of modern physics, "matter" is usually taken to include light, but for present purposes we will have to step back from that usage.

As many of you know, in quantum theory, a product of the twentieth century, some of the main distinctions between light and matter, as understood previously in physics, went away. A great achievement of nineteenth-century physics was to understand that light consists of wave-like disturbances in electric and magnetic fields. The fields, as dynamical entities, fill all space. Matter, on the other hand, was thought to be built up from tiny particles that occupy discrete bits of space. We learned in the twentieth century, with the development of quantum theory, that this distinction is superficial.

If you want to understand the behavior of matter on small scales – within its constituent atoms, say – then matter must be described, as light is, using space-filling fields. But they are not precisely the same kind of fields that we had before; they retain a vestige of the old particle concept. An example will be helpful here. We can visualize how an electron settles down when it is bound to a proton in a hydrogen atom. In any of its orbitals, called stationary states, we can picture the probability of finding an electron in different places. That field of probabilities is what the electron's wave function encodes. We can use brighter areas to show where the probabilities are large, but in principle nonzero probabilities extend out to spatial infinity, in any of the states. These visualizations, which make quite attractive patterns, are not fantasies. (They should seem fantastic, but they are not fantasies.) We use programs like Mathematica and Photoshop to create the images, but the description of hydrogen they incarnate is based on equations that have been verified with extraordinary accuracy – in important respects, to parts in trillions. There can be little doubt that this is the way nature works, and that the images are an honest portrayal of profound understanding.

Conversely, light can sometimes behave as if it were made of particles, called photons. I'll say more about that later. In the more accurate, unified treatment both matter and light obey the same kinds of equations. Perhaps you have seen a classic paradoxical image, that when apprehended from one point of view seems to be a rabbit but from another point of view seems to be a duck. In reality the image is neither, or both: It is what it is, a dabbit. Similarly, we have wavicles.

The wave/particle synthesis transcends one major contrast between light and matter. But there are several other apparent differences between the usual conceptions of light and matter that need to be explained, if we are going to get a unified concept.

For example: Light gets created and destroyed easily, whereas matter is permanent; it gets rearranged but not created or destroyed. Light travels at the speed of light, and is always on the move, whereas material

particles, such as electrons and protons, travel at less than the speed of light, and can come to rest. Light transfers energy from one place to another. Matter, when it moves at all, transfers mass from one place to another. And perhaps what is most striking, light is in a deep sense a single thing, whereas matter seems to be made out of several different things. Atoms of the different chemical elements are made of electrons and different kinds of nuclei; the nuclei are made out of protons and neutrons; the neutrons and protons are made out of up and down quarks and gluons. The list of matter's building blocks gets more sophisticated, but it doesn't converge to a list with just one entry.

So, to bring unity and beauty to our description of nature, we would like to make the world from building blocks, fundamental particles, that have zero mass. Unfortunately, many of the fundamental particles we know do not cooperate. Electrons, for instance, do not move at the speed of light in empty space, but always slower.

What can we do about that? When physicists do not like how the world works, we have learned there is an interesting fallback position: We imagine a better world, and then see if we can somehow gracefully mess that world up, to get ours.

Since many of the properties of the Higgs particles could be predicted in advance of their observation, we could infer what they had to look like. And so we could recognize them when we saw them. The great news of July 4, 2012, is that thanks to a massive international effort at CERN's Large Hadron Collider, now we have.

Physics today is justifiably ambitious. We can realistically aspire to a unified picture that gets down to just one thing. So, among the rest, we want to eliminate the dichotomy between light and matter. The tale is not finished, but one by one those apparent distinctions between light and matter have fallen away. Recently we have completed a major new chapter of the story, as I'll now explain.

Light moves at the speed of light. In the context of special relativity, this means that the particles of light, photons, have zero mass. And that is a really nice feature. When you study the equations of physics, you find that particles with zero mass satisfy the equations that are the most beautiful, the most conceptually tight, the most consistent, and the most elegant.

The new development is that we have found a good solution to the mass quandary. It involves an idea that was theorized almost fifty years ago, but has only now come to experimental fruition. The resolution, following the fallback strategy I just mentioned, is to imagine that space is filled with a material, a "cosmic molasses," that slows some things down (including electrons and quarks, but *not* photons). If you remove that material, imaginatively, particles such as electrons and quarks will move at the speed of light, and they will be described by the beautiful equations of massless particles. The observed fact that electrons and quarks don't move at the speed of light will reflect the evil influence of that all-pervasive cosmic molasses, rather than an intrinsic shortcoming.

The molasses metaphor is kind of icky. Here is a nicer metaphor: Imagine that a race of intelligent fish evolves in the oceans of a water-rich planet. Those fish get so intelligent that they start to think about physics and the laws of motion. They carefully study how things move, and they derive some very complicated laws, because the way things move through water is very complicated. The push-back of the water itself complicates motion.

For a long time, our fish struggle with their equations, until one day a fish genius, Fish Newton, figures out another way to describe things. You can get by with much simpler laws of motion, she proposes, by removing water from your equations. The fish of course had always lived surrounded by that stuff we call water, and had come to take it for granted, not realizing they could remove it, imaginatively. Once you do that, Fish Newton demonstrates, you can start with simpler laws – Newton's laws of motion. Then you put the water back in, you recover the complicated laws that fish physicists had derived before, which describe everyday motion as observed in their world.

The big news is that we are like those fish. We live in a universal, cosmic ocean. We can get a simpler, more beautiful description of the world, more elegant laws of motion, more elegant laws for all of physics, by postulating that a material fills the whole world everywhere and slows things down and gives various particles mass.

It's an old idea, as I mentioned, and we have been using it for decades to get more beautiful equations, which have been quite successful. But there has been a big problem looming over it. We learned a lot about matter in the twentieth century. Through studies ranging from intricate chemistry to systematic, precise, violent experiments with accelerators, we have developed a rich,

full account of how the physical world works. We made a tremendous amount of progress. We made an inventory of the forces, and discovered two new ones (the strong and weak forces, supplementing gravity and electromagnetism). We discovered many new fundamental particles and understood their interactions. It would be hard to overstate the power and accuracy of our understanding of substance. But in all of our explorations, nothing we discovered had the right properties to make the cosmic ocean. The charm quark doesn't do it, nor the beauty quark, nor the top quark, nor photons nor gluons. None of those particles is up to the job.

We live in a universal, cosmic ocean. We can get a simpler, more beautiful description of the world, more elegant laws of motion, more elegant laws for all of physics, by postulating that a material fills the whole world everywhere and slows things down and gives various particles mass.

As our beautiful equations using the cosmic ocean idea went from triumph to triumph, our confidence in the existence of that medium grew. Since no known material would provide it, physicists postulated a new one: the Higgs field.

Fortunately, that bold hypothesis has observable consequences.

In the quantum description of the world the minimal units, or quanta, of any field appear as particles. For instance, photons are the quanta of the electromagnetic field. Light appears continuous when you have lots of it. But if you have very dim light, you find that it breaks up into little packets, each with the same finite energy (for monochromatic light). Those are the quanta, photons, the minimal units, of light. Gravitons are the quanta of gravity. They have not yet been detected, and for the foreseeable future they probably won't be, because they interact too feebly. But theoretically we are sure they are there. Gluons are the quanta of the nuclear force fields. They were first inferred theoretically, and then found experimentally in one of the great triumphs of twentieth-century physics.

The Higgs field also has quanta, called Higgs particles. They are the minimal units of the world-filling material substance we postulated, to legitimize the equations of our dreams.

Since many of the properties of the Higgs particles could be predicted in advance of their observation, we could infer what they had to look like. And so we could recognize them when we saw them. The great news of July 4, 2012, is that thanks to a massive international effort at CERN's Large Hadron Collider, now we have.

The LHC is a giant twenty-six-mile circular tunnel. Inside it, we have protons moving at within one part in a million of the speed of light. Two beams of those very energetic protons circulate in opposite directions around the tunnel. Once you have gone through the trouble of accelerating the protons to such high energy you want to keep them, so you have them move in a circle. You have to use powerful superconducting magnets – lots of them – to coax the protons. The reason the ring has to be so big, and the magnets so powerful, is simply that when protons move so fast it is extremely hard to deflect them from straight-line motion. The magnets' power requirements would be exorbitant, if they were ordinary magnets. So they have to be superconducting magnets, and this requires that you keep them at a very low temperature, two degrees Kelvin. And that requires a lot of specialized plumbing, using liquid helium. If any of that plumbing goes wrong, you can have catastrophic failures. Getting all this to work involves truly heroic engineering.

The intellectual point is to explore our theories of the fundamental way the world works, using those protons. That step presents lots of challenges, too. I'll describe one especially interesting and important one.

When two protons smash together, what actually collides, usually, are two gluons, one from each proton. If your goal is to make Higgs particles, that is problematic. For the Higgs particle, in line with its role as the quantum of molasses, couples to particles proportionally to their mass. (Remember, the mass arises from that coupling.) But gluons, like photons, have zero mass. So gluons don't couple to the Higgs particle directly at all.

Fortunately, though, gluons do manage to couple to Higgs particles indirectly, in a remarkably beautiful way.

Gluons couple directly to all kinds of quarks, including the very heavy (and very unstable) top quarks and top antiquarks. A top quark – top antiquark pair can come to be and then pass away after a short time, spontaneously. That possibility is a special case of quantum uncertainty, or if you like quantum fluctuations. We call such evanescent pairs "virtual particles." The top quark – top antiquark pair, being very heavy particles, are very happy to couple to the Higgs particle. And so the gluons get to couple to the Higgs particle indirectly, with the

help of deep quantum physics, through those intermediate virtual particles.

Once you produce the Higgs particle, it occasionally decays into two photons. Since photons, like gluons, have zero mass, that decay process also must go through intermediate virtual particles. That circumstance raises a remarkable possibility. Besides the particles we know about, other very heavy particles, that we have not yet observed, could also be contributing, in their virtual form. And so it is especially important to measure the properties of the Higgs particle accurately, because they open a new window into the unknown.

The collisions that produce Higgs particles are a small subset of all the collisions that occur at the LHC, and even within that subset the Higgs particle is one particle among dozens of the particles emitted. So you have to understand and measure things extremely well in order to pick out this particular process from all the processes we already understand and don't regard as so interesting anymore. Or, to use a different metaphor, if you are looking for a needle in a haystack, it is really important to know exactly what hay looks like. Physicists have a saying, "Yesterday's sensation is today's calibration." Astonishing things we were proud of discovering in the late part of the twentieth century are now taken for granted and used as stepping stones, to reach higher.

It is one thing for a theorist to draw doodles showing what the process will look like. Actually detecting those photons is quite another. The cost of the LHC was approximately five billion euros. The whole project is our civilization's answer to the pyramids of Egypt. In this case, it is a monument to human curiosity and determination.

The detectors are especially fantastic. The Atlas detector would fill a fair-size aircraft hangar. It is stuffed with state-of-the-art, even beyond-state-of-the-art, electronics designed to reconstruct what happens in those violent collisions, or "Little Bangs."

You can't resolve the tiny time scales over which all the action takes place by taking snapshots. It is more like studying the ashes, after an explosion, in order to reconstruct what the explosion itself was like. Lots of particles, typically several dozens, emerge. You want to see how many there are, which ones they are, and how fast and in which directions they are moving. Essentially all of them are moving very close to the speed of light, but maybe one is moving within one one-hundred-thousandth of the speed of light, while another is moving within one one-millionth of the speed of light. Those tiny differences carry crucial information. You have to be very fast and accurate about measuring particle velocities and distinguishing the different kinds of particles.

Thanks to this grand endeavor, now we have firmly established the existence of a material that fills the universe and changes the properties of things we know about. That answer suggests some wonderful questions.

If space is – or, more flexibly, is filled with – a material, could that material change with time? Specifically, could it have melted or boiled away early in the Big Bang, when things were very hot? And could it be differently organized elsewhere?

In fact, it has already proved fruitful to think that the properties of space-filling material – or, you might say, of space itself – change with time. The early universe could have been very different in its fundamental properties. In particular, it could have had a sort of negative gravity, which triggered a process of very rapid inflation. That might explain quite a bit about the universe we see. Cosmic inflation is a topic for another talk, but it is important to mention how our ideas hang together.

Could all the apparent distinctions among elementary particles, not just their masses, arise from their differing reactions to cosmic fields?

We are also licensed to speculate, since the properties of space are negotiable, that things could be very different elsewhere. This leads to a concept called the multiverse, the idea that if you got far enough away you would find that the effective description of the world is quite different from what we have here. The world might, for instance, look as if it had a different number of dimensions. Or instead of one kind of electromagnetism, you might have two with different kinds of photons and different versions of electric charge simultaneously. Or you might even find a universe in which there is no QCD.

Could all the apparent distinctions among elementary particles, not just their masses, arise from their differing reactions to cosmic fields? That possibility would allow for a truly unified description where all the particles, all the fundamental building blocks of nature have equivalent properties, but are made to look different due to complications introduced by world-filling substances. Detailed investigation shows this idea is not only viable, but explanatory, and productive of testable consequences. In this way Einstein's dream of unification has evolved from mystic faith to quantitative science.

The details of that story are a movie for another time, still in production, but I can show you the trailer. The movie, which is

If you assume that the new super-particles exist, and you consider their effects as virtual particles, you discover a marvelous quantitative consequence. For if you extrapolate the known laws of physics to short distances, making corrections for the effects of those additional virtual particles, then you find that the different interactions come to have equal strength.

actually a sort of sequel to "The Modern Concept of Substance," is called Desperately Seeking SUSY.

SUSY is short for supersymmetry. It is the next great target for discovery at the LHC. SUSY involves the idea that space has another set of dimensions that is very small and that we don't see (yet). In fact, the new dimensions are not dimensions of space in the ordinary sense; they are something quite new: quantum dimensions. The central innovation is that to describe positions in superspace, instead of ordinary numbers that satisfy $x \times y = y \times x$, you have to use a new kind of numbers, Grassmann numbers, for which $x \times y = - y \times x$. That strange minus sign makes a big difference. The quantum dimensions are not just small, but in a sense discrete. You can think of them as just having two sheets. You can explore a quantum dimension fully in one step, because a second step leads you to nowhere: $x^2 = 0$.

If you step into the other sheet of the quantum dimension, you don't arrive in a different place, in the usual sense; rather, you turn into a different kind of particle. So, if you were an electron, you would turn into something called a selectron, which retains some of the electron's properties, such as the same electric charge, but has much larger mass and is a boson instead of a fermion. Roughly speaking: If you were a force-mediating particle, you will become a material particle, and vice versa. That is the essence of supersymmetry, physically. Thus SUSY would transcend an annoying dichotomy in our current descriptions of nature: that is, the distinction between matter particles and force particles, or in the jargon, between fermions and bosons. That dichotomy, you will appreciate, is a modern, sophisticated descendant of the old divide between matter and light.

But the reason I don't merely admire SUSY, but *love* her, is more concrete. If you assume that the new super-particles exist, and you consider their effects as virtual particles, you discover a marvelous quantitative consequence. For if you extrapolate the known laws of physics to short distances, making corrections for the effects of those additional virtual particles, then you find that the different interactions come to have equal strength. Thus unification of all the interactions we know, including gravity, will at last mature from a vague hope into a quantitative phenomenon.

I hear sirens singing. They sing that empty space is a medium that, given SUSY, reconciles perceived differences. And they sing another suggestive detail: The observed mass of the Higgs particle, it turns out, is nicely consistent with SUSY's preferences. Like Odysseus, tied to the mast, listening to all this, I am entranced, hoping the sirens sing true. Over the next few years, through further experimental exploration, we will find out whether they have been teaching us or teasing us.

Some of you might know Caravaggio's painting of St. Thomas inspecting the wounds of the Lord. I have always admired St. Thomas, and thought of him as the patron saint of *experimental* physics. He wants to see the actual wounds.

But the painting also includes the one whose wounds Thomas wants to examine, the patron saint of *theoretical* physics, who said, "Blessed are they who do not see and yet believe." ■

To view or listen to the presentation, visit http://www.amacad.org/events/statedmeetings/modernconceptmatter.

Francis Amory Prize Symposium: Advances in Reproductive Biology and Medicine

On March 14, 2012, the Academy presented the Francis Amory Prize to **Patrick C. Walsh**, M.D., a renowned urologist who pioneered work in the understanding and treatment of prostate cancer. (The prize citation was printed in the Spring 2012 issue of the *Bulletin*.) Following the prize ceremony, Dr. Walsh participated in the Francis Amory Prize Symposium on advances in reproductive biology and medicine. The symposium also included presentations by **David C. Page** (Whitehead Institute; MIT) and **Patricia K. Donahoe** (Massachusetts General Hospital; Harvard Medical School). The prize ceremony and discussion served as the Academy's 1983rd Stated Meeting. The following is an edited transcript of the symposium.

The Y Chromosome

David C. Page

David C. Page is Director of the Whitehead Institute; Professor of Biology at the Massachusetts Institute of Technology; and a Howard Hughes Medical Institute Investigator. He was elected a Fellow of the American Academy in 2011.

As the first speaker of this Francis Amory Prize Symposium, I would like to offer some comic relief. Before we get to the substantive presentations by Drs. Donahoe and Walsh, I will bring you late-breaking news from the Y chromosome. I have spent the better part of my career defending the honor of the Y chromosome in the face of innumerable insults to its character and future prospects. Let me now address these questions in the context of discoveries that my colleagues and I published this month.

You may have heard some nasty rumors that the Y chromosome is slowly withering away, and that it is on course to perish in a few million years. For the past decade or so, these rumors have appeared in leading scientific journals, and they are occasionally resurrected at conferences. Where did these ideas about the disappearing Y chromosome come from, and what is the truth about the fate of the Y chromosome? To answer these questions, I will give you a crash course in what we now understand to be the origins of not only the Y chromosome but also the X chromosome. Three hundred million years ago, when we were reptiles (the old days you talk about at Thanksgiving and other family gatherings), we existed as males and females, but we had no sex chromosomes. We had only what in our laboratory we call "ordinary" chromosomes. Others call them *autosomes*. But about three hundred million years ago, a perfectly ordinary, matched pair of chromosomes began a journey.

These ordinary chromosomes had swapped genes back and forth every time eggs and sperm were made – that is, until one member of this unsuspecting pair acquired a mutation that would give rise to the sex-determining gene, *SRY*, on the Y chromosome. Over time, first in the immediate vicinity of *SRY* and then over a larger region, sexual recombination – that swapping of genes with a partner chromosome – stopped. It turns out that swapping genes in the making of eggs and sperm is very good for the health and well-being of genes over long expanses of time; within the region that had stopped swapping with the X, the Y chromosome started losing genes and began to shrink (Figure 1). This process eventually took over most of the Y chromosome, so that while today's X chromosome retains the gene content of the ancestral autosomes, the Y chromosome is a mere vestige of its former glory. If you extrapolate into the future, it does not look good for the Y chromosome.

This doomsday scenario did not escape the attention of researchers in the field. In fact, in an editorial published in *Nature* a decade ago, somewhat grandly titled "The Future of Sex," my colleagues John Aitken and Jenny Graves recount what I have just told you: that the Y chromosome is particularly vulnerable across evolutionary time because it does not have a matching partner with which it can swap and retrieve lost genetic information. They went on to state that the original Y chromosome, that ancestral autosome, carried "around 1,500 genes;

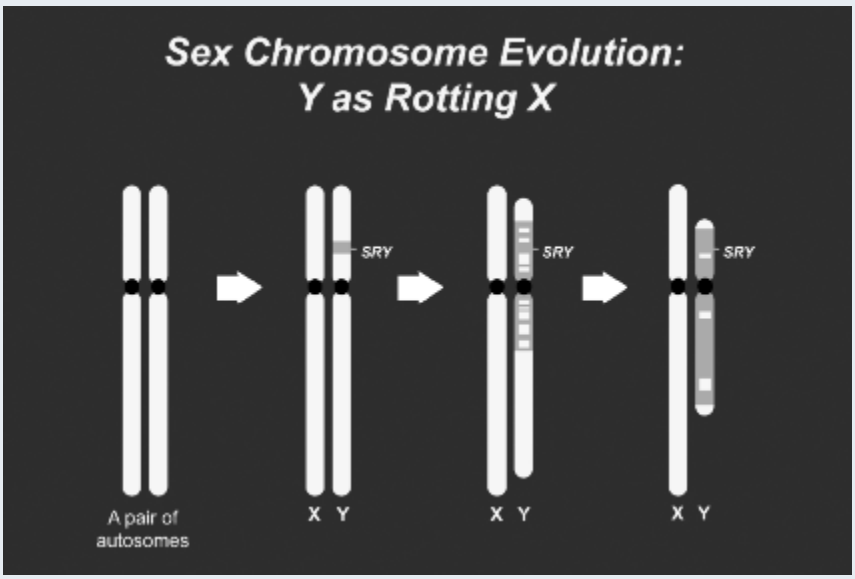


Figure 1

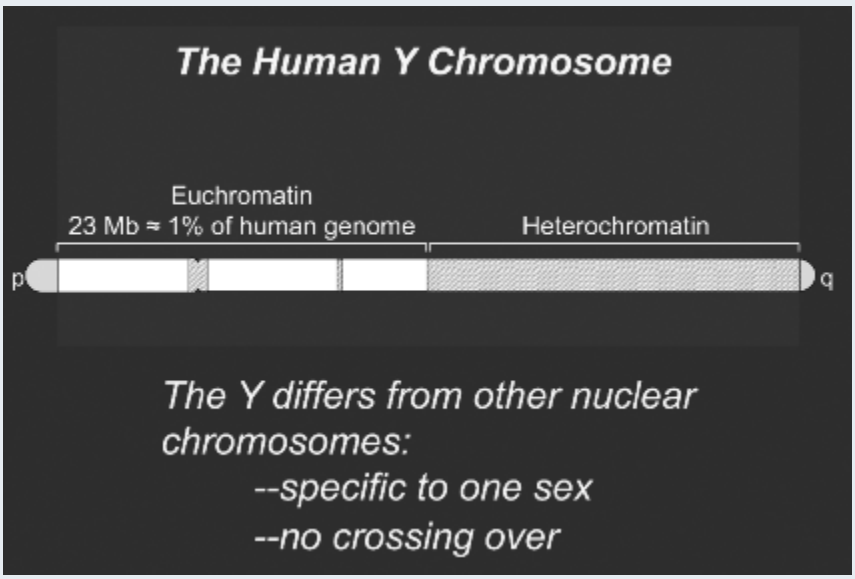


Figure 2

but during the ensuing three hundred million years, all but around 50 were inactivated or lost." And then came the devastating analytic part of this editorial, which took these two data points (300 million years ago, 1,500 genes; today, 50 genes), drew a straight line through them, and reached the following conclusion: "at the present rate of decay, the Y chromosome will self-destruct in around ten million years."

I was not the first member of my laboratory to read this editorial. It was one of my graduate students who came running into my office, tears streaming down his face. We held an emergency lab meeting in which we resolved to pick up the pace of our research. So let me tell you briefly what we have learned in the ensuing decade.

Figure 2 shows a schematic of the human Y chromosome as we understand it. At either end of the chromosome are areas where the X and the Y chromosomes routinely swap genetic information. These areas are called the *pseudoautosomal regions*. In between lies the strictly male-specific part of the Y chromosome, which is distinguished from all other nuclear chromosomes by two features. First, it is specific to one sex; all other chromosomes have traveled through both males and females. Second, it does not participate in crossing-over or swapping with a homologue. In fact, much of the long arm of the Y chromosome is so-called heterochromatic (see Figure 2). That is, it has a very simple, monotonous sequence composition and is such a dense jungle of repeats that, sadly, no molecular biologist has entered the heterochromatic region and returned alive. So tonight, we will instead focus on the euchromatic part of the Y chromosome, which makes up a bit less than 1 percent of the human genome.

I will now summarize all that has been learned in several laboratories, including my own, over the last decade. In doing so, I will contrast the slurs of the past with the understanding of the present.

First, the notion that the Y chromosome is a genetic wasteland: we now understand that the Y chromosome carries about seventy-six protein-coating genes, many of which have specialized roles in the production of sperm.

Second, the image of the Y chromosome as merely a rotting copy of an ancient autosome: we understand today that the Y chromosome still carries some of the genes from that ancestral autosome. However it has also imported other genes from elsewhere in the genome, especially during primate evolution, and has even amplified some of them.

Third, the idea that the Y chromosome is full of junky repeats: we have learned that the Y chromosome actually carries palindromes – that is, almost perfectly symmetrical structures of unbelievable size, scale, and precision.

We have learned in the last ten or fifteen years that the Y chromosome holds many of the answers to male infertility (spermatogenic failure), and it may hold important answers in the case of testis cancer and Turner syndrome as well.

Fourth, the notion that all of the Y chromosome's genes are disintegrating: today we understand that special mechanisms operating within the palindromes contribute to the evolutionary longevity of gene pairs located there.

Fifth, the theory that the Y is headed for extinction: it is now apparent that even the single-copy genes of the Y, those not benefiting from the palindrome mechanism, are doing quite well.

Finally, in an age of translational research, the ultimate slur is that the Y chromosome is of no medical significance. We have learned in the last ten or fifteen years that the Y chromosome holds many of the answers to male infertility (spermatogenic failure), and it may hold important answers in the case of testis cancer and Turner syndrome as well.

In closing, I will turn to the work that we published just this month. It is a tale of three primates, and it directly addresses the claim that the Y chromosome will go extinct within ten million years. I will tell the story through a comparison of the Y chromosomes of three primates. The star of this show is the rhesus monkey, whose Y chromosome we will compare with the Y chromosome of a chimpanzee named Clint as well as that of none other than tonight's honoree, Dr. Patrick Walsh. (This is an appropriate time to disclose publicly the fact that the Y chromosome we sequenced eight or nine years ago was that of Dr. Walsh. We have not worked out all the issues of informed consent, but that will be dealt with later this evening.)

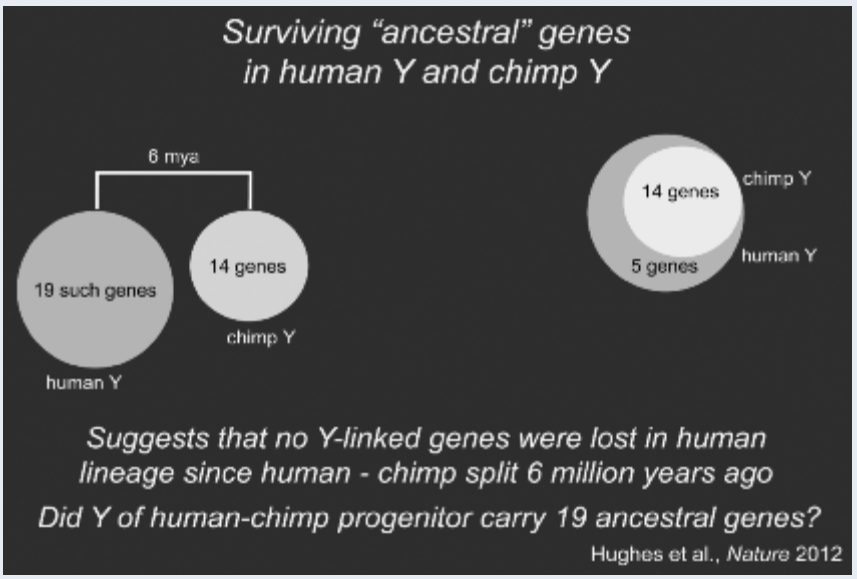


Figure 3

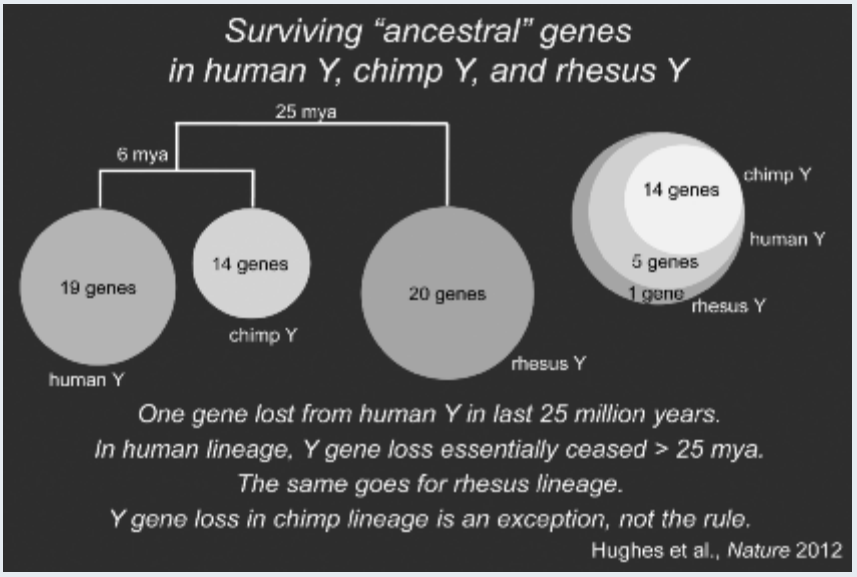


Figure 4

What does comparing Patrick's Y chromosome with those of Clint and the rhesus monkey tell us about the future and the fate of the Y? We are going to look at a set of genes that we called the *ancestral genes*, that is, the genes of the Y's autosomal ancestry. On Patrick's Y chromosome, there are nineteen such genes. Clint the chimp has only fourteen such genes, and these fourteen form a nested subset of Patrick's nineteen (Figure 3). This finding suggests that no Y-chromosomal genes have been lost in the human lineage since the split between

human and chimpanzee six million years ago. But did the Y chromosome of the human-chimpanzee progenitor carry nineteen ancestral genes? To answer this question, we turn to the rhesus monkey, and we switch from a six million-year comparison to a twenty-five million-year comparison. Here, we find that the rhesus monkey has twenty ancestral genes, and that Patrick's nineteen are completely nested within those twenty (Figure 4). In other words, Patrick's Y chromosome carries almost exactly the same set of genes as the Y chromosome of the rhesus; this implies that in the lineage leading to Patrick's Y chromosome and to all other Y chromosomes in this room, one gene has been lost in the last twenty-five million years. In other words, in the human lineage, gene loss on the Y chromosome essentially ceased more than twenty-five million years ago. The same goes for the rhesus lineage. As it turns out, the chimp is the exception, not the rule. So I want all the men in the audience to come away from this lecture having breathed a huge sigh of relief.

Developmental Reproductive Biology: Advances Impacting Disorders of Sexual Development and Ovarian Cancer

Patricia K. Donahoe

Patricia K. Donahoe is the Marshall K. Bartlett Professor of Surgery at Harvard Medical School and Director of the Pediatric Surgical Research Laboratories and Chief Emerita of Pediatric Surgical Services at Massachusetts General Hospital. She has been a Fellow of the American Academy since 1987.

Developmental reproductive biology has had a substantial influence on our clinical care of children with disorders of sexual differentiation. The molecular factors so important in normal sexual differentiation have also influenced the way we care for patients with ovarian cancer.

Sexual differentiation is an amazing cascade of events, each of which must be correct for proper sexual differentiation to occur. One must first have the right chromosomal endowment. Once the gonads under the influence of this chromosomal endowment have properly differentiated, they must make the right hormones. Then other tissues must respond appropriately to those hormones in order for an appropriate phenotypic male or female to eventuate. Sexual differentiation, which occurs midway through mammalian development after the primitive streak forms and before gastrulation, is driven by the intermediate mesoderm, which is located between the ectoderm and the endoderm in the early embryo. At that time, a number of transcription factors come into play, allowing further differentiation of the intermediate mesoderm into the *urogenital ridge*.

The urogenital ridge is posteriorly and dorsally placed in the embryo and is sexually indifferent until the gonad has declared itself as a testis or an ovary (Figure 1); both male and the female reproductive tracts are present and in close approximation, at this time, as are the subjacent kidneys and superjacent adrenals. The urogenital ridge is then exposed to the transcriptional master switch, the sex-differentiation gene SRY, located on the sex-determining region of the *Y* chromosome. The only function ascribed to this tiny gene is to bend DNA. One wonders how such a potent master switch can be such a simple molecule. As a transcription factor, it is responsible for the differentiation of the somatic components of the gonad.

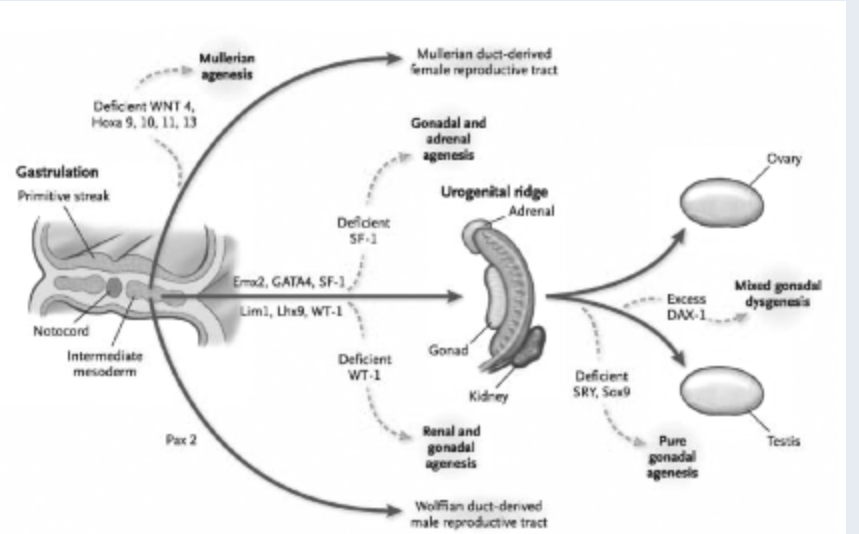
Before somatic differentiation of the gonad occurs, a small number of cells within the epiblast differentiate to become germ cells. These germ cells, which perpetuate pluripotency and propagate the gene pool, undergo an extensive migration from the epiblast, along the primitive streak, and to the hindgut from which they eventually populate the differentiating gonad in the urogenital ridge.

One of Dr. Page's great contributions, in addition to defining the sex-determining region of the Y chromosome, was the discovery of the mechanisms contributing to meiosis inhibition, which differentiates male and female gonads, as female germ cells enter meiosis just before birth, while the male gonad produces a "meiosis inhibit-

ing factor" which prevents meiosis until puberty, many years later.

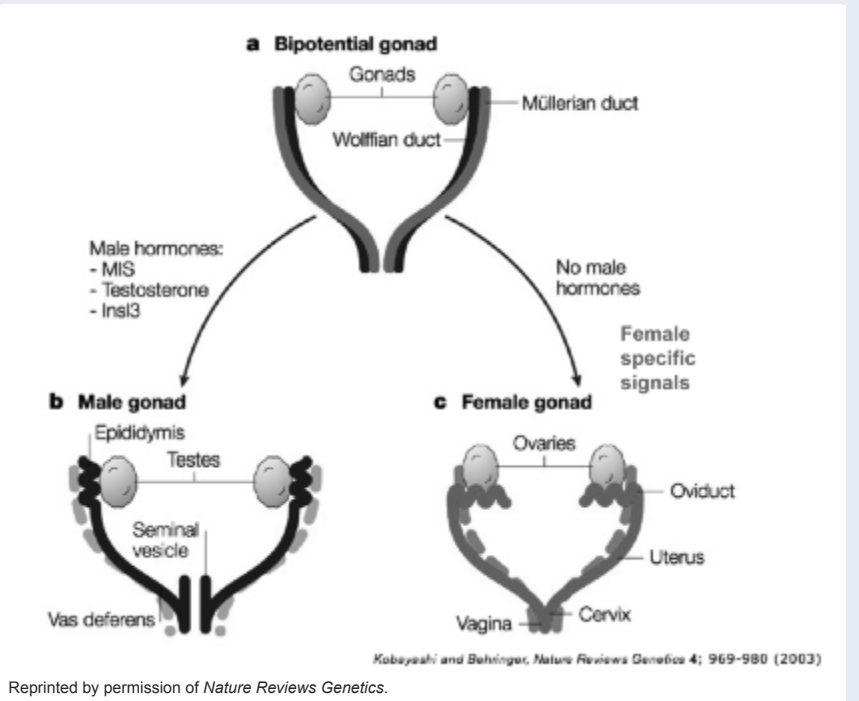
If the gonad differentiates as a testis under the influence of SRY, it produces two products. One is testosterone, which is further modified by five alpha reductase, one of the genes that Patrick Walsh discovered with his early mentor, Jean Wilson. This reduced form of testosterone acts on the external genitalia, resulting in male differentiation. Under the influence of dihydrotestosterone (dHT), the genital tubercle becomes a phallus, and the genital folds become the scrotal organs housing the descended gonad. In the face of syndromes resulting in testosterone deficiency, this differentiation cannot be completed, resulting in smaller structures. There are also syndromes in which the adrenal produces an excess of testosterone, which, in an XX female, will influence the development of the external genitalia to a more male phenotype; in these patients the clitoris is enlarged and the labia are accentuated as scrotal folds. We undertake surgery in XX patients who were exposed to excess endogenous testosterone when they are very young to reduce both the clitoris and the labia and to bring the vagina down to the perineum so that after surgery, the 46XX female patient has a small normal appearing female clitoris, petite labial folds, and an exteriorized vagina.

The other protein made by the differentiated testis is Müllerian Inhibiting Substance (MIS), with which I and my colleagues have had a lifelong interest. In the male, this potent hormone is responsible for complete regression of the Müllerian duct that would otherwise go on to form the Fallopian tubes, the uterus, and the vagina of the female (Figure 2). We hypothesized that if this protein can cause complete regression of the Müllerian duct, then it might be a potential therapeutic against tumors of Müllerian duct origin (that is, cancers of the Fallopian tube,



Reprinted by permission of the *New England Journal of Medicine*.

Figure 1



Reprinted by permission of *Nature Reviews Genetics*.

Figure 2

uterus, or cervix). Dr. Robert Scully, a renowned reproductive pathologist at the Massachusetts General Hospital, suggested, "Look also at ovarian cancer because ovarian cancers recapitulate the Müllerian duct of the embryo." In validating this prediction, over the last few decades, we have purified MIS and, with colleagues at Biogen, have cloned the gene for MIS and scaled up its production. We later (along with many other labs studying this subject) cloned its receptors and studied its signal transduction pathway. Meanwhile we defined its clinical use in ovarian, breast, prostate, cervical, and endometrial cancers. To scale up production of MIS, we collaborated with Ipsen to develop MIS for potential clinical trials against ovarian cancer. This scaled human recombinant MIS inhibited ovarian cancers *in vitro*, as well as in animals treated *in vivo* for long periods.[1]

More recently, we began to consider the possibility that ovarian cancer is a stem cell disease. Could we isolate its stem cells and determine their responsiveness to MIS? This hypothesis was raised since gynecologists-oncologists can be seemingly 100 percent successful in eradicating ovarian cancer when surgery is combined with chemotherapeutic agents, but in 70 percent of patients, the tumors return and are lethal within one or two years. We looked for markers that would allow us to enrich the stem cell population, screened 130, and selected those markers that would be gentle to the cells when used for separation and compatible with flow cytometry. The marker panel chosen allowed enrichment of a select stem cell-like population of tumor cells, validated by their ability to form colonies and migrate *in vitro*, and, when injected in mice after limiting dilution, to show early tumor formation.

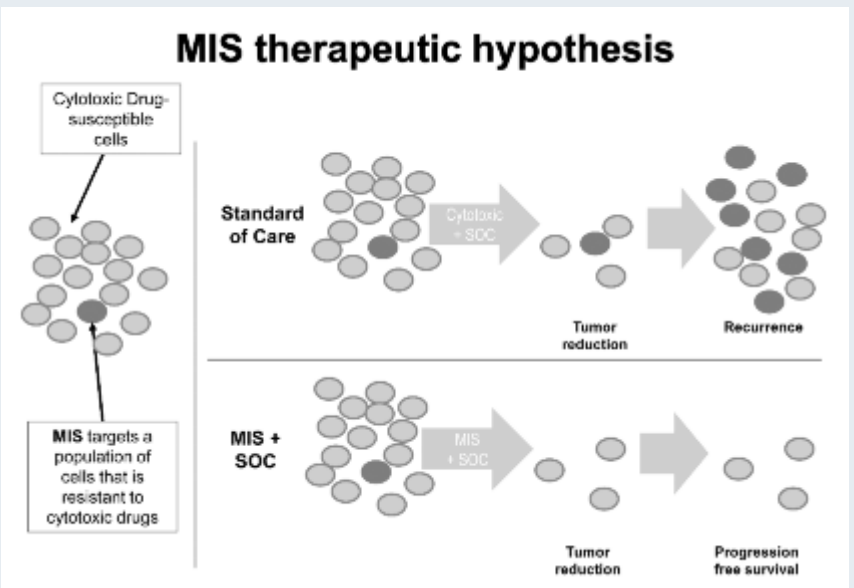


Figure 3

As we expected, these stem cell populations responded to MIS as well as to a small molecule MIS mimetic previously discovered in the laboratory.[2] But to our surprise, when we exposed this select population to the chemotherapeutic agents that we currently use to treat ovarian cancer, we stimulated that population. One result showed a twentyfold growth of those select tumor cells treated with doxorubicin and a four to fivefold growth of those treated with cisplatin.[3] Since this could represent a ratio change because the chemotherapeutic agents kill off so many other cells, we then confirmed by using colony formation assays that the same phenomenon occurred quantitatively.

The implications of this finding, recently published in the *Proceedings of the National Academy of Sciences*, is that ovarian cancers are initially heterogeneous with a population that not only does not respond to chemotherapeutic agents but is actually stimulated by these clinically used agents.[4] Therefore, our therapeutic strategies and care of our patients must include individualized treatment of the stem cell population as well as the bulk of the tumor. Figure 3 illustrates a suggested shift in the future care of patients

[1] D. T. MacLaughlin and P. K. Donahoe, "Sex Determination and Differentiation," *New England Journal of Medicine* 350 (4) (2004): 367 – 378.

[2] N. Renlund, R. Pieretti-Vanmarke, F. O'Neil, L. Zhang, P. K. Donahoe, and J. Teixeira, "c-Jun N-terminal kinase inhibitor II (SP600125) activates Müllerian Inhibiting Substance type II receptor-mediated signal transduction," *Endocrinology* 149 (1) (2008): 108 – 115; PMCID: PMC2194615.

[3] X. Wei, D. Dombkoski, K. Meirelles, R. Pieretti-Van Marcke, P. P. Szotek, H. L. Chang, F. I. Preffer, P. R. Mueller, J. Teixeira, D. T. MacLaughlin, and P. K. Donahoe, "Müllerian Inhibiting Substance preferentially inhibits stem/progenitors in human ovarian cancer cell lines compared to chemotherapeutics," *Proceedings of the National Academy of Sciences USA* 107 (44) (November 2, 2010): 18874 – 18879; PMCID: PMC2973919.

[4] K. Meirelles, L. A. Benedict, D. Dombkowski, D. Pepin, F. I. Preffer, J. Teixeira, P. S. Tanwar, R. H. Young, D. T. MacLaughlin, P. K. Donahoe, and X. Wei, "Human ovarian cancer stem/progenitor cells are stimulated by doxorubicin but inhibited by Müllerian inhibiting substance," *Proceedings of the National Academy of Sciences USA* 109 (7) (2012): 2358 – 2363.

Developmental reproductive biology has had a substantial influence on our clinical care of children with disorders of sexual differentiation. The molecular factors so important in normal sexual differentiation have also influenced the way we care for patients with ovarian cancer.

with ovarian cancer. We should address not only the bulk of the tumor, which responds very well to standard chemotherapeutic agents, but also the stem cell population that completely evades and is actually stimulated by current chemotherapeutic agents, but responds to MIS. We hope that, in the future, both of these populations will be treated effectively and that the treatments will be selected in a patient-specific manner.

We have scaled up production of MIS and hope to take it to commercial development for treatment of patients. Toward that end, we formed a company, Mulleris Therapeutics Incorporated, and are working to continue the scale-up that we began successfully with Ipsen/Biomeasure in 2008. Future ovarian cancer therapy should continue to provide the standard of care with cryoreductive surgery and platinum-based and Taxol therapies; however, instead of subsequently treating women only when they manifest a recurrence of the tumor, we recommend treating the stem cell population so that recurrence of the tumor is averted (Figure 4).

I would like to thank my colleagues, particularly David MacLaughlin and Jose Teixeira, as none of this work is ever done in isolation. Advances in our understanding of reproductive biology have had an impact on the surgical and endocrinologic management of children born with abnormalities or disorders of sexual differentiation. Some of the discoveries of developmental biology made in the care of these children may also benefit those who face the possibility of reproductive cancers, such as ovarian cancer.

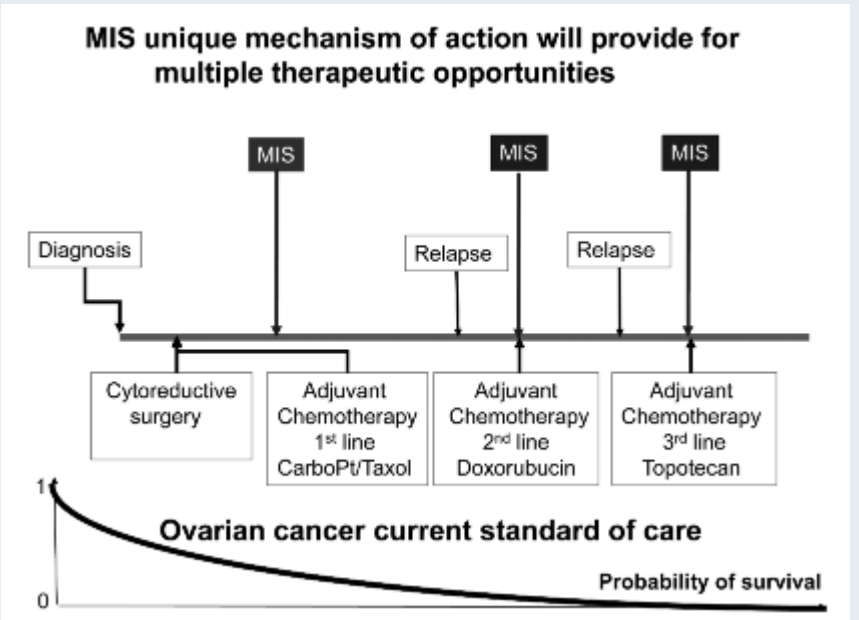


Figure 4

The Impact of Anatomic Discoveries on Prostate Cancer Surgery

Patrick C. Walsh

Patrick C. Walsh, the 2012 Francis Amory Prize recipient, is University Distinguished Service Professor of Urology at Johns Hopkins Medical Institutions.

For tonight's last talk, I am going to tell a story. The story is about the impact of anatomic discoveries on prostate cancer surgery, and it begins with Hugh Hampton Young, the founder of modern urology, who performed the first radical prostatectomy via the perineal approach at Johns Hopkins in 1904. Young was awarded the Amory Prize in 1940. In 1947, an Irish surgeon named Terence Millin developed the radical retropubic approach, which is similar to the transabdominal approach used today, and he received the Amory Prize in 1954.

But by 1970, radical prostatectomies were rarely performed, despite their effective control of cancer, because of major side effects. There was major bleeding, often life threatening. One hundred percent of men who underwent the procedure were impotent, and 10 to 25 percent were completely incontinent. Patients and their physicians thought that the treatment was worse than the disease. When I arrived at Johns Hopkins in 1974, I was surprised to realize that even at the institution where the operation originated, it was rarely performed. At that time, I wondered why the side effects occurred and if they could be prevented. I do not believe that I would have ever made the contributions that I have made to the field of urology had I not been at Hopkins.

Hopkins has been a wonderful place to be. Though it goes unspoken, there is an expectation that your major job is discovery. On my first day, I went to lunch and sat next to the distinguished neuroscientist Vernon Mountcastle, who is a member of the American Academy. I introduced myself, saying, "I'm the new urologist." And although I expected him to respond with the same line I'd heard over and over again – "oh, you're the new plumber" – I heard something different. He said, "What's your field of research?"

To make an important discovery, you need an important problem to work on, and I decided that I would try to find out why the side effects of the prostatectomy occurred. I learned very quickly that these side effects occurred because we did not understand the anatomy around the prostate. Bleeding occurred because the anatomy of the major veins responsible for the bleeding had not been charted. Impotence occurred because the location of the innervation to the corpora cavernosa was not known. And incontinence occurred because our understanding of the sphincter responsible for passive urinary control was incorrect. Why? It was because all of this anatomy had been studied in the adult cadaver. In adults, the prostate is shrouded by dense fascia, which conceals the surrounding anatomy. In the postmortem state, the abdominal viscera compress the pelvic organs into a thick pancake of tissue, and formalin fixatives dissolve the fatty planes, making the identification of anatomic structures impossible. The solution was to use the operating room as an anatomy laboratory and to perform fetal dissections. All of this is

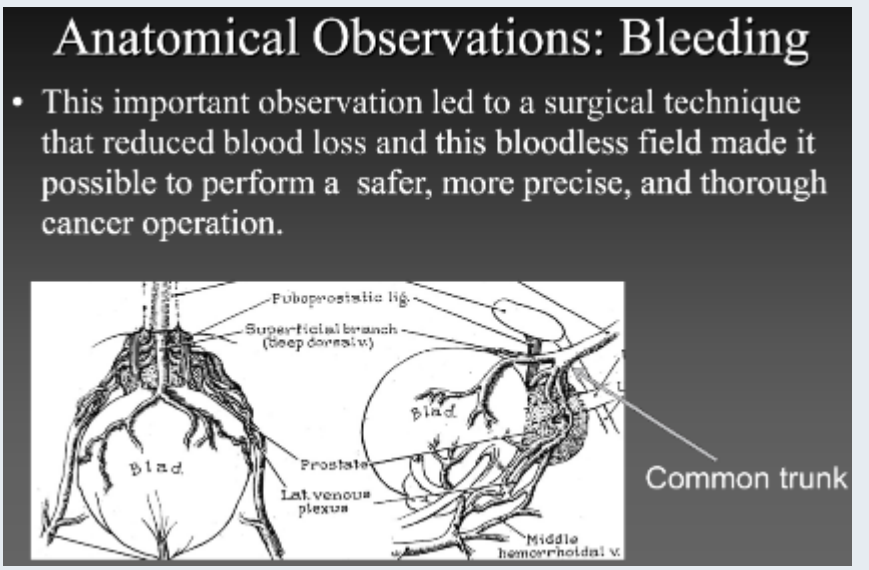


Figure 1

chronicled in an article published on the twenty-fifth anniversary of the first nerve-sparing radical prostatectomy.[1]

The first thing I tackled was bleeding. Using the operating room as an anatomy laboratory, I identified a common trunk over the urethra (Figure 1), hidden underneath a shroud of tissue. Merrill Sosman, the great radiologist at Brigham and Women's Hospital in Boston, had the expression, "You only see what you look for and you only look for what you know." Here, I was looking for something I didn't know. Identifying the common trunk was an important observation because it led to a surgical technique that reduced blood loss; in turn, having a bloodless field made it possible to perform a safer, more precise, and thorough cancer operation.

In 1977, soon after the technique for controlling bleeding was developed, a fifty-eight-year-old man returned three months following surgery and told me that he was fully potent. I wondered, how could this be? At that time, everyone believed that because all men were impotent following surgery, the nerves had to run through the prostate. But I knew from this one case that this was not true. So where were the nerves? The answer was not in any textbook. In 1981, I was a visiting professor at the University of Leiden. I spent the afternoon with neuro-urologist Pieter Donker, professor emeritus and former chairman of the department, who was using a dissecting microscope to study (in a stillborn male infant) the nerves that innervate the bladder. When I asked to see the branches to the corpora cavernosa, the nerves responsible for erectile function, he said that he had never looked. Three hours later, we had identified them outside the prostate. Figure 2

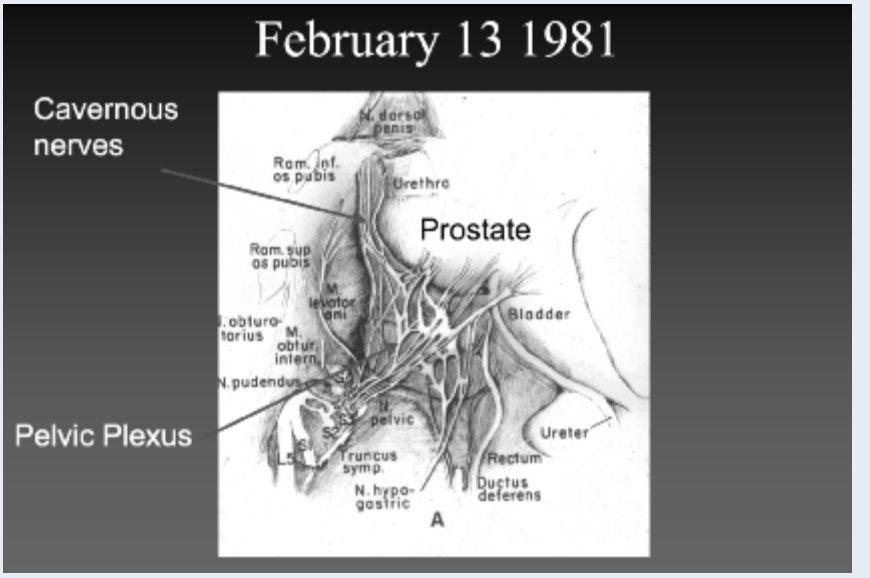


Figure 2

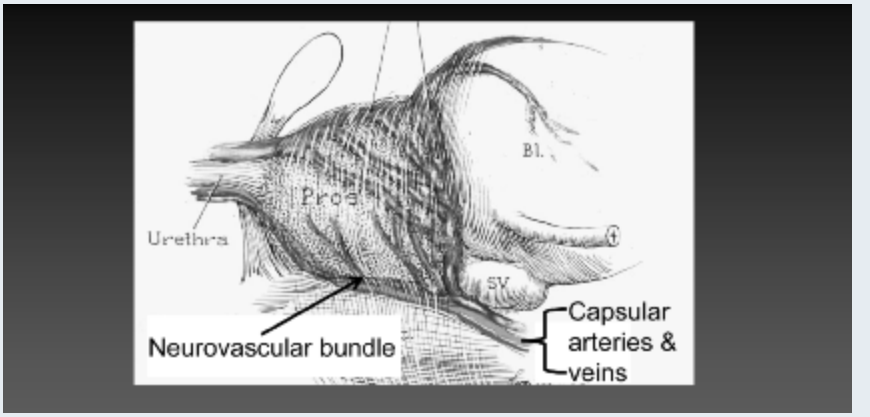


Figure 3

shows the prostate, the urethra, and bladder in the infant cadaver. The nerves that we dissected out reveal the branches to the corpora cavernosa, clearly outside the prostate. Based on this observation, we knew where the cavernous nerves were located in a tiny fetus, much the same way you might have a schematic for your television set, but how would you find that transistor? That is, how could we identify these microscopic structures in the adult male pelvis?

When I returned to Hopkins, I once again used the operating room as an anatomy laboratory. There I identified that the capsular arteries and veins of the prostate traveled in exactly the same location as the nerves in the fetus and speculated that this neurovascular bundle could be used as the intraoperative landmark to identify these microscopic nerves (Figure 3). Armed with that information, on April 26, 1982, I performed the first purposeful nerve-sparing radical prostatectomy. Next month, that patient will have lived thirty years cancer free and with a normal quality of life.

From there, I went on to perform detailed neuroanatomical studies, providing templates for surgeons and delineating the fascia around the prostate (Figure 4). My hope was to make radical prostatectomy a better can-

[1] Patrick Craig Walsh, "The Discovery of the Cavernous Nerves and Development of Nerve Sparing Radical Retropubic Prostatectomy," *The Journal of Urology* 177 (5) (May 2007): 1632 – 1635.

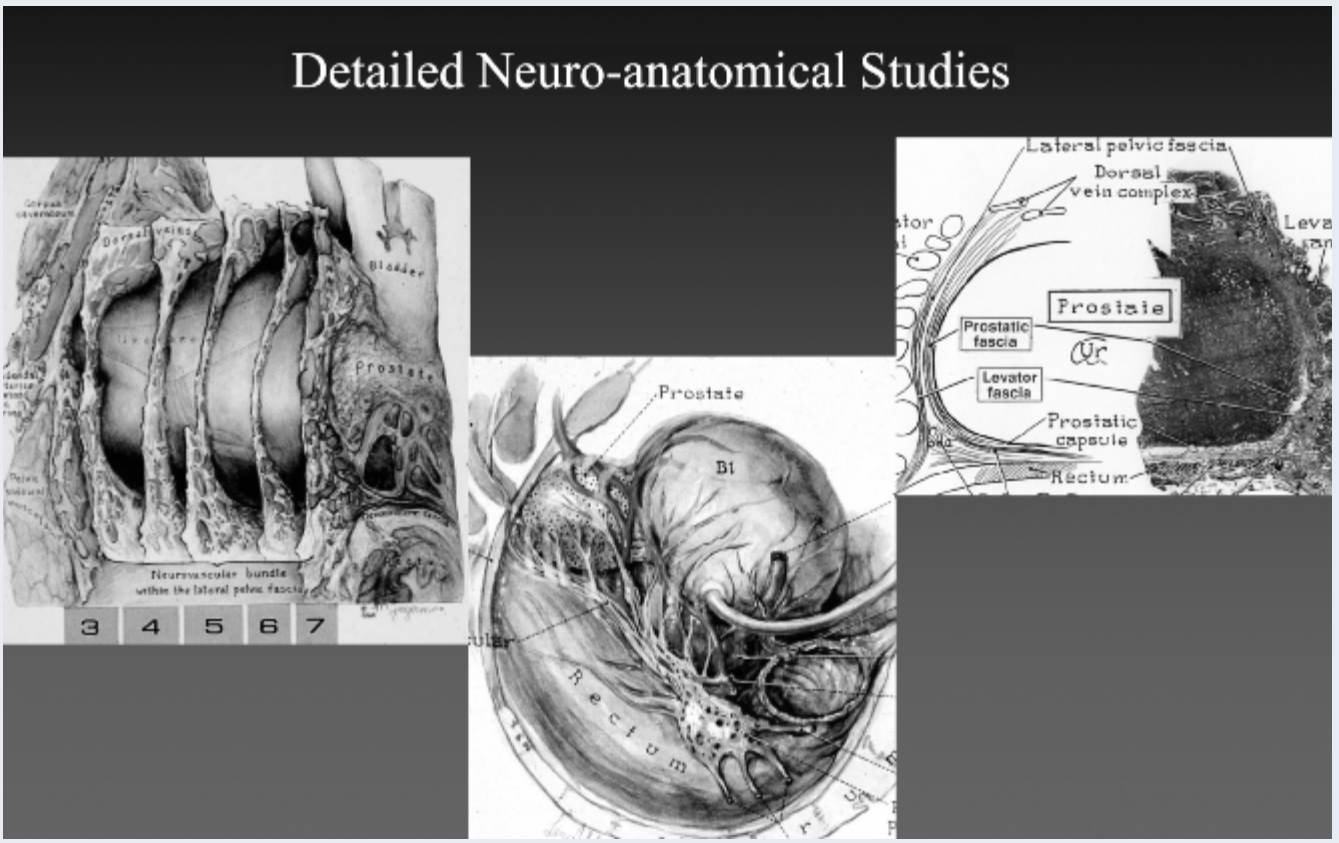


Figure 4

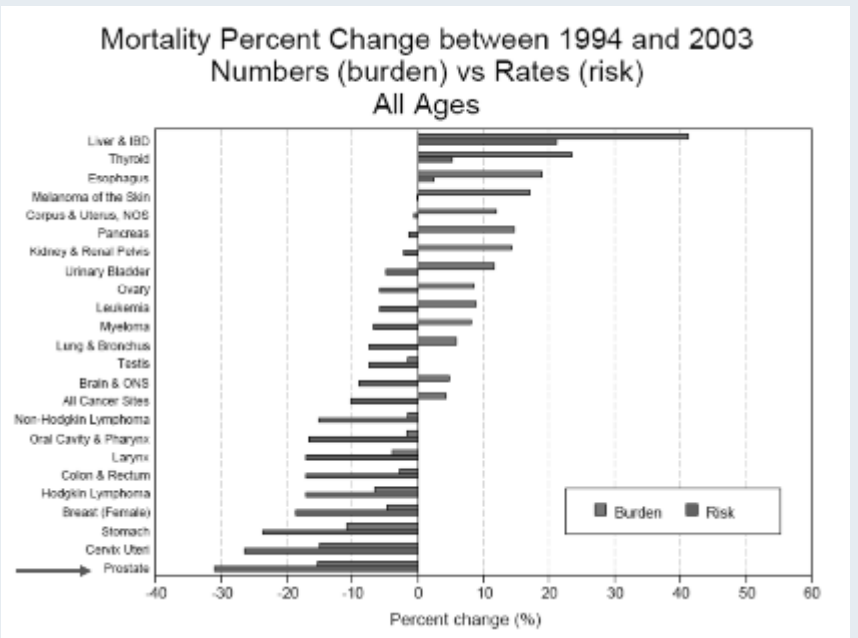


Figure 5

cer operation, and I embarked on a twenty-nine-year journey to perfect the technique. Again, using the operating room as an anatomy laboratory, I changed one thing at a time, resulting in twenty-eight major changes over twenty-nine years in 4,569 patients. I maintained a database from day one, documenting changes in technique, cancer control, and quality of life. I constantly reevaluated outcomes, and eventually, I used video for documentation. I found that I could perform the same operation on two men on the same day, and while one of them would be in perfect health at three months, the other would take a year or longer to recover. I learned that minor differences in technique had a major impact, so I videotaped cases, looked at outcomes, reviewed those videotapes frame by frame (yes, my wife is a saint for allowing me to spend my summer vacations doing that) to identify some of the changes that were made. I then used these videos to teach others.

What were the accomplishments of this work? First, there was a major reduction in death from prostate cancer. Prostate cancer is the most common cancer in men. It is also the second most common cause of cancer death in men in the United States. The Scandinavian Prostate Cancer Group carried out a very brave randomized trial, randomizing men to surgery versus watchful waiting, and last year, in *The New England Journal of Medicine*, the fifteen-year follow-up study was published.[2] Among the men who had benefited the most – that is, men under the age of sixty-five who are most likely to live fifteen years – there was, across the board, a 50 percent relative reduction in metastasis, in death from any cause and in death from cancer.

What is the impact of these results? In 1983, only 7 percent of men with prostate cancer underwent surgery, and radiotherapy was too underpowered to cure. Essentially, no one was being treated with curative intent. However, with the reduction in side effects and improved safety, by 1993, one-third of men – one hundred thousand men that year – underwent surgery. If we apply the results of the Scandinavian trial at fifteen years to today, there should be a dramatic reduction in the number of men dying of the disease or suffering from painful metastasis. Figure 5 shows the changes in mortality in cancers in men and women between 1994 and 2003. The greatest decline in mortality over that decade was the decline in deaths from prostate cancer. The operation was also safer with a reduction in blood loss, which meant that the thirty-day mortality rate fell from 2 percent to 0.2 percent, and the length of stay in the hospital decreased from two weeks to the one to two days that it is today. Another impact is improved quality of life. Today, significant incontinence should be less than 2 percent and sexual function can be preserved in 80 to 90 percent of men who have normal sexual function preoperatively, if it is possible (for optimal cancer control) to preserve both neurovascular bundles and if the procedure is performed by a skilled surgeon.

My hope was to make radical prostatectomy a better cancer operation, and I embarked on a twenty-nine-year journey to perfect the technique.

What has been the impact on research? In breast and colon cancer, tissue was always available for pathologic correlation and biochemical molecular study, which accelerated discovery in these fields. However, prior to the development of nerve-sparing radical prostatectomy, only 7 percent of men with localized disease underwent surgery, and thus only small needle biopsy specimens were available for research. However, the availability of tissue harvested from surgical specimens today has galvanized research. In the long run, this impact on research may be the contribution of surgery that may have the greatest impact in reducing deaths from cancer.

In summary, the impact of anatomic discoveries are: improved surgical exposure, reduced blood loss, wider surgical margins, the ability to preserve potency, improved urinary continence, reduction in deaths from prostate cancer, and the availability of tumor tissue, which has galvanized research in the field.

In closing, I would like to thank the residents, faculty, and support staff, past and present, at Hopkins. Over the last thirty years, they have made possible the discoveries that I have summarized in this presentation. I would also like to thank my patients, who have been my partners in discovery. ■

To view or listen to the presentations, visit http://www.amacad.org/events/statedmeetings/1983_amory.

[2] Anna Bill-Axelson, Lars Holmberg, Mirja Ruutu, Hans Garmo, Jennifer R. Stark, Christer Busch, Stig Nordling, Michael Häggman, Swen-Olof Andersson, Stefan Bratell, Anders Spångberg, Juni Palmgren, Gunnar Steineck, Hans-Olov Adami, and Jan-Erik Johansson; for the SPCG-4 Investigators, "Radical Prostatectomy versus Watchful Waiting in Early Prostate Cancer," *New England Journal of Medicine* 364 (May 5, 2011): 1708 – 1717.

Regional Forums on the Humanities and Social Sciences

The Academy's Commission on the Humanities and Social Sciences is advancing arguments for the importance of these disciplines to the nation's intellectual and economic strength, public institutions, and civil society. The Commission is led by **Richard H. Brodhead**, president of Duke University, and **John W. Rowe**, chairman emeritus of Exelon Corporation. Commission members include leaders from higher education, business, the arts and humanities, and public affairs.

In recent months, the Commission has hosted a series of regional forums to collect testimony on the value of the humanities and social sciences. These forums, undertaken at the suggestion of **Philip Bredesen**, former governor of Tennessee and chair of the Commission's Publicity Committee, are providing members with a more complete understanding of the many communities within and beyond academia that draw on the humanities and social sciences for their livelihood and well-being.

The forums have received extensive media coverage and have identified new participants and new audiences for an inclusive public campaign to follow the publication of the Commission's initial report, forthcoming in 2013.

Cambridge Forum – July 17, 2012

The Academy piloted the first forum at its Cambridge headquarters in July. The meeting, organized in collaboration with the six humanities councils of New England, focused on civics education and the importance of teaching history. Commissioners **David Souter** (Supreme Court of the United States), **Annette Gordon-Reed** (Harvard University), **Philip Bredesen** (former governor of Tennessee), and **Richard Freeman** (Harvard University) joined members of the regional humanities and education communities, including the leader of a Bhutanese refugee community, a deputy commissioner of state economic development, and an associate justice of the Massachusetts Appeals Court, as well as educators and representatives of state humanities councils.

Justice Souter, pondering the importance of the humanities, said: "I think we want to promote – what I think it is essential to American government that we do promote – is a sense and understanding that we do not exist in our opinions in isolation. The humanities perhaps ultimately teach that . . . we are not alone."

Richard Freeman (Harvard University) and **Annette Gordon-Reed** (Harvard University)

David Souter (Supreme Court of the United States) and **David Watters** (New Hampshire State Senate; University of New Hampshire)

Stanford Forum – September 4, 2012

A forum held at Stanford University in September, chaired by Stanford President **John Hennessy**, discussed the importance of the humanities and social sciences to international relations, national security, and global competitiveness. Speakers included several former Cabinet members as well as a Stanford undergraduate student. Representatives from universities; the military; private enterprise; and Cal Humanities, the state humanities council, participated in the day's events. Former Secretary of State **Condoleezza Rice** established a common theme for the conversation when she linked a nation's self-awareness with its capacity to tackle international challenges: "We are, as Americans, losing the sense of 'us.' One way not to fear 'them' is to have a strong sense of 'us.'" Retired Army Lieutenant General and former U.S. Ambassador to Afghanistan **Karl Eikenberry** pointed out that sound international policy requires a deep knowledge of other cultures and languages, as well as an understanding of our own nation's history and traditions: "If you aspire to be a transnational bridge, you have to be grounded on both sides of the river."

Condoleezza Rice (Stanford University)

Karl Eikenberry (Stanford University) and **William J. Perry** (Stanford University)

Gerald Early (Washington University in St. Louis)

St. Louis Forum – September 7, 2012

In September, **Gerald Early** (Washington University in St. Louis) organized and moderated a forum at the Missouri History Museum in St. Louis on the importance of the humanities and social sciences in local communities. Leaders of fifteen Missouri cultural institutions and community groups joined in the day's discussion. Chief **Glenna Wallace** of the Eastern Shawnee Tribe declared the study of history crucial for creating a sense of self and community among Native Americans. **Geoff Giglierano**, executive director of the Missouri Humanities Council, extended that message to the entire nation: "Just as an individual who has a flawed or incomplete memory and conscience can't function, a society, a civilization, a nation with a flawed or incomplete memory and conscience is in a lot of trouble. It is not going to function."

Regional Forums, continued

Miami Forum – September 14, 2012

Philip Bredesen (former Governor of Tennessee), **Donna Shalala** (University of Miami), **Leslie Berlowitz** (American Academy), and **Eduardo Padrón** (Miami Dade College)

Donna Shalala, president of the University of Miami, and **Eduardo Padrón**, president of Miami Dade College, cohosted a forum in September on the importance of the humanities to the multiethnic culture of southern Florida and to the development of a shared civic identity. The meeting featured singer **Gloria Estefan**, who testified on the critical importance of funding art, music, history, and civics courses. Panelists stressed how essential it is for members of the wider humanities and social sciences communities to form partnerships across the education continuum, and how powerful those collaborations can be. "It is through the humanities that we best record, share, and pass on the truths that make up the human experience," said **Alina Interián**, executive director of the Florida Center for the Literary Arts at Miami Dade College. "[P]eople who learn how to think, who are trained how to think, are better problem solvers, more generous in their understanding of others, better able to understand many perspectives before making decisions. They make better citizens in the kind of democratic, free societies we value and cherish and for which we have fought so hard in our country."

Durham Forum – October 26, 2012

In October, Commission Cochair and Duke University President **Richard Brodhead** hosted a forum on how to bolster teaching and research in the humanities and social sciences at a time when public support and student enrollments are falling. Nearly two dozen North Carolina-based English and social studies teachers, arts administrators, and educational policy leaders offered their impressions of the state of the humanities. Attendees included former North Carolina Governor **James B. Hunt, Jr.**, interim Chancellor of North Carolina Central University **Charles Becton**, and President of the National Humanities Center **Geoffrey Harpham**. Many speakers noted that the humanities offer students a deeper self-understanding and are key to solving the problems of the future. **Todd Roberts**, chancellor of the North Carolina School of Science and Mathematics, argued for the crucial connections between scientific, social scientific, and humanistic research: "Grand challenges can't be solved by science and technology alone."

James B. Hunt, Jr. (former Governor of North Carolina) and **Richard Brodhead** (Duke University)

New York Forum – November 7, 2012

Anthony Marx, president of the New York Public Library; **Pauline Yu**, president of the American Council of Learned Societies; and **Carl H. Pforzheimer III**, manager of Carl H. Pforzheimer and Co. LLC, cohosted a forum in November on the importance of libraries and advanced research in the humanities. Historians, novelists and poets, architects, artists, and librarians spoke about the crucial importance of public access to books, research documents, and venues for the exchange of ideas. In his opening remarks, Anthony Marx cited the enormous crowds that visited the library in the aftermath of Hurricane Sandy as evidence that "people will fight their way through a storm to be able to do the work of the humanities, and to be able to inspire each other by doing it together." Many speakers joined Pauline Yu in stressing the need to support ongoing, advanced research in the humanities as part of an overall strategy for preserving and advancing the intellectual life of the nation: "[T]he knowledge of the humanities will not vanish instantly, but it will ineluctably degrade if it is not constantly renewed by rigorous research and the transmission of advanced expertise to the next generation of scholars." ■

Pauline Yu (American Council of Learned Societies)

Anthony Marx (New York Public Library)

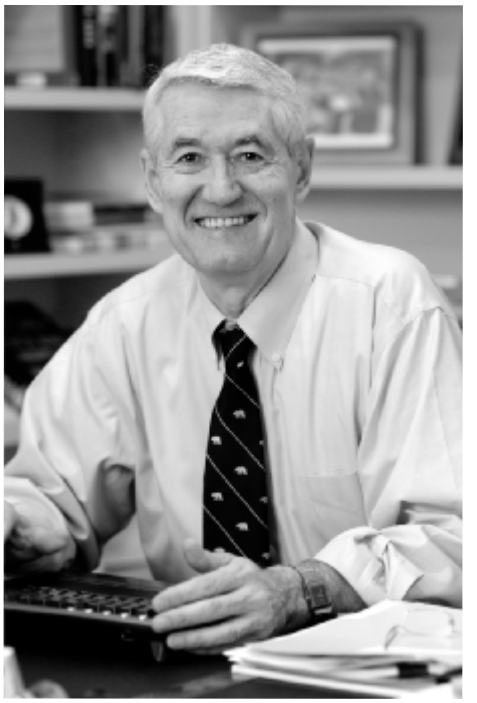
Audio and video from the forums are available on the Academy website at http://www.humanitiescommission.org/RecentActivity/Events.aspx.

The Lincoln Project: Excellence and Access in Public Higher Education

A new Academy initiative – The Lincoln Project: Excellence and Access in Public Higher Education – will advance a national discussion on the importance of public colleges and universities. Although they are key engines of economic growth, innovation, and upward mobility, these schools are facing cutbacks in government support, competition from for-profit education providers and foreign universities, and pressures to respond to technological changes.

The initiative will engage state and federal policy-makers, elected officials, university and business leaders, philanthropists, learned societies, and, ultimately, the general public to improve understanding and to influence education policy at the state, federal, and institutional levels. Through a series of national conferences, it will reinforce the work of other organizations and advocacy groups concerned with these issues.

The Lincoln Project is named for President Abraham Lincoln to commemorate his role in signing the Morrill Act of 1862, which laid the groundwork for the nation's unparalleled public university system.



Robert J. Birgeneau (pictured above), chancellor of the University of California, Berkeley, will lead the project, along with a group of eminent and experienced advisors. ■

The Lincoln Project: Excellence and Access in Public Higher Education

Project Chair

Robert J. Birgeneau
Chancellor, University of California, Berkeley

*Advisors**

Lawrence S. Bacow
Former President, Tufts University

Gene Block
Chancellor, University of California, Los Angeles

Henry E. Brady
Dean, Goldman School of Public Policy, University of California, Berkeley

Nancy E. Cantor
Chancellor and President, Syracuse University

John T. Casteen III
Former President, University of Virginia

Mary Sue Coleman
President, University of Michigan

Matthew Goldstein
Chancellor, City University of New York

Robert D. Haas
Chairman Emeritus, Levi Strauss & Co.

Earl Lewis
Incoming President, Andrew W. Mellon Foundation

William Powers, Jr.
President, University of Texas at Austin

Gerald Rosenfeld
Senior Advisor and Vice Chairman of U.S. Investment Banking, Lazard Ltd.

Phyllis Wise
Chancellor, University of Illinois at Urbana-Champaign

Frank D. Yeary
Chairman, CamberView Partners LLC

*partial list

Examining U.S. Energy Policy

The interconnected challenges of climate change, an increased global demand for energy, and America's need for enhanced energy security will require a substantial transformation of the U.S. energy system, including the large-scale adoption of new energy technologies. The American Academy's Alternative Energy Future project (AEF) is identifying behavioral and regulatory barriers to this transformation and exploring how policy-makers could best anticipate and overcome these obstacles using lessons from the social sciences.

Creating New Research Networks

The Academy organized a workshop in Washington, D.C., on November 29 – 30, 2012, that gathered investigators from the government, academic, and industry sectors to discuss novel approaches to understanding and overcoming the social and behavioral barriers to the adoption of new energy technologies. Topics included considering human behavior in technology development, engaging the public on new technologies, and facilitating large-scale technology deployment.

Participants discussed how social scientific knowledge could be applied to new and existing energy programs, and how to scale up successful state and local initiatives to the regional and national levels. The workshop also established the foundation for a network of researchers, based at the Academy, that will develop guidelines for evaluating the application of social science research to government-funded energy projects. Participants discussed how the network's activities and membership could be designed to maximize the exchange of research tools and data.

Participants at the workshop on creating new research networks: Douglas Arent (Joint Institute for Strategic Energy Analysis) **and Holmes Hummel** (U.S. Department of Energy)

Shaping Durable and Flexible Energy Policy

Legal scholars, political scientists, and members of the AEF project committee convened at the Academy's headquarters on February 14 – 15, 2013, for a workshop on "Establishing a Durable Governance Framework for Energy Policy." Project Chair **Robert W. Fri** (Resources for the Future) moderated the discussion with **Ann Carlson** (University of California, Los Angeles, School of Law) and **Dallas Burtraw** (Resources for the Future). The meeting focused on the urgent need for a blueprint for a U.S. energy policy that is durable enough to last for decades, yet flexible enough to change as new socioeconomic, technological, and environmental conditions arise.

The participants discussed the factors that contribute to sustainable energy policies, identified critical areas for future research, and suggested methods to encourage interdisciplinary scholarship on this question. They considered how stable previous policies have proven to be and whether these policies have successfully adapted to subsequent societal and scientific changes. Other topics explored at the meeting included the role of agency discretion versus detailed legislation or other statutory directives; the roles of different tiers of government, from the local to the federal level; and the role of stakeholder groups, including Public Utility Commissions and private firms that develop new energy technologies.

Examining U.S. Energy Policy, continued

Winter 2013 *Dædalus* "The Alternative Energy Future"

Robert W. Fri (Resources for the Future): *The Scope of the Transition*

Hal Harvey (Energy Innovation; University of Chicago), **Franklin M. Orr, Jr.** (Stanford University) & **Clara Vondrich** (ClimateWorks Foundation): *A Trillion Tons*

Jon A. Krosnick (Stanford University) & **Bo MacInnis** (Stanford University): *Does the American Public Support Legislation to Reduce Greenhouse Gas Emissions?*

Naomi Oreskes (University of California, San Diego) & **Erik M. Conway** (Pasadena, California): *The Collapse of Western Civilization: A View from the Future*

Kelly Sims Gallagher (Tufts University): *Why & How Governments Support Renewable Energy*

Thomas Dietz (Michigan State University), **Paul C. Stern** (National Research Council) & **Elke U. Weber** (Columbia University): *Reducing Carbon-Based Energy Consumption through Changes in Household Behavior*

Roger E. Kasperson (Clark University) & **Bonnie J. Ram** (Ram Power LLC): *The Public Acceptance of New Energy Technologies*

Robert O. Keohane (Princeton University) & **David G. Victor** (University of California, San Diego): *The Transnational Politics of Energy*

Dallas Burtraw (Resources for the Future): *The Institutional Blind Spot in Environmental Economics*

Ann E. Carlson (University of California, Los Angeles) & **Robert W. Fri** (Resources for the Future): *Designing a Durable Energy Policy*

Michael H. Dworkin (Vermont Law School), **Roman V. Sidortsov** (Vermont Law School) & **Benjamin K. Sovacool** (Vermont Law School): *Rethinking the Scale, Structure & Scope of U.S. Energy Institutions*

Rosina M. Bierbaum (University of Michigan) & **Pamela A. Matson** (Stanford University): *Energy in the Context of Sustainability*

Stephen Ansolabehere (Harvard University) & **Robert W. Fri** (Resources for the Future): *Social Sciences & the Alternative Energy Future*

New *Dædalus* on "The Alternative Energy Future"

The Winter 2013 issue of *Dædalus*, the Journal of the American Academy, on "The Alternative Energy Future" highlights questions where existing social science research could be of use as well as areas where additional research is needed. A concluding essay by guest editors **Robert Fri** and **Stephen Ansolabehere** outlines a research agenda for social science, including questions that are especially relevant to future energy policy choices. Stakeholders from all sectors will need to cooperate to find answers to these questions and to facilitate the transformation in U.S. energy policy that will be required to solve the energy challenges of the twenty-first century. ■

For more information about the Alternative Energy Future project, visit http://www.amacad.org/projects/alternativeNEW.aspx.

Jody Freeman (Harvard Law School) and ***Dædalus*** **co-guest editor** **Stephen Ansolabehere** (Harvard University)

Nuclear Power in Southeast Asia

With nearly every nation in Southeast Asia exploring the possibility of developing a civilian nuclear power program, the Academy's Global Nuclear Future (GNF) Initiative is working to create a culture of safety and security in the operation and oversight of nuclear facilities in the region.

The Academy recently convened delegates from a dozen nations for an off-the-record meeting in Hanoi, Vietnam. Senior government officials and policy experts from Egypt, India, Indonesia, Japan, Malaysia, the Philippines, Russia, Singapore, South Korea, Sri Lanka, Thailand, the United States, and Vietnam candidly discussed the political, technical, and nonproliferation issues related to the expansion of nuclear energy in Southeast Asia. The goal of the meeting – and of the larger Initiative – was to identify, refine, and promote measures that will limit the safety, security, and proliferation risks associated with a growing global nuclear footprint.

According to **Scott D. Sagan** (Stanford University), who codirects the GNF Initiative with **Steven E. Miller** (Harvard University), "A key strand of the GNF project has focused on two regions – Southeast Asia and the Middle East – where there is strong government interest in nuclear power, but limited technical capacity, a fledgling regulatory infrastructure, and uncertain public acceptance of the technology."

At the Hanoi meeting, policy-makers from throughout Southeast Asia, as well as technical experts and industry representatives from countries with established nuclear programs, outlined the nuclear power plans of individual states and shared best practices for ensuring that the programs advance as safely as possible. Delegates discussed ways to create a culture of safety in the operation of nuclear facilities in the post-Fukushima era, methods of ensuring the transparency of civilian nuclear power programs, and ideas for managing the nuclear fuel cycle, including the concept of regional storage and disposal of used fuel, among other topics.

Vietnam Vice Minister of Science and Technology **Le Dinh Tien**, U.S. Ambassador to Vietnam **David Shear**, and GNF codirector **Scott D. Sagan** (Stanford University)

Vietnam's Vice Minister of Science and Technology, **Le Dinh Tien**, told conference participants that his country hopes to have nuclear power generation online by 2020. He said that the Academy-sponsored meeting will help provide "common ground for the safe, secure, and peaceful use of nuclear energy."

U.S. Ambassador to Vietnam **David Shear** also addressed the group. He noted that all the nations in the region are growing rapidly and are in various stages of weighing nuclear power to meet increased energy demands. "No one nation can ensure the safe and secure development of nuclear energy," Shear said. "That's why conferences like this are so important."

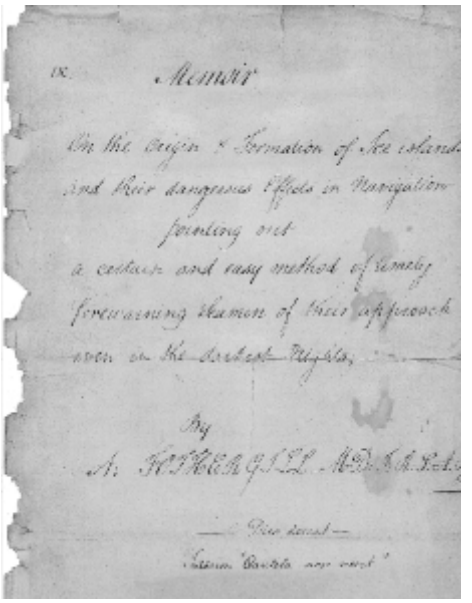
The regional strategies that were discussed at the meeting will be disseminated to the broader international nuclear-energy policy community. The GNF project is organizing a series of publications that will address the economic, technical, public policy, and security challenges faced by nations in Southeast Asia that do not currently have nuclear power plants but have plans to acquire them or are in the process of doing so.

The meeting in Hanoi, organized in collaboration with the Vietnam Atomic Energy Agency, followed Academy-sponsored regional conferences on the Global Nuclear Future in the United Arab Emirates in 2009 and in Singapore in 2010. ■

From the Archives

Anthony Fothergill (1732 – 1813) was an Edinburgh-educated physician and natural historian. In 1806, he sent an essay to the Academy entitled "Memoir on the origin & formation of ice-islands, and their dangerous effects in navigation, pointing out a certain and easy method of timely forewarning seamen of their approach even in the darkest night." Though some of his points had been anticipated independently by François Péron, a French naturalist and explorer, Fothergill made the following observations in his essay:

2. That the origin, formation, and destination of ice islands, hitherto unknown, may now perhaps admit of a probable explanation, that may excite others to complete the discovery.
3. That the arctic regions alone give birth to ice islands, and the liquefaction of the polar ices to the tides, as has been supposed seems highly improbable.
4. That the ice islands observed in the more temperate seas, where the temperature decreases downwards, may originate where least expected, viz. at the bottom; especially where rocks and other conducting bodies overspread the surface.
5. That the notion of central fire is groundless; and that objections, drawn from it, or volcanoes, are alike inadmissible.
6. That ice in the open air evaporates even below the point of congelation, and that evaporation generates cold and accumulates ice in the curious cave of Grace Dieu most in summer.
7. That the evils, occasionally produced by ice islands, are complained of, while their beneficial effects on the animal and vegetable creation have hitherto passed unnoticed.
8. That winds, blowing over them, temper the intense heat of summer in the adjacent climates.
9. That ice islands may be guarded against by vigilance, and by ships well constructed.
10. That the thermometer may be rendered preeminently useful in pointing out the approach of rocks, shoals, and shores; but particularly of ice islands and the Gulph stream.
11. That the barometer may also greatly contribute, and that these instruments should jointly constitute a part of the nautical apparatus, and daily observations be noted in the journals.
12. Finally, that by due attention to the above rules those dangerous obstacles to navigation may be detected, which elude the magnetic needle and all other instruments; and thus might the art of navigation be improved, science promoted, and many disasters prevented.


IX. Memoir

On the Origin & Formation of Ice islands and their dangerous Effects in Navigation pointing out a certain and easy method of timely forewarning Seamen of their approach even in the darkest Nights.

By

A. Fothergill M.D. F.A.S.E.L.

Cover page of Fothergill's treatise on ice-islands

Reprinted from the *Memoirs of the American Academy of Arts and Sciences*, vol. 3, no. 1 (1809), 69.

Select Prizes and Awards to Members

Nobel Prizes, 2012

Chemistry

Robert Lefkowitz (Duke University Medical Center)

Medicine

John Gurdon (University of Cambridge)

Economics

Alvin Roth (Harvard University)

Lloyd Shapley (University of California, Los Angeles)

Wolf Prizes, 2013

Architecture

Eduardo Souto de Moura (Universidade do Porto; Souto Moura-Arquitectos SA)

Mathematics

Michael Artin (Massachusetts Institute of Technology)

George Mostow (Yale University)

Chemistry

Robert Langer (Massachusetts Institute of Technology)

Agriculture

Jared Diamond (University of California, Los Angeles)

National Medal of Science

Allen Bard (University of Texas at Austin)

Sallie Chisholm (Massachusetts Institute of Technology)

Sidney Drell (Stanford University)

Sandra Faber (University of California, Santa Cruz)

Sylvester James Gates (University of Maryland)

Solomon Golomb (University of Southern California)

M. Frederick Hawthorne (University of Missouri-Columbia)

National Medal of Science, *continued*

Leroy Hood (Institute for Systems Biology)

Barry Mazur (Harvard University)

Lucille Shapiro (Stanford University School of Medicine)

Anne Treisman (Princeton University)

National Medal of Technology and Innovation

Frances Arnold (California Institute of Technology)

Robert Langer (Massachusetts Institute of Technology)

Academy Fellows elected to the Institute of Medicine

Jacqueline K. Barton (California Institute of Technology)

Don W. Cleveland (University of California San Diego School of Medicine)

James J. Collins (Boston University)

Vishva M. Dixit (Genentech Inc.)

John P. Donoghue (Brown University)

Robert M. Groves (Georgetown University)

David Julius (University of California, San Francisco)

Dan R. Littman (New York University School of Medicine)

Terry R. Magnuson (University of North Carolina School of Medicine)

Thomas Maniatis (Columbia University Medical Center)

Steven A. Siegelbaum (Columbia University Medical Center)

Wayne M. Yokoyama (Washington University School of Medicine in St. Louis)

Breakthrough Prize in Life Sciences

Cornelia I. Bargmann (Rockefeller University)

David Botstein (Princeton University)

Lewis C. Cantley (Weill Cornell Medical College)

Hans Clevers (Hubrecht Institute)

Titia de Lange (Rockefeller University)

Eric S. Lander (Broad Institute of MIT and Harvard)

Bert Vogelstein (Johns Hopkins University)

Robert A. Weinberg (Massachusetts Institute of Technology)

Other Awards

Nima Arkani-Hamed (Institute for Advanced Study) is among the recipients of the Fundamental Physics Prize.

Charles L. Bennett (Johns Hopkins University) was awarded the 2012 Gruber Cosmology Prize.

Leo Beranek (Westwood, MA) is the recipient of the IEEE Founders Medal.

Jeffrey Bezos (Amazon.com) was named 2012 Businessperson of the Year by *Fortune*.

Robert J. Birgeneau (University of California, Berkeley) was awarded the 2012 Karl Taylor Compton Medal for Leadership in Physics.

Caroline Walker Bynum (Institute for Advanced Study) was elected to the Orden Pour le Mérite für Wissenschaften und Künste of the Federal Republic of Germany.

Jesse H. Choper (UC Berkeley School of Law) is the recipient of the State Bar of California's Bernard E. Witkin Medal for 2012.

James J. Collins (Boston University) is among the recipients of the 2012 Sanofi-Institut Pasteur Awards.

Thomas D. Cook (Northwestern University) is the recipient of the 2012 Peter H. Rossi Award, given by the University of Maryland School of Public Policy and the Association for Public Policy Analysis and Management.

Daniel Day-Lewis (New York, NY) won an Academy Award for Best Actor for his role in *Lincoln*. He was also awarded a Golden Globe for Best Actor in a Drama.

Ronald Dworkin† (New York University) was awarded a 2012 Balzan Prize for Jurisprudence.

Gerald Early (Washington University in St. Louis) received the St. Louis American Foundation's Lifetime Achiever in Education award.

Louise Erdrich (Minneapolis, MN) won a 2012 National Book Award for *The Round House*.

Nina Fedoroff (Pennsylvania State University) was awarded the 2013 Desert Research Institute Nevada Medal.

Martin Feldstein (Harvard University) was awarded the 2012 SIEPR Prize for Contributions to Economic Policy.

David Ferry (Wellesley College) won a 2012 National Book Award for *Bewilderment*.

Neil Gehrels (Goddard Space Flight Center) received the Committee on Space Research Harrie Massey Award.

Laurie H. Glimcher (Weill Cornell Medical College) is the recipient of the 2012 Ernst W. Bertner Memorial Award from The University of Texas MD Anderson Cancer Center.

Sharon Glotzer (University of Michigan) was named a 2012 Simons Investigator by the Simons Foundation.

Shafi Goldwasser (Massachusetts Institute of Technology) was named a 2012 Simons Investigator by the Simons Foundation.

Harry Gray (California Institute of Technology) has been awarded the 2013 Othmer Gold Medal by the Chemical Heritage Foundation.

† *Deceased*

John Guckenheimer (Cornell University) received the 2013 American Mathematical Society's Leroy P. Steele Prize for Mathematical Exposition. He shares the prize with **Philip Holmes** (Princeton University).

Jeffrey C. Hall (Cambridge, ME) has been awarded the Wiley Prize in Biomedical Sciences, the Canada Gairdner Award, and the Massry Prize. He shares these prizes with **Michael Rosbash** (Brandeis University) and Michael W. Young (Rockefeller University).

Stephen Hawking (University of Cambridge) was awarded a special physics prize by the Fundamental Physics Prize Foundation.

R. Scott Hawley (Stowers Institute for Medical Research) was awarded the George W. Beadle Award of the Genetics Society of America.

John L. Hennessy (Stanford University) was awarded the 2012 IEEE Medal of Honor.

Geoffrey Hill (University of Oxford) received the British honor of knighthood.

Philip Holmes (Princeton University) received the 2013 American Mathematical Society's Leroy P. Steele Prize for Mathematical Exposition. He shares the prize with **John Guckenheimer** (Cornell University).

Sarah Hrdy (Winters, CA) was awarded the J. I. Staley Prize and the W. W. Howells Book Prize for *Mothers and Others : The evolutionary origins of mutual understanding*.

Shirley Ann Jackson (Rensselaer Polytechnic Institute) was selected as an International Fellow of the Royal Academy of Engineering.

Irwin M. Jacobs (Qualcomm, Inc.) is the recipient of the 2013 IEEE Medal of Honor.

David A. Kenny (University of Connecticut) received the Distinguished Scientist Award from the Society of Experimental Social Psychologists.

Jon Kleinberg (Cornell University) was named a 2012 Simons Investigator by the Simons Foundation.

Leonard Kleinrock (University of California, Los Angeles) is the recipient of the 2012 IEEE Alexander Graham Bell Medal.

Ang Lee (Ang Lee Productions) won an Academy Award for Best Director for *Life of Pi*.

Andrei Linde (Stanford University) is among the recipients of the Fundamental Physics Prize.

George Lucas (Skywalker Properties, Ltd.) received an NAACP Image Award for Best Motion Picture for *Red Tails*.

Juan Maldacena (Institute for Advanced Study) is among the recipients of the Fundamental Physics Prize.

Mark Mazower (Columbia University) is the recipient of the Dido Sotiriou Award.

Bill McKibben (Middlebury College) received the Gandhi Peace Award.

Jerrold Meinwald (Cornell University) was awarded the Benjamin Franklin Medal in Chemistry.

Sam Nunn (Nuclear Threat Initiative) and Richard Lugar (Indiana University) were honored with the first Nunn-Lugar Award for Promoting Nuclear Security, given by Carnegie Corporation of New York and the Carnegie Endowment for International Peace.

Ralph Nuzzo (University of Illinois at Urbana-Champaign) was awarded an Alexander von Humboldt Professorship.

Tim O'Brien (Austin, TX) received the 2012 Richard C. Holbrooke Distinguished Achievement Award.

Robert Page (Arizona State University) was elected a Fellow of the Entomological Society of America.

Thomas D. Petes (Duke University Medical Center) was awarded the Thomas Hunt Morgan Medal of the Genetics Society of America.

Jeffrey V. Ravetch (Rockefeller University) is among the recipients of the 2012 Sanofi-Institut Pasteur Awards.

James R. Rice (Harvard University) received the American Geophysical Union's 2012 Walter H. Bucher Medal.

John D. Roberts (California Institute of Technology) has been awarded the 2013 American Institute of Chemists Gold Medal.

Michael Rosbash (Brandeis University) has been awarded the Wiley Prize in Biomedical Sciences, the Canada Gairdner Award, and the Massry Prize. He shares these prizes with **Jeffrey C. Hall** (Cambridge, ME) and Michael W. Young (Rockefeller University).

E. John Rosenwald, Jr. (JPMorgan) was honored with the Living Landmark Award by the New York Landmarks Conservancy.

Marlan O. Scully (Texas A&M University) is the 2012 recipient of the Frederic Ives Medal/Jarus Quinn Prize, given by The Optical Society of America.

Nathan Seiberg (Institute for Advanced Study) is among the recipients of the Fundamental Physics Prize.

Yakov Sinai (Princeton University) received the 2013 American Mathematical Society's Leroy P. Steele Prize for Lifetime Achievement.

Linda B. Smith (Indiana University) is the 2013 recipient of the David E. Rumelhart Prize.

Ralph Snyderman (Duke University School of Medicine) is the recipient of the David E. Rogers Award, given by the Association of American Medical Colleges.

James Spudich (Stanford University School of Medicine) was awarded the 2012 Albert Lasker Basic Medical Research Award. He shares the award with **Ronald D. Vale** (University of California, San Francisco) and Michael Sheetz (Columbia University).

Peter J. Stang (University of Utah) was awarded the 2013 Priestley Medal from the American Chemical Society.

Eric J. Sundquist (Johns Hopkins University) is the 2012 recipient of the Jay B. Hubbell Award, given by the American Literature Section of the Modern Language Association.

Ivan Edward Sutherland (Portland State University) is the recipient of the 2012 Kyoto Prize in Advanced Technology.

Terence Tao (University of California, Los Angeles) was named a 2012 Simons Investigator by the Simons Foundation.

Calvin Trillin (*The New Yorker*) was awarded the 2012 Thurber Prize for American Humor.

Ronald D. Vale (University of California, San Francisco) was awarded the 2012 Albert Lasker Basic Medical Research Award. He shares the award with **James Spudich** (Stanford University School of Medicine) and Michael Sheetz (Columbia University).

Marvalee H. Wake (University of California, Berkeley) is the inaugural recipient of the International Union of Biological Sciences Award.

Douglas C. Wallace (The Children's Hospital of Philadelphia ; University of Pennsylvania) is the recipient of the 2012 Genetics Prize of the Gruber Foundation.

Sharon K. Weiner (American University ; Visiting Scholar, 2005 – 2006) received the 2012 Louis Brownlow Book Award from the National Academy of Public Administration for *Our Own Worst Enemy? : Institutional Interests and the Proliferation of Nuclear Weapons Expertise*.

Edward Witten (Institute for Advanced Study) is among the recipients of the Fundamental Physics Prize.

Horng-Tzer Yau (Harvard University) was named a 2012 Simons Investigator by the Simons Foundation.

Marvin Zelen (Harvard University) is the recipient of the Karl E. Peace Award for Outstanding Statistical Contributions for the Betterment of Society, given by the American Statistical Association. He shares the award with Fritz Scheuren (NORC at the University of Chicago).

New Appointments

Lewis Cantley (Harvard Medical School) has been named Director of the Cancer Center at Weill Cornell Medical College and NewYork-Presbyterian Hospital.

Jared L. Cohon (Carnegie Mellon University) has been appointed to the board of the Heinz Endowments.

F. Fleming Crim (University of Wisconsin-Madison) was named Assistant Director for the Directorate of Mathematical and Physical Sciences at the National Science Foundation.

Sheldon H. Danziger (University of Michigan) was named President of the Russell Sage Foundation.

Karen Davis (Johns Hopkins University) has been named Director of the Roger C. Lipitz Center for Integrated Health Care at Johns Hopkins Bloomberg School of Public Health.

Esther Duflo (Massachusetts Institute of Technology) was appointed a Member of the President's Global Development Council.

Jonathan Galassi (Farrar, Straus and Giroux) has been elected to the Board of Directors of Words Without Borders.

John Hennessy (Stanford University) has been appointed to the Board of Trustees of the Gordon and Betty Moore Foundation.

Susan Hockfield (Massachusetts Institute of Technology) has been elected to the Board of Directors of Qualcomm Incorporated. She was also named U.S. Science Envoy.

Ira Katznelson (Columbia University) was named President of the Social Science Research Council.

William C. Kirby (Harvard University) has been elected a member of the Board of Directors of Cabot Corporation.

Steven E. Koonin (New York University) joined the Board of Directors of Ceres, Inc.

G. Peter Lepage (Cornell University) has been appointed to the National Science Board of the National Science Foundation.

James J. McCarthy (Harvard University) was appointed to the U.S. Arctic Research Commission.

Kathleen McCartney (Harvard Graduate School of Education) has been named President of Smith College.

W. James McNerney, Jr. (Boeing Company) has been elected to the Board of Directors of FIRST (For Inspiration and Recognition of Science and Technology).

Gary Nabel (National Institute of Allergy & Infectious Diseases) has been named Chief Scientific Officer and Senior Vice President at Sanofi.

Erin K. O'Shea (Harvard University) was named Vice President and Chief Scientific Officer at the Howard Hughes Medical Institute.

Herbert Pardes (NewYork-Presbyterian Hospital) was elected to the Board of Directors of the National Center on Addiction and Substance Abuse at Columbia University.

Roger Perlmutter (Amgen, Inc.) was appointed as an Independent Non-Executive Director of Ablynx.

William K. Reilly (Aqua International Partners) was appointed a Member of the President's Global Development Council.

Geraldine Richmond (University of Oregon) has been appointed to the National Science Board of the National Science Foundation.

Theodore C. Rogers (American Industrial Partners) has been elected to the Board of Directors of Words Without Borders.

Joan V. Ruderman (Harvard Medical School) has been named President and Director of the Marine Biological Laboratory.

Barbara A. Schaal (Washington University in St. Louis) has been named Dean of the Faculty of Arts & Sciences at Washington University in St. Louis. She was also appointed U.S. Science Envoy.

Eric Schmidt (Google) has been elected to the Board of Directors of FIRST (For Inspiration and Recognition of Science and Technology).

Lucille Shapiro (Stanford University School of Medicine) has been appointed to the Board of Directors of Pacific Biosciences of California, Inc.

David Skorton (Cornell University) was appointed Chairman of the Board of Directors of the New York Racing Association.

Subra Suresh (National Science Foundation) has been named President of Carnegie Mellon University.

Daniel Vasella (Novartis) has been elected to the Board of Directors of American Express.

James V. Wertsch (Washington University in St. Louis) has been named Vice Chancellor for International Affairs at Washington University in St. Louis.

Judy Woodruff (*PBS NewsHour*) has been elected a Trustee of the Duke Endowment.

Select Publications

Poetry

John Ashbery (Bard College). *Quick Question : New Poems*. Ecco, December 2012

Charles Bernstein (University of Pennsylvania). *Recalculating*. University of Chicago Press, March 2013

Rachel Hadas (Rutgers, the State University of New Jersey). *The Golden Road : Poems*. TriQuarterly Books, October 2012

Paul Muldoon (Princeton University). *The Word on the Street : Rock Lyrics*. Farrar, Straus and Giroux, February 2013

Fiction

Louise Erdrich (Minneapolis, MN). *The Round House*, Harper, October 2012

Jamaica Kincaid (Claremont McKenna College). *See Now Then*. Farrar, Straus and Giroux, February 2013

Sharon Olds (New York University). *Stag's Leap*. Knopf, September 2012

Jerry Pinkney (Jerry Pinkney Studio). *Puss in Boots*. Dial, November 2012

James Salter (Bridgehampton, NY). *All That Is*. Knopf, April 2013

Lynne Sharon Schwartz (New York, NY). *Two-Part Inventions*. Counterpoint, November 2012

Nonfiction

Ben S. Bernanke (United States Federal Reserve). *The Federal Reserve and the Financial Crisis : Lectures by Ben S. Bernanke*. Princeton University Press, March 2013

Angus Burgin (Johns Hopkins University ; Visiting Scholar, 2009 – 2010). *The Great Persuasion : Reinventing Free Markets since the Depression*. Harvard University Press, October 2012

Noam Chomsky (Massachusetts Institute of Technology). *Power Systems : Conversations on Global Democratic Uprisings and the New Challenges to the U.S. Empire*, interviews with David Barsamian (Alternative Radio). Metropolitan, January 2013

Marjorie B. Cohn (Harvard Art Museums). *Classic Modern : The Art Worlds of Joseph Pulitzer Jr.* Yale University Press, February 2013

Peter Crane (Yale University). *Ginkgo : The Tree that Time Forgot*. Yale University Press, March 2013

Arthur C. Danto (Columbia University). *What Art Is*. Yale University Press, March 2013

Frans de Waal (Emory University). *The Bonobo and the Atheist : In Search of Humanism among the Primates*. W.W. Norton, March 2013

Jared Diamond (University of California, Los Angeles). *The World Until Yesterday: What Can We Learn from Traditional Societies?* Viking, January 2013

Robert A. Ferguson (Columbia University). *Alone in America: The Stories that Matter*. Harvard University Press, January 2013

Robert W. Fogel (University of Chicago). *Explaining Long-Term Trends in Health and Longevity*. Cambridge University Press, August 2012

Robert W. Fogel (University of Chicago), Enid M. Fogel (University of Chicago), Mark Guglielmo (Bentley University), and Nathaniel Grotte (University of Chicago). *Political Arithmetic: Simon Kuznets and the Empirical Tradition in Economics*. University of Chicago Press, April 2013

Saul Friedländer (University of California, Los Angeles). *Franz Kafka: The Poet of Shame and Guilt*. Yale University Press, April 2013

Darlene Clark Hine (Northwestern University) and John McCluskey Jr. (Indiana University). *The Black Chicago Renaissance*. University of Illinois Press, July 2012

Gish Jen (Cambridge, MA). *Tiger Writing: Art, Culture, and the Interdependent Self*. Harvard University Press, March 2013

Ira Katznelson (Columbia University; Social Science Research Council). *Fear Itself: The New Deal and the Origins of Our Time*. W.W. Norton/Liveright, March 2013

Rashid Khalidi (Columbia University). *Brokers of Deceit: How the U.S. Has Undermined Peace in the Middle East*. Beacon Press, March 2013

Phillip Lopate (Hofstra University). *Portrait Inside My Head: Essays*. Free Press, February 2013

Nolan McCarty (Princeton University), **Keith T. Poole** (University of Georgia), and **Howard Rosenthal** (New York University). *Political Bubbles: Financial Crises and the Failure of American Democracy*. Princeton University Press, May 2013

Thomas Nagel (New York University). *Mind and Cosmos: Why the Materialist Neo-Darwinian Conception of Nature is Almost Certainly False*. Oxford University Press, September 2012

Martha C. Nussbaum (University of Chicago) and Alison L. LaCroix (University of Chicago). *Subversion and Sympathy: Gender, Law, and the British Novel*. Oxford University Press, January 2013

Jeremiah P. Ostriker (Princeton University) and Simon Mitton (University of Cambridge). *Heart of Darkness: Unraveling the Mysteries of the Invisible Universe*. Princeton University Press, February 2013

Elizabeth J. Perry (Harvard University). *Anyuan: Mining China's Revolutionary Tradition*. University of California Press, October 2012

David G. Roskies (Jewish Theological Seminary) and Naomi Diamant (New York University). *Holocaust Literature: A History and Guide*. Brandeis University Press, January 2013

J.S. Rowlinson (Oxford University). *Sir James Dewar, 1842 – 1923: A Ruthless Chemist*. Ashgate, August 2012

John Ruggie (Harvard Kennedy School). *Just Business: Multinational Corporations and Human Rights*. W.W. Norton, March 2013

Richard Sennett (New York University; London School of Economics). *Together: The Rituals, Pleasures, and Politics of Cooperation*. Yale University Press, February 2013

John Sexton (New York University) with Thomas Oliphant (Washington, DC) and Peter J. Schwartz (New York, NY). *Baseball as a Road to God: Seeing Beyond the Game*. Gotham, March 2013

Neil Shubin (University of Chicago). *The Universe Within: Discovering the Common History of Rocks, Planets, and People*. Pantheon, January 2013

Robert B. Silvers (*New York Review of Books*), ed. *The New York Review Abroad: Fifty Years of International Reportage*. New York Review of Books, April 2013

Wole Soyinka (Abeokuta, Nigeria). *Of Africa*. Yale University Press, November 2012

Charles Taylor (McGill University). *Democracia Republicana: Republican Democracy*. LOM Ediciones, October 2012

Peter Temin (Massachusetts Institute of Technology) and David Vines (Oxford University). *The Leaderless Economy: Why the World Economic System Fell Apart and How to Fix It*. Princeton University Press, February 2013

Garry Wills (Northwestern University). *Why Priests? A Failed Tradition*. Viking, February 2013

Edward O. Wilson (Harvard University). *Letters to a Young Scientist*. W.W. Norton/Liveright, April 2013

Robert Wuthnow (Princeton University). *The God Problem: Expressing Faith and Being Reasonable*. University of California Press, October 2012

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

Remembrance

*It is with sadness that the Academy notes the passing of the following members.**

Armen Albert Alchian – February 19, 2013; elected to the Academy in 1978

Robert Heron Bork – December 19, 2012; elected to the Academy in 1981

Dave Brubeck – December 5, 2012; elected to the Academy in 2011

James McGill Buchanan – January 9, 2013; elected to the Academy in 1976

Arthur Chaskalson – December 1, 2012; elected to the Academy in 2008

James Anderson DePreist – February 8, 2013; elected to the Academy in 1992

Michael Anthony Eardley Dummett – December 27, 2012; elected to the Academy in 1985

Ronald Myles Dworkin – February 14, 2013; elected to the Academy in 1979

Stuart Jay Freedman – November 9, 2012; elected to the Academy in 2006

Howard Gest – April 24, 2012; elected to the Academy in 2002

Erwin Nick Hiebert – November 28, 2012; elected to the Academy in 1975

Albert Otto Hirschman – December 10, 2012; elected to the Academy in 1965

Donald Frederick Hornig – January 21, 2013; elected to the Academy in 1952

Ada Louise Huxtable – January 7, 2013; elected to the Academy in 1974

Farish Alston Jenkins, Jr. – November 11, 2012; elected to the Academy in 2011

Elwood Vernon Jensen – December 16, 2012; elected to the Academy in 1975

Charles Everett Koop – February 25, 2013; elected to the Academy in 1990

Alexander Leaf – December 24, 2012; elected to the Academy in 1966

Gerda Lerner – January 2, 2013; elected to the Academy in 1998

Rita Levi-Montalcini – December 30, 2012; elected to the Academy in 1966

Chia-Chiao Lin – January 13, 2013; elected to the Academy in 1951

Robert Peichung Lin – November 17, 2012; elected to the Academy in 2006

E. Peter Lougheed – July 13, 2012; elected to the Academy in 2002

Rudolf Ludwig Mößbauer – September 14, 2011; elected to the Academy in 1971

Steven Muller – January 19, 2013; elected to the Academy in 1975

Joseph E. Murray – November 26, 2012; elected to the Academy in 1992

Oscar Soares Filho Niemeyer – December 5, 2012; elected to the Academy in 1949

Robert Coleman Richardson – February 19, 2013; elected to the Academy in 1995

Henry William Riecken – December 27, 2012; elected to the Academy in 1971

Charles Rosen – December 9, 2012; elected to the Academy in 1974

Warren B. Rudman – November 19, 2012; elected to the Academy in 2002

Nevin Stewart Scrimshaw – February 8, 2013; elected to the Academy in 1975

Richard Gustave Stern – January 24, 2013; elected to the Academy in 1995

Kenneth Winfred Thompson – February 2, 2013; elected to the Academy in 1963

Nicholas John Turro – November 24, 2012; elected to the Academy in 1981

J. Richard Udry – July 29, 2012; elected to the Academy in 1997

Annemarie Weber – July 5, 2012; elected to the Academy in 1976

Carl R. Woese – December 30, 2012; elected to the Academy in 1985

**Notice received from November 13, 2012 to February 26, 2013*

The Academy was created to cultivate every art and science that may tend to advance the interest, honour, dignity, and happiness of a free, independent, and virtuous people.

– *Charter of Incorporation,*
May 4, 1780

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