AMERICAN ACADEMY OF ARTS & SCIENCES

Bulletin

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AMERICAN ACADEMY
OF ARTS & SCIENCES

Calendar of Events

Friday, February 2, 2007

Symposium – Cambridge

Sponsored by the American Academy, the McGovern Institute for Brain Research at MIT, and Harvard University

Is There Science Underlying Truth Detection?

Speakers: Emilio Bizzi, MIT; **Steven Hyman,** Harvard University; **Elizabeth Phelps,** New York University; **Marcus E. Raichle,** Washington University School of Medicine; **Nancy Kanwisher,** MIT; **Henry Greely,** Stanford Law School; **Stephen Morse,** University of Pennsylvania Law School; **Jed Rakoff,** U.S. District Court, Southern District of New York; **Walter Sinnott-Armstrong,** Dartmouth College

Location: House of the Academy

Time: 2:00 p.m.

Wednesday, February 7, 2007

Stated Meeting – Cambridge

Stem Cell Challenges in Biology and Public Policy

Introduction: Harvey F. Lodish, Whitehead Institute for Biomedical Research

Speaker: Douglas A. Melton, Harvard University

Location: House of the Academy

Time: 6:00 p.m.

Monday, February 26, 2007

Stated Meeting – Stanford

Stem Cells: Politics and Promise

Introduction: John L. Hennessy, Stanford University

Speaker: Irving L. Weissman, Stanford University School of Medicine

Location: The Faculty Club, Stanford University

Time: 5:00 p.m.

Wednesday, March 14, 2007

Stated Meeting – Cambridge

Education in the Developing World

Speakers: David E. Bloom, Harvard School of Public Health, and **Michael Kremer,** Harvard University

Location: House of the Academy

Time: 6:00 p.m.

Tuesday, March 27, 2007

American Academy and Boston Athenaeum Joint Meeting – Cambridge

An Evening with Galway Kinnell

Introduction: Rosanna Warren, Boston University

Reading: Galway Kinnell, New York University

Location: House of the Academy

Time: 6:00 p.m.

Friday, April 27 – Sunday, April 29, 2007

American Academy and American Philosophical Society Joint Meeting – Washington, D.C.

The Public Good: Knowledge as the Foundation for a Democratic Society

Wednesday, May 9, 2007

Stated Meeting – Cambridge

An Evening of Chamber Music

Location: House of the Academy

For information and reservations, contact the Events Office (phone: 617-576-5032; email: mevents@amacad.org).

Academy News

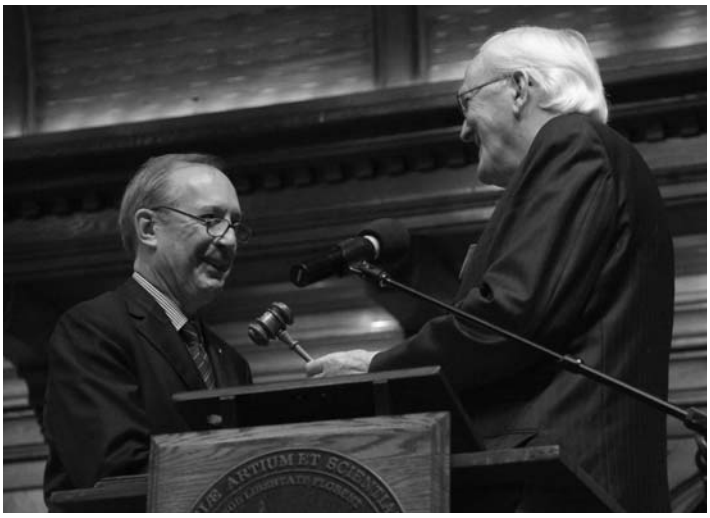
Induction Ceremony Welcomes New President and 226th Class of Members

On Saturday, October 7, 2006, the Academy inducted its 44th President, **Emilio Bizzi**, and its 226th class of Fellows and Foreign Honorary Members. In opening remarks, **Patricia Meyer Spacks** expressed her appreciation to Academy officers, Trust members, and Fellows for their support during her tenure in office and voiced her delight in passing the presidency on to "a remarkable man who is deeply dedicated to the Academy's interests." **Denis Donoghue**, Chair of the Academy's Presidential Search Committee, introduced Emilio Bizzi, noting that "over the past three centuries, U.S. and university presidents, inventors, businessmen, humanists, and scientists have been called upon to serve as president." A leading neuroscientist, Bizzi is Institute Professor and Investigator at the McGovern Institute for Brain Research at MIT. A Fellow for over twenty-five years, he served as Secretary of the Academy from 1998 – 2005.

The Induction Ceremony followed a morning orientation program that provided new members with an overview of Academy activities, including meetings and seminars held across the country as well as research programs ranging from initiatives on science and technology, the humanities, and higher education to studies on Internet security and the independence of the judiciary. Throughout their presentations, the project leaders emphasized that the Academy seeks to avoid quick judgments. Rather, it tries to assess all sides of difficult issues, to conduct long-term analyses of American and international policy choices, and to further scholarship as the basis for thoughtful action. (The orientation presentations appear on pages 11 – 20.)

Of the 195 new Fellows and Foreign Honorary Members elected in 2006, nearly 78 percent attended the Induction events. Greeting the over 500 members and guests at the afternoon ceremony, President Bizzi remarked, "From the beginning, the Academy has convened bankers and businessmen, physicians and public servants, as well as farmers, theologians, and academics to address the issues of the day." The 2006 class includes writers and performers, physical and biological scientists, humanists and social scientists, philanthropists and corporate leaders, among others. But as Chief Executive Officer **Leslie Berlowitz** observed, "what binds this distinguished class together is the fact that you engage in path-breaking work that influences our culture, our society, and our dreams" (see pages 39 – 51 for descriptors of the new members).

This year's ceremony focused on the wide-ranging interests and diverse perspectives of the new members as well as their common concern with many of the critical issues facing a global society.



Forty-fourth President Emilio Bizzi (Massachusetts Institute of Technology) accepting the gavel from Chairman of the Presidential Search Committee Denis Donoghue (New York University) at the Induction Ceremony on October 7, 2006.

Physicist and business and foundation leader **Fred Kavli** (Class V) urged those in attendance to "celebrate human curiosity in science, the humanities, the arts, business, and philanthropy, and to support the urge to explore, to gain knowledge, and to pursue confidently our daring search into the unknown." Other speakers included NASA meteorologist **Joanne Simpson** (Class I); biomedical researcher and Nobel laureate **Paul Nurse** (Class II); member of the French Senate, civil-liberties advocate, and authority on constitutional law **Robert Badinter** (Class III); and actor, writer, and director **Alan Alda** (Class IV). To close the ceremony, Denis Donoghue read two poems by Academy Fellows – an early draft of "Poetry" by Marianne Moore and "Style" by Howard Nemerov.

At a dinner honoring the speakers and the platform party, Cochair of the Academy Trust **Peter Nicholas** praised the Academy's commitment to unite scholars and practitioners as critical partners in advancing the nation. "In founding the Academy, John Adams said that 'we shall not be solely of the schoolmen of Cambridge.' He saw colleges as the site for the development of basic knowledge, but the Academy would be a center for drawing together thinkers and doers to shape and guide the new country. Today we recognize that our task is to turn knowledge and informed perspectives into actionable activities. We embrace this translational role as our fundamental purpose." ■

Induction 2006

Gwen Ifill '06 (WETA)

Charles Bernstein '06 (University of Pennsylvania) and Rosmarie Waldrop '06 (Providence, RI)

Henry Rosovsky '69 (Harvard University) and Leslie Wexner '06 (Limited Brands Corporation)

Margaret Murnane '06 (University of Colorado, Boulder) and Geraldine Richmond '06 (University of Oregon)

Anneila Sargent '06 (California Institute of Technology) and Judith Temkin Irvine '06 (University of Michigan)

David Patterson '06 (University of California, Berkeley) and David Knechtges '06 (University of Washington)

Ian Ayres '06 (Yale Law School) and Lawrence Lessig '06 (Stanford Law School)

Nora Newcombe '06 (Temple University) and Michael Goodchild '06 (University of California, Santa Barbara)

Barbara Finlayson-Pitts '06 (University of California, Irvine) asking a question at the morning orientation program for new members.

Jerome Kohlberg, Jr. '06 (Kisco Management Corp.) and Victor Navasky '06 (The Nation; Columbia University Graduate School of Journalism)

Darlene Clark Hine '06 (Northwestern University) and Lawrence Bobo '06 (Stanford University)

Alan Alda '06 (New York, NY) and Henry Louis Gates, Jr. '93 (Harvard University)

Induction 2006

Jeffrey Bluestone '06 (University of California, San Francisco) and Dale Boger '06 (Scripps Research Institute)

George Vande Woude '06 (Van Andel Research Institute) and Michael Botchan '06 (University of California, Berkeley)

Gershon Kekst '06 (Kekst and Company) and Billie Tisch '06 (Tisch Foundation)

Meredith Monk '06 (The House Foundation for the Arts) and Don Harrán '06 (The Hebrew University of Jerusalem)

President Emilio Bizzi (MIT), Chair of the Trust and Vice President Louis W. Cabot (Cabot-Wellington, LLC), Chief Executive Officer Leslie Berlowitz, and Secretary Jerrold Meinwald (Cornell University)

Induction Ceremony

Challenges Facing a Global Society

On October 7, 2006, the American Academy of Arts and Sciences inducted its 226th class of Fellows and Foreign Honorary Members at a ceremony held in Cambridge, Massachusetts. Meteorologist **Joanne Simpson**; biomedical researcher **Paul Nurse**; civil-liberties advocate and authority on constitutional law **Robert Badinter**; actor, writer, and director **Alan Alda**; and physicist and business and foundation leader **Fred Kavli** addressed the audience. Their remarks appear below.

Joanne Simpson

During the past fifty years, meteorologists have made spectacular progress in their field. My generation was lucky to be part of the great advancements in both the science of meteorology and its technology – such as computers, Doppler radars, and satellites – which were spurred in part by World War II and the Cold War. But because of the importance of climate and weather to human life, politics and politicians have specified the goals for meteorology.

In the early days, when I started out, resources were bountiful: projects could be funded by a phone call or a single-page letter. Weather modification was a fashion until the late 1970s, when the decision makers deemed it a failure and it faded out. Fears that the Soviets could be ahead of us in applications of cloud seeding, however, gave birth to cloud physics and to considerable parts of my own work on cloud models, guided by aircraft observations.

But earth-science research, of which meteorology is a part, is now in a crucial situation. During the past two decades, resources allotted to earth scientists and to earth science have dwindled, with an increasingly rapid decline over the past six years. As a result, the basic infrastructures of research and the attraction of star scientists into the field are in danger.

We have to be more willing to provide more unfettered funding to scientists with creative ideas, even when the future applications of their research cannot be foreseen.

The damage done has serious consequences. I don't see any successors to the likes of Jack Bjerknes and Carl Rossby, both members of the Academy, whose thinking on atmospheric processes changed the basic concepts of their field in the twentieth century. The keyword here is "thinking," creatively and critically. Nowadays, because of the need to compete for scarce funding, meteorologists are so consumed with writing proposals that few have a chance to *think* as their predecessors did. Today I can point to just three or four great meteorologists who have enough energy and talent to do their research, to nurture their students, and to protect them from political hassles. Their students, in turn, become mentors of still another generation of scholars, but this is a fragile linkage, with a small population as in endangered wildlife ecologies.

Moreover, meteorological support is currently weighted heavily toward technology and computer-prediction models, which aim at applications rather than basic understanding of the atmosphere and the ocean. Because the technology is expensive – with those who provide funds expecting a quick return in applications – the new remote observing tools and powerful computers are often overpromised in terms of their immediate value to forecasting.

Nevertheless, there is reason to be optimistic about the future. I base this on the twentieth-century advance from laborious hand observations to machine-produced information from sophisticated remote sensors and models. With the Internet, many of these data sets are freely available to anyone with the time to use them.

Still, we have to be more willing to provide more unfettered funding to scientists with creative ideas, even when the future applications of their research cannot be foreseen. The technologies are but tools for creative, dedicated scientists, not ends in themselves. To improve understanding of the complex processes that control the atmosphere and the oceans requires that the human brain be in an environment where the science itself is a high priority.

Paul Nurse

The title of my remarks is "In Defense of Doubt." This might be thought a rather unusual theme for an address to an Academy dedicated to the cultivation of the arts and sciences and the advancement of intellectual understanding. One might imagine that such an Academy should be working to reduce doubt rather than defending doubt. In contrast, my intent is to argue that doubt should be encouraged. It is a critical step in the pursuit of knowledge, particularly scientific knowledge, and a proper recognition of the significance of doubt is also important for the interactions of science with society, and, for that matter, for society as a whole.

My starting point is the eleventh-century French monastic scholar Peter Abelard. He identified doubt as a crucial step in the pursuit of truth when he stated, "By doubting we come to inquiry, and through inquiry we perceive truth." What Abelard meant by doubting was the recognition that all is not known with certainty about the world. Doubting embraces a skeptical approach. It challenges the views of established opinions and authorities; and doubt, together with curiosity, forms the mainsprings promoting the pursuit of knowledge. Maintaining a skeptical approach during inquiry also leads to respect for observation, experiment, consistency, and the development of ideas that can be tested and are therefore capable of refutation – all of which are core attributes of science.

This emphasis on doubt and skepticism contrasts with views of the world based on faith and beliefs, which do not depend on empirical support derived from direct evidence or proof but rather depend on testimony or authority, and so may consider doubt of little value or even as a weakness. Such views are often associated with more fundamentalist religious beliefs, and the difference in these two approaches is the basis for the present debate over creationism as an explanation for the diversity of life. Creationism depends upon received authority for its support, and therefore is not subject to doubt or refutation, both of which are central to scientific inquiry.

How can we deal with the mismatch between what society expects and what science can deliver? I would argue that the way forward is to encourage public dialogue, openness, and honesty.

Doubts can also become marginalized when grand ideologies are too zealously embraced, becoming excessively self-referential and incapable of refutation. Two examples of ideologies that many have argued suffer these problems are those developed by Marx and Freud. Ideologies such as these and faith-based thinking have and will continue to provide important insights, but when they are used as the only prism through which the world should be observed and understood, then intellectual impoverishment is generally the outcome. Doubt, in contrast, encourages both a diversity of ideas and a healthy skeptical approach, which helps test the validity of ideas, a surer way to arrive at reliable knowledge.

I have emphasized the importance of doubt and skepticism for scientific inquiry, but, interestingly, society generally views science as lacking doubt. The great ideas of science have usually been subject to prolonged investigation and testing, and having survived such intense interrogation, they become accepted as highly reliable explanations for the world around us. This is how we teach science in schools, and it's how we scientists often portray science in the media, encouraging society to view science as always dealing in certain knowledge. Long-standing and well-tested ideas should have such a high status, but this does not always apply to many problems of science under current investigation, problems in which society may have great interest. Examples in the area of biomedicine include the causes, treatment, and prevention of disease; the genetic basis of behavior; and the influence of diet and pollution on health. Frequently, research in these areas falls in the category of tentative knowledge. But such hesitant understanding is unsatisfactory to society and its leaders who are seeking, quite understandably, greater certainty. A current example is whether the bird flu virus will cause a human influenza pandemic, a question which most scientists working in the area find very difficult to answer. But clear advice about whether or not this is likely is of great importance to governments and to the public, which are wrestling with how to manage a potential major threat to public health.

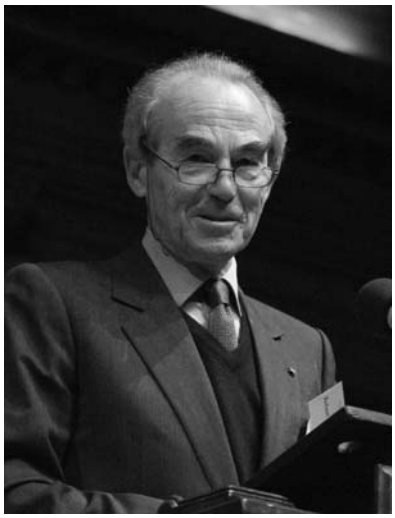
This disconnection leads to a problem for interactions between science and society. Society is looking for certainties and believes science can usually provide them, while science is often in a state of tentative knowledge at the edge of understanding and cannot always provide the certainties required in the time frame they are needed. The problem is exacerbated when less than scrupulous political leaders take shelter behind poor science, or declare good science "junk," in order to bolster either a particular political opinion or to support specific commercial activities. An example of the latter are those who deny the evidence of climate change and argue that it is junk science, when their real motive is to protect the oil industry by promoting a society based on high-energy consumption. I believe the future will judge this debate in much the same way as we now view the tobacco industry's denial that smoking causes cancer.

How can we deal with this mismatch between what society expects and what science can deliver? I would argue that the way forward is to encourage public dialogue, openness, and honesty. A willingness of engaged scien-

tists to talk and listen to the public about the issues; an openness to explain the true nature of scientific inquiry and the knowledge it produces, which can range from very reliable understanding to far more tentative explanations; and an honesty to admit when we are unsure and cannot provide the clarity requested. This last point can be a real issue with the coverage of science in the media, because the wish to provide differing views – and perhaps less laudably, the entertainment of observing a confrontation between individuals at polar opposites – can lead to the excessive exposure of fallacious ideas held and presented by zealous individuals lacking not only doubts about, but also support for, their positions.

I want to take my defense of doubt just one step further, to the healthy functioning of society on a global scale. Real dangers threaten the world when those with intolerant fundamentalist religious or ideological beliefs come to political power or have too much influence on those in political power. Their lack of doubt leads them to believe that they are always in the right, producing groups, governments, and regimes who do not listen to the opinions of others, who are not interested in dialogue, and who turn all too readily to military or violent interventions to impose their orthodoxies on others. We are in real need of greater doubt in today's world, not only for the advancement of knowledge and its effective use for the benefit of humanity, but also to make the world a safer place.

Francis Bacon, the seventeenth-century English architect of the Scientific Revolution, eloquently summed up the argument I am making when he said: "If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts, he shall end in certainties." I commend this passage to us all and to the world's political leaders.



Robert Badinter

I love constitutions. A good constitution represents a political instrument, a legal architecture, a historical episode, and a literary work. Reading the most beautiful ones gives me the same pleasure as reading a literary masterpiece. Whenever I read the French 1789 Declaration of the Rights of Man and the Citizen, it sounds to me like the overture of *Don Giovanni*, considering the tragedy that will follow. And I always marvel at the preamble of the American Constitution: "We the people of the United States. . . ." I want to stress that the founding fathers, the American children of the century of Enlightenment, are to constitutionalism what Bach is to music – giants.

I am convinced that there is an art of constitutionalism. Some constitutions succeed in combining political vision, efficiency of institutions, and clarity, sometimes even beauty, of legal style. Others deserve only the oblivion in which history has buried them. France, in this regard, offers a vast collection of samples. In more than two centuries, the United States has known but one Constitution and twenty-seven Amendments. During the same period, the French people have lived under three monarchies, two empires, five republics, thirteen written constitutions, and innumerable amendments. The product of a passionate history, crossed by revolutions, constitutionalism in France, like our cuisine, has become not only part of the culture but also, in some way, a national art. Strangely enough, Napoleon Bonaparte, on the days following his coup d'état, called into his office the best constitutional experts of the time. They explained their views, Bonaparte listened, and at the end he said, "All of this is very interesting, gentlemen, but you must remember that a good constitution should always be short and obscure. . . ."

Through the years my passion for constitutionalism has not lost its intensity. A constitution is not a police regulation. It proceeds from a certain conception of power, in a given society, at a specific moment, to fulfill certain requirements. Take democracy. Democracy remains, through various formulas, the government of the people, by the people, for the people. But this sovereign principle can be expressed in many institutional ways. It can be federal, like in Germany, or centralized, like in France. It can be parliamentary, as in most European states, or presidential, as in the United States. It can use popular referendums, or ignore them, like in Germany. It can even be a monarchy, like in England or Spain. But a good democratic constitution should in all cases fulfill two requirements: respect the fundamental freedoms of the individual, and satisfy the needs of the society that it will rule.

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This explains, I believe, why the success of the Philadelphia Convention of 1787 could not be achieved by the European Brussels Convention of 2002. Indeed, there are striking and obvious differences in the two conventions. In Philadelphia, only thirty of the fifty-five delegates from the thirteen states

were present in the rather small twelve-by-twelve-meter chamber. In Brussels, 105 delegates from twenty-eight old nations, plus 102 deputies, were present in the huge session room of the European Parliament. In Philadelphia, sessions were held *in camera*. In Brussels, they were open to the media. If you look at it, the Philadelphia Convention appears more or less like a general commission in a parliamentary assembly, deciding over majority vote, while in Brussels, this huge crowd of delegates had to reach consensus.

But the fundamental difference lies elsewhere. The delegates in Philadelphia wanted to go beyond the Articles of the Confederation and find a new formula that would, at the same time, protect the prerogative of each state, while overcoming the difficulties of living and acting together as one state on the world scene. On the contrary, most national delegates at the Brussels Convention just wanted to improve the existing European treaties, but certainly not give birth to a new state, the United States of Europe, the real dream of true European believers, among which, I confess, I rank. This lack of political will explains the deceptive result, unless you agree with another explanation given to me by a good friend, a brilliant member of the English Parliament: "Robert, do you know why success was not reached here in Brussels where it was in Philadelphia? It's obvious. In Philadelphia, they all spoke English and none of them were British. . . ." After all, when you come to think of it England has been for centuries a major power on the world scene and guarantees the freedom of its citizens without a written constitution. What a blow to a constitution lover!

Alan Alda

I know everyone in this room is very smart. So, just for fun, I'm going to give you a question from an IQ test. See if you can answer this. I'm going to read you a list of names. Which one stands out as odd? John Adams, Benjamin Franklin, Thomas Jefferson, Charles Darwin, Alan Alda.

Does anyone need extra time?

I can't tell you how much it means to me to be invited to become part of this institution, and to be included among the extraordinary people who represent the humanities and the arts – disciplines that express some of humanity's most probing questions. It's amazing how life on Earth has come up with these questions in such a relatively short time.

It wasn't long ago, not even a tick on the cosmic clock, after we first appeared on this wet rock spinning through time and space, that one of us first put his handprint on the wall of a cave. Whatever else it meant, that handprint said, "I'm here." But even before that, there must have been dancing and singing. There must have been vocalization, the hubbub of community, the glee of existence. All this, I think, was the birth of the arts.

We made notches on sticks to count and keep track of things, but the notches that we made in our *brains* were the crucial ones. We began parsing our language so that, in a string of sounds, the *order* of the sounds had meaning. This let us communicate the huge difference between "My foot is on the rock" and "The rock is on my foot." At that point, we could start parsing not just our words but the world itself. We could go from the statement of "I'm here" to questions like "*Where* is here?" "*What* is here?" "What's that over there?" and the big one, "Who am *I* who is asking all these questions?" That, I think, was the birth of the humanities.

All I mean to say by this fanciful romp through prehistory is how happy I am to be included among the historians, philosophers, philologists, those who engage in the study and practice of literature, and all the other representatives of the humanities and arts who are gathered here today. We all belong to the same brotherhood. We have all traveled different paths in search of an answer to a question that has nagged us for thousands of years: *what does it mean to be human?* Together with our colleagues in the sciences, we've searched endlessly for an answer to that question: what does it mean to be human? It may be the most critical question we've ever asked in the life of our species, especially *now*, when our ability to destroy ourselves is so much greater than our ability to understand ourselves.

The search for wisdom – and for a deeper understanding of who we are – is the daunting challenge for the humanities. They are that part of our common brain that reflects on our actions, questions our desires, and forces us to declare what we value.

I know artists best, so let me talk about artists for a minute, but I think the humanities and the arts share many of these attributes, as do the sciences. Here's what gets me about artists: I'm touched by their courage and their generosity.

This is what it's like when you decide to be an artist: In the first place, you don't *decide* to do it. You're kidnapped by it. You never know if you have what it takes. And after years of doing it, you're always back where you started, a beginner. Because every time

you head for the horizon, it's not there. An artist looks at life and the chaos of nature, then takes a brush, a violin, a camera, or his or her own body and plays a plaintive song of desire on it, a desire for understanding. Who are we? Why are we the way we are? Can we ever become what we wish we could become?

All artists, I think, are like poets – whether they arrange words on a page; make steel and stone into buildings; or leap into the air, transforming their bodies into visual music. The poet puts the right words in the right order so that the colliding of their sounds and meanings make your neurons flash like a pinball machine. And like the poet, artists of all kinds take the viewer's nervous system and snap it like a whip. They refresh our vision. They press our reset button. They make the colors of the world as vivid as they were when we were children and saw them for the first time.

Artists try to say things that can't be said. In a fragile net of words, gestures, or colors, we hope to capture a feeling, a taste, a painful longing. But the net is always too porous, and we're left with the sweet frustration of *almost knowing*, which is a teasingly pleasurable experience.

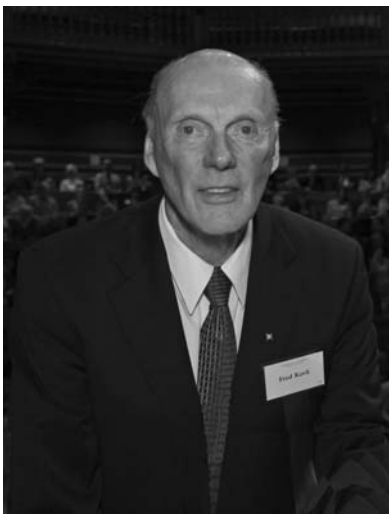
We often tune ourselves to the oscillations of nature: the rhythmic beat of the heart, or the sea running up the shore and then pulling back, or the bang and slam of the shutter in a storm. From these elemental rhythms spring the one-two beat of music, and the push and pull of the play on words. They're the antagonist and the protagonist of drama. They're the essay's ebb and flow of argument.

We ride this rhythm, and it rides us. Like a windsock in a heartless gale, the artist whips back and forth to the beat of nature, free of care and sometimes just as free of safety. I love my fellow artists for the dangerous life they lead, for the exhaustion of their birth pains, and for how they bet their lives on the slim hope that they can make something worth looking at or listening to.

We may amuse and delight, but like Shakespeare's clowns, we also ask the most impertinent questions about who we think we are. Where would we be without artists? We would be gray automatons in a gray landscape picking gray flowers for gray lovers. Life would be grim.

And where would we be without the humanities? Life, I think, would seem far more meaningless. The search for wisdom – and for a deeper understanding of who we are – is the daunting challenge for the humanities. They are that part of our common brain that reflects on our actions, questions our desires, and forces us to declare what we value. In some ways, we're *all* artists – practicing our skills, but also reaching into the dark for an answer.

In the dark of the cave, we hope to find light – not from the torch, but from the sparks that fly as we decode the handprint on the wall. I wish us luck, and I'm so very grateful to be included among you, one and all.



Fred Kavli

I think of this day as a celebration of human curiosity, of our hunger for knowledge, and of human ambition, all of which are strongly represented in this learned and distinguished group.

Often, our thoughts about the most fundamental matters are inspired by our contact with nature. While growing up in Norway, I would ski across the vast, white expanses of its quiet mountains. At times, the whole sky was aflame with Northern Lights, shifting and dancing across the sky, down to the mountaintops. In the stillness and loneliness of the mountains, I pondered the wilderness, the planet, and the wonders of man. I am still pondering. The universe, so big beyond imagination, yet composed of particles so small beyond comprehension. And those little creatures that have taken command of the planet Earth, not because of their strength, not because of their longevity, but because of their brains.

After traveling a long road from the white mountaintops of Norway and a long journey through the business world, I have come back to where I started, to the universe, from its smallest building blocks to the vast and incredible wonders of space, and to the emerging master of nature, the human brain. I have come to support basic science because of my curiosity, and because I believe in its long-range benefit to humankind.

Basic science is the exploration of the unknown, the cutting edge of knowledge. Science is driven by human curiosity. But the

desire to learn penetrates all life, from the viruses that have learned to hide inside the cell's nucleus; to the bacteria that work as individual cells when they are alone and hunt as a pack with higher efficiency when they have adequate density; to the kitten that constantly tests and explores and gets into trouble; to the human being. So we see that the process of learning is basic to the survival of life, from the simplest organism to the most complex.

The best science, the science that produces the most important breakthroughs, is more likely to be driven by basic curiosity than by short-term benefit. Scientists were not motivated by practical applications when they developed the quantum theory of matter. And yet, that research led to, among other results, an understanding of electronic conduction in solid-state materials, which led to the invention of the transistor, making possible the development of integrated circuits, computers, the Internet, and the IT world in which we live today.

I believe there is a strong relationship between the level of our nation's science and its technological and industrial leadership in today's high-tech world.

Similarly, when Crick, Watson, and Franklin discovered the double-helical structure of DNA, they didn't know the extent to which it would revolutionize our understanding of biology and open the door to remarkable advances in medicine.

I believe there is a strong relationship between the level of our nation's science and its technological and industrial leadership in today's high-tech world. It is important that our leaders in government duly recognize the importance of investing in research, which yields enormous benefits to society through improved standards of living, better health, and stronger national security.

Today we are witnessing the resurgence of philanthropy, as more and more entrepreneurs apply their fortunes and skills for the benefit of humanity in so many important fields. I think the most exciting fields of the twenty-first century are astroscience, nanoscience, and neuroscience – the biggest, the smallest, and the most complex – all of which I'm supporting through the Kavli Foundation.

Let us celebrate human curiosity in science, the humanities, the arts, business, and philanthropy. Let us support the urge to explore, to gain knowledge, and to pursue confidently our daring search into the unknown. ■

Projects and Studies

At a morning orientation program for new members, held on October 7, 2006, leaders of current Academy projects presented updates on their work. Their remarks appear below.

Initiative for Science, Engineering, and Technology

Charles M. Vest

President Emeritus and Professor of Mechanical Engineering, Massachusetts Institute of Technology

Science and technology today are conducted in a very rapidly changing landscape. Certainly the role of science, engineering, and technology in our lives has increased dramatically over the past sixty years. (We frequently use sixty years as the yardstick – basically the time since the end of World War II.) The intensity of application of science and technology in our everyday as well as corporate lives has accelerated. Consider the adoption of major technical innovations and products. It took the automobile about a lifetime to reach 25 percent of America's households. The telephone and radio took about the length of a typical professional career. The amount of time it has taken us to adopt a new technology continually decreased as we introduced television, cell phones, and the Internet. When we got to the World Wide Web, it took only seven or eight years to reach 25 percent of America's households.

As this pace of technological change accelerates, U.S. leadership in science and technology is certainly no longer guaranteed, if ever it was. I, for one, happen to think that's good, because I hope more great science and advanced science education are, in fact, done around the world. Nonetheless, if there is a loss of American leadership it may be more the result of our decline than of others' advance.

Many in this country are beginning to think of science as a cost, rather than understanding it as a key investment in our future. Issues of science and technology are beginning to strike dissonant chords with aspects of our nation's culture and politics. This discord has increased rapidly, as we have begun to engineer what most of us think of as the stuff of life. When you begin hearing students in the hallways at MIT talking about "biohacking," you know things are changing in very profound ways.

We face a lot of questions. What will the next sixty years of science look like? What kind of science will be done, how will it be done, where will it be done, why will it be done, and who will do it?

What will Tom Friedman's flat world actually mean for the advance of science, engineering, and technology? Will we work more collaboratively across national boundaries? I think the answer is clearly yes. The question is, how will and how should that be accomplished? Looking ten years ahead, will we still be so fortunate to attract the best and brightest young men and women from countries around the world to be educated, to pursue their research, and, for some of them, to stay in the United States and contribute in amazing ways to our institutions and our economy? Or will we wake up in fifteen to twenty years and find that the typical path is for Americans to go to, say, China in order to do the most advanced

Selected leaders of current Academy projects: front (left to right): Patricia Meyer Spacks (University of Virginia), Charles M. Vest (MIT), David Clark (MIT), Steven Miller (Kennedy School of Government, Harvard University); back (left to right): Robert C. Post (Yale Law School), Linda Greenhouse (New York Times), Boyce Rensberger (MIT), Joel E. Cohen (Rockefeller and Columbia Universities), Norman M. Bradburn (University of Chicago)

work in science and engineering? That is certainly possible. After all, in the decades prior to World War II, Americans who wanted to learn and work at the cutting edge of science went to Germany or the United Kingdom. How can the United States maintain its leadership role? What policies should be put in place to achieve that goal?

We face a lot of questions. What will the next sixty years of science look like? What kind of science will be done, how will it be done, where will it be done, why will it be done, and who will do it? The answers to these questions are not very obvious and are at the core of what the Academy's Initiative on Science, Engineering, and Technology plans to consider. The Initiative will examine how the world of science and technology is likely to change. Through this study, we can help the broad public and policymakers understand these changes and their implications, in order to adapt to and lead them better.

I believe – and it's the reason that Neal Lane and I were pleased to cochair this activity – that the Academy brings several important strengths to this enterprise. First, the Academy brings new voices to the debate. It is not a Washington institution. One of the Academy's advantages is the ability to step back and take a more objective view of these matters, in a nonpolitical, nonpartisan way.

Second, the Academy is not a science-advocacy organization. It brings to these questions the assurance that they will be dealt with in a very broad, multidisciplinary, and independent fashion. Science and technology policy today requires not only scientific and engineering expertise but also knowledge of business, economics, law, politics, and ethics. Finally, our understanding of these issues benefits from a cross-sector discussion, which the Academy can provide. We want to include the voices of scholars, administrators, entrepreneurs, and policymakers.

The Initiative is just getting started. The steering committee has had two meetings, at which we tentatively narrowed our work to three topics. First, we want to examine the public's understanding of scientific information and its trust in science. We see this as a two-way street: not only does the public need to have a deeper understanding of science and technology, but also scientists and engineers and researchers and scholars need to have a better understanding of the public and how to communicate with it more effectively. We also want to take a look at such issues as scientific integrity as well as the state and the future of the peer-review system.

Second, we want to look at science and engineering education, and how young men and women in this culture are making career choices and why. We start this project knowing that perhaps the most profound problems we face are in the K-12 system. But, for now, we want to concentrate our work on the upper end of the pipeline – undergraduates, graduate students, postdocs – with particular attention to the issues surrounding women, underrepresented minorities, and people from various levels of the socioeconomic spectrum. What makes careers in these areas attractive? What makes them unattractive, and what should we do about it?

The third area is science funding and regulation. Science, as I said earlier, is increasingly crossing national borders. Science itself has always been done this way, but now the pace of innovation – and the roles of academic and research institutions, the private sector, NGOs, and others – are also changing in this global context. What do we need to think about to construct policy to recognize and work effectively within this context? Are there different ways in which we should think about the balance between intellectual property and the scientific commons? Again, this balance is changing dramatically, especially in the life sciences. Finally, given all of this, how should we structure the funding of science and advanced scientific and engineering education in this country? In particular, what role should both the federal government and industry play?

We have put before ourselves a very rich set of questions. We will be calling on many members of the Academy to do the actual work. I look forward very much, as I know Neal does, to working with all of you and to the opportunity, not too far in the future, to report on some of the committee's findings.

Securing the Internet as Public Space

David Clark

Senior Research Scientist, Massachusetts Institute of Technology Computer Science and Artificial Intelligence Laboratory

In an Academy Induction talk three years ago, Tom Leighton, Professor of Applied Mathematics at MIT and Co-Founder and Chief Scientist at Akamai Technologies, suggested that we develop a study of Internet security. This topic is very much in the tradition of the spirited studies the Academy has done in the past, including projects on traditional security, international relations, and nuclear issues. The Internet may seem very different, but, in fact, it clearly draws on the research strengths of the Academy.

Do I need to persuade anybody that the Internet has a security problem? Spam is perhaps just a nuisance, but we also have phishing. Here, con artists attempt to steal sensitive information by sending emails that purport to come from a reputable organization. They say, "Please go to this website and type in your personal information again."

If phishing doesn't catch you, there are zombies. (At least computer scientists give our problems good names.) Zombies are creepy pieces of code that get onto your computer, allowing it to be bent to the will of an evil master. After the evil master has accumulated ten thousand or one hundred thousand zombies, what does he do with them? He rents them out by the hour. Why would someone bother to rent out a botnet (as a collection of zombies is called in this world) for an hour or two? A person could use it to send spam from your email address to everyone in your address book. Or he could take all ten thousand machines and launch them in a savage attack on a target site. By sending a lot of traffic simultaneously to the site, he can completely overwhelm it, preventing it from doing anything useful. Why would he do that? The answer is old-fashioned extortion. Take a porn site or a gambling site, for example – a business that may be socially uncomfortable. You could tell the operators of such a site to leave a bag containing $10,000 on a street corner in exchange for not taking their site offline for a day. And you'll actually get paid. This is organized crime.

If I've convinced you that we have a problem, the next question is, why did the Internet turn out this way? You might look back to its roots and ask, why did it start like this? One obvious answer is that all of its designers were idiots. But putting

it less harshly, we could say that, in the beginning, they were really working on basic issues, and it was hard to imagine having to deal with zombies. After all, the people who worked on creating the internal combustion engine didn't think about air bags and crumple zones.

There's another, slightly deeper answer, which is that the Internet was designed for people who trusted each other. Since everybody trusted each other, we did not need lots of security mechanisms; we designed a system optimized for trust. How did we do that? We built a system free of constraints, where people could do what they wanted; we knew that if they were left on their own, they would make the right decisions.

To maximize security on the Internet, we do not need better technology or encryption. We need the perspectives of people who understand behavior: political scientists, sociologists, lawyers, economists, philosophers. That spectrum matches the breadth of Academy Fellows.

The Internet does not observe, examine, judge, filter, or modify the information you send. It just forwards it. This means you and I could invent a new application, turn it on, and let it communicate across the Internet – and that's great. But it also means the Internet very effectively and stupidly delivers every zombie and every virus – so maybe we didn't quite get that right in the beginning.

If you think about most of the social interactions we have on a regular basis, we often may not trust the person with whom we're interacting. What do you do under those circumstances? You turn to constraints that make the interaction safe enough to carry out. One obvious example of a constraint would be a trusted third party. Credit card companies represent a trusted third party. When you buy and sell a house, you don't just give someone a large bag of money and have them give you a piece of paper that purports to be a deed. You involve lawyers, title insurance companies, and registrars of deeds. This complicated and cumbersome structure gives us confidence when we carry out the transaction, even though we don't trust each other.

That current state of communication between people who don't trust each other is entirely different from the circumstances that defined the early stages of Internet security research. Early Internet security research was funded by the military and intelligence communities. They had a very simple model of the world: it was composed of "good guys" and "bad guys." Good guys want to communicate; bad guys want to steal classified information. We wanted to have open channels between trusted good guys. How do we let the people with the white hats communicate? Well, we have this technology where we can encrypt all the bits. The bad guys could maybe disrupt the Internet, but they couldn't see the bits and then steal them, or modify them.

That classic notion of security on the Internet divided the world into two groups of people: those you completely trusted and those you did not. When that idea was carried into the civilian world, though, it hit an interesting brick wall. Law enforcement agencies, like the Department of Justice, FBI, and NSA, said, 'Wait a minute. I would like to be able to listen to what the bad guys are doing.' So they swapped labels and traded hats – the communicating parties are now the bad guys. How then did they proceed in this space? In the name of "national security," they tried to prevent people from using encryption. They made it at least difficult, and in some cases illegal. This stunned the people who designed Internet security in the first place, because good security had meant disclosure control (via encryption), and now there were people moving in the completely opposite direction.

There are several insights you can take away from this story. I started out by saying we need to improve Internet security, but we don't even have a definition of security. It's not better disclosure control. It's not perfect privacy. It's probably not the "best of" anything. In fact, when you look at the way the real world works, you know there's no such thing as perfect security. How do you decide whether or not a park is safe for children to play in? It's not because the park has perfect security. You assess the mix of risks and benefits and decide what to do. In fact, security, in the real world, is defined as the acceptable outcome of a tussle among parties with adverse interests. There are not just good guys and bad guys.

You have to think about Internet security in a space that matches real-world experience. Most of the time, you are in a space where you don't necessarily trust the people with whom you're working. But you believe there is an acceptable set of constraints that allows you to decide whether or not it's safe to go forward. In most of the real world, people don't have black hats and white hats. The Internet has to support the paradigm that people wish to communicate but do not necessarily trust each other.

The last point I want to make is that third-party solutions are not purely technical solutions. Why do you trust the registrar of deeds? It's not because the registrar is operating in a system technically designed so that it can't screw up. It is because the registrar is embedded in a social space with very strong constraints on him to do the right thing. Why do you trust the lawyers? Why do you trust the credit card company? There are places where you wouldn't trust these people. Social constructs differ from place to place.

This brings us back to the question of why the Academy is a good place to do this kind of study. To maximize security on the Internet, we do not need better technology or encryption. We need the perspectives of people who understand behavior: political scientists, sociologists, lawyers, economists, philosophers. That spectrum matches the breadth of Academy Fellows. That's why the study is so much fun to do here. The goal of the study is to have a conversation about the technical and social building blocks of a secure Internet. I can now explain what I mean by a secure Internet. It is an Internet that is safe enough so that we're prepared to continue going there.

Every project should have a bumper sticker. Ours is simply: "Kill the Zombies."

Confronting Nuclear Peril

Steven Miller

Director, International Security Program, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University

It is my privilege to offer a few words about the work of the Committee on International Security Studies, a long-standing group of the Academy that convenes scholars from all over the country to work on various issues of national and international security.

Our work in this domain goes back more than half a century. In the late 1950s, the world was on the cusp of a new and (it was widely believed) much more perilous nuclear world. There had been innovations in the manufacture of nuclear weapons that made mass production of these weapons possible. Very quickly during the 1950s there was a dramatic upward spiral in the number of nuclear weapons in the arsenals of a few major nuclear weapons states, with the production of hundreds to thousands of weapons. This led to the nuclearization of almost all spheres of military activity. We had everything from nuclear backpacks to nuclear artillery shells to nuclear torpedoes – all the way up to long-range intercontinental delivery systems. Most importantly, in the late 1950s, we were on the edge of the missile age. In fact, one of the more famous works in the field of security studies is a book by Bernard Brodie called *Strategy in the Missile Age*. Missiles were just another way of delivering weapons that already existed, but they had one very powerful implication: they greatly reduced the timeline associated with a nuclear crisis or confrontation.

Suddenly among the more fateful decisions ever to be made by humankind were those that had to be made within a ten or twelve-minute time frame. This led to various schemes to buttress deterrence by creating reprisal opportunities, such as hair-trigger alert postures and launch on warning doctrines. Of course, all of this occurred in the context of missile systems that were not only quick but also unrecallable. If you made a mistake, it was truly an irrevocable mistake. The arrival of the missile age compounded the portentous dangers associated with nuclear weapons.

What the Committee on International Security Studies is aiming to do is to assess comprehensively the global nuclear order. Where are we? What path are we on? What does it mean if the present restraint structure seems to be eroding just at the moment when we are faced with one nuclear crisis after another?

In the late 1950s, we were also in the early but vigorous pursuit of ballistic missile defense. Analysts very quickly realized the tremendous potential for an offense-defense arms race, where we could see a prodigious escalation in the arsenals of the competing sides. The obvious answer to missile defense was the expansion of offensive forces that would neutralize and overwhelm the opponent's defensive capabilities.

In short, the late 1950s was a perilous moment and a time when we were struggling to create frameworks for managing what Albert Einstein and Bertrand Russell called in their famous manifesto of 1955 "a species threatening technology." It was in this context that the Academy sponsored, over a several-year period, the body of work that turned out to be absolutely formative in creating the notion of arms control and validating it as a useful and feasible instrument of national policy. These studies led to the creation of what you might call governance mechanisms: negotiated restraint on the pursuit and deployment of nuclear weapons. Several decades of subsequent arms control policy found its conceptual and intellectual grounding in this path-breaking work. In a substantially unprecedented way, arms control came to play a major role in shaping the nuclear competition between the Soviet Union and the United States and in constructing the international nonproliferation regime.

The Academy's work on national security affairs and broad issues in international security continued in the decades to come. During the 1970s the Academy continued to carry out important work on strategic arms control. In the 1980s, it undertook a very influential study of missile defense and the concept of President Reagan's Star Wars initiative, among other things. In the 1990s, under the direction of Carl Kaysen and others, there was thoughtful work on sovereignty and intervention, especially as we worried about Rwanda, Somalia, and Bosnia and the circumstances under which we could apply military power legitimately and effectively for humanitarian purposes. We've had a whole slate of recent work on the militarization of states, on the security implications of biotechnology, and on the implications of the collapse of the Soviet Union and the struggle to impose order on the post-Soviet states – a project led by Robert Legvold. A few of us at the Academy, including Martin Malin, did some work in the advance of the Iraq War, trying to assess the possible costs and risks of that unhappy intervention.

The specific project for which I now have some responsibility examines the global nuclear order. It is rooted in the premise that as in the late 1950s, we are presently at a moment of transition. There are numerous indications that cause foreboding about the health and effectiveness of the global nuclear order. As we sit here today, we're on the edge of an expected North Korean nuclear test. The UN Security Council has missed the boat on sanctions for Iran in reaction to its protracted noncompliance with the safeguard obligation under the IAEA. We are currently bogged down in the horrible mess in Iraq, a mess that was motivated primarily by the fear that Iraq was going to gain weapons of mass destruction, above all nuclear weapons, and that it might be harboring terrorists. The nuclear order that we face today is one of uncertainty and it's also one with new agenda items.

Further, while the world is full of invocations of 9/11, there is another interesting date – 10/11, October 11, 2001, when an intelligence agent named Dragon Fire reported that Al Qaeda had nuclear weapons and had smuggled one into the United States, supposedly in New York City. On October 11 this possibility was reported to President Bush. The question was whether this report was plausible. The answer was yes. Was it conceivable that Al Qaeda could get its hands on a nuclear weapon? The answer was yes. Was it plausible that Al Qaeda could actually detonate a nuclear weapon? The answer was yes. Was there any way that you could say to the president that this was a wholly dismissible claim? The answer was no.

In fact, the U.S. government went through some scary weeks before it became apparent that this was a false report. The seriousness with which it took the claim is evidenced by the fact that Vice President Cheney spent many weeks hiding in an undisclosed location, subjected to the ridicule of late-night television comedians, but in fact behaving in a manner that reflected the seriousness with which the U.S. government took the threat of nuclear terrorism. We did not take nuclear terrorism seriously during the Cold War. We never imagined it would be a problem when the Cold War ended.

In sum, new nuclear problems have arisen, old solutions (including arms control) have faded or (at least occasionally) failed, and the global nuclear order built up over several decades of the Cold War, which proved to be so durable and effective in that era, is now eroded and its effectiveness and relevance is in doubt. What the Committee on International Security Studies is aiming to do is to assess comprehensively the global nuclear order. Where are we? What path are we on? What does it mean if the present restraint structure seems to be eroding just at the moment when we are faced with one nuclear crisis after another? If the answers of the past half century are no longer effective or sufficient, what should be done now? What is the future role of negotiated restraint? What is going to be the relationship of nuclear power and nuclear weapons in a greenhouse gas–restrained world? If we're going to live in a world that is populated by more nuclear arms states, how do we manage that world in a safe fashion? If we are on a path that is heading in an unfortunate and unattractive direction, what alternative exists that is better and how do we achieve it? As in the late 1950s, we are on the cusp of a new and more perilous era. And as was the case in the late 1950s, the Committee on International Security Studies hopes to contribute work that will help safely navigate the dangers of this new era.

Academic Freedom

Robert C. Post

David Boies Professor of Law, Yale Law School

We have come a long way since 1918 when Nicholas Murray Butler, the president of Columbia University, issued a "last and only warning to any among us . . .who are not with whole heart and mind and strength committed to fight with us to make the world safe for democracy." Butler's harassment of antiwar faculty famously caused Charles Beard to resign from Columbia in disgust.

Although that kind of crude threat to academic freedom may not now be a problem for many of us, my suggestion today is that academic freedom is very much at risk in the contemporary United States.

I do not refer to such issues as the surveillance of email, the monitoring of library use, the wiretapping of phones, or the ever-growing restrictions on contacts with our foreign colleagues. Nor am I referring to how the greatly increased need for funding has led the modern research university to privatize knowledge and to outsource funding to corporations that threaten to co-opt the use and distribution of knowledge in ways that are inconsistent with academic freedom.

I refer instead to the fact that for the first time in a long time the modern American university is now the object of sustained and coordinated ideological attack. Those of you who are scientists know well enough the explosive controversies that surround issues like evolution, stem cell research, or cosmology. But this morning I shall talk about a different kind of assault. I shall discuss the growing movement to condemn the American university as an illegitimate bastion of "liberalism."

At the cutting edge of this movement is something called the "Academic Bill of Rights" (ABR), which rests on the plainly correct premise that university scholars should be judged on the merit of their work rather than on their political views. The ABR uses this premise to reach toward a conclusion that is truly disturbing. Noting that in many university departments, most particularly in departments that concern the humanities and the soft social sciences, registered Democrats far outnumber registered Republicans, proponents of the ABR conclude that universities have discriminated against conservatives, and they demand as a remedy that universities take account of "intellectual diversity" in their employment decisions. In this way, intellectual diversity has become a fighting slogan for those who advocate that universities judge scholars based upon their political affiliation rather than upon the professional merit of their work.

The effort to impose "intellectual diversity" has become part of the legislative agenda of many organized groups. It has been proposed to state legislatures throughout the country. In 2003, it was included in the proposed International Studies in Higher Education Act as a criterion for the distribution of federal Title VI funds to foreign language and area study centers, and this proposed bill passed the House of Representatives in a nearly unanimous vote.

In this context, several Fellows of the American Academy thought the time had come to intervene and to attempt to defuse this assault on basic values of academic freedom. We came to the Academy because it could stand as an honest broker; the Academy has no ideological agenda. It has no disciplinary or ideological bias. Besides myself, our project committee includes Robert Berdahl, former chancellor of UC Berkeley, now president of the American Association of Universities; Nancy Cantor, chancellor of Syracuse University and chair of the American Council on Education; Jonathan Cole, former provost at Columbia; and Geoffrey Stone, former provost at Chicago.

Intellectual diversity has become a fighting slogan for those who advocate that universities judge scholars based upon their political affiliation rather than upon the professional merit of their work. . . . Our aspiration is to offer a compelling account of academic freedom that will defuse the current controversy threatening to compromise professional academic independence, which for so long has proved a mainstay of higher education in the United States.

Our plan is to develop a succinct statement on the relationship between intellectual diversity and a proper understanding of academic freedom. We hope to work with the nation's leading higher education organizations, professional associations, and

learned societies to promote the dissemination and endorsement of this statement. Our aspiration is to offer a compelling account of academic freedom that will defuse the current controversy threatening to compromise professional academic independence, which for so long has proved a mainstay of higher education in the United States.

Universal Basic and Secondary Education

Joel E. Cohen

Abby Rockefeller Mauzé Professor of Populations, Rockefeller University; Professor of Populations, Columbia University

In 1930, there were two billion people on the planet; in 1999, there were six billion people. The twentieth century was the only century in human history to experience a tripling of the human population. What can we anticipate in the next half century?

Today, the population numbers 6.6 billion. If current fertility rates persist without decline, we will be at 11.7 billion by 2050, a near doubling. Since roughly 1960, however, worldwide annual growth rates have dropped by half, from 2.1 percent per year to 1.1 percent per year. It's reasonable to anticipate a moderate and continuing decline in levels of fertility. If that happens, the United Nations projects a population of about 9.1 billion people in 2050. That number is extremely sensitive to what happens between now and then, and particularly to what we do today and tomorrow to educate people and provide them with reproductive health care.

By 2050, we can reliably anticipate four major changes. One, a much bigger population: whether it's two billion or four billion more people, we don't really know. All of that growth will be in poor countries. Two, we anticipate that the population will be growing more slowly, and it's possible that worldwide population growth will end. Three, the population will be much older than any human population before. For example, in the year 2000, for the first time in human history, the number of people sixty years and older exceeded the number of people between the ages of zero and four. By 2050, we anticipate that there will be three and a half times as many people sixty and older as between zero and four. A minority of grandparent-aged people will have grandchildren. Four, the world will be more urban. From 2007 on, there will be more people living in cities than in the countryside. All of the billions more people that we'll add by 2050 will be living in the cities of the poor countries. It will be a world different from the one we grew up in.

I did a survey of the kinds of panaceas people have proposed for dealing with the problems associated with widespread poverty, environmental impact, political and cultural conflicts, and rapid population growth. Panaceas come in three varieties: a bigger pie, fewer forks, and better manners. A better pie means let's increase productive capacity. Let's use technology to make more of what we want and reduce the unwanted effects of our affluence. The fewer forks proposal says let's slow population growth, and let's moderate or eliminate irrational consumption. The better manners school says let's reduce violence as a means of solving our differences. Let's eliminate corruption in governance. Let's reduce inequities between rich and poor, young and old, male and female. Let's have more efficient markets globally and locally.

If we do not educate all of the world's children well, with the skills required to master information, we prevent them from participating at the leading edge of the world's economy. And if we do not educate all children well, with the values required to solve the problems of poverty, the environment, conflict, and rapid population growth, those problems will still be with our children after we are gone.

The idea occurred to me that educating all children well for ten to twelve years could support all three of these approaches, depending on the values instilled by such education. It could increase global capacity to produce and use technology. It could facilitate lower fertility. It could increase demand and competence for better governance. This idea became, with the visionary leadership of Leslie Berlowitz, the basis of the Academy's program on universal basic and secondary education. I've been fortunate to lead this program since 1998 with David Bloom, an Academy Fellow at the Harvard School of Public Health.

Reports of this project are now available on the Academy's website. A book on *Educating All Children: A Global Agenda* will be published in January 2007 by MIT Press, and we published an essay on this project as the lead article (June 2005) in the journal *Finance & Development*, which is distributed by the International Monetary Fund. That was the first issue the IMF ever devoted to education, and it was a privilege to write the lead essay for them. We also published a lead article on the goals of universal basic and secondary education in the September 2006 issue of *Prospects*, UNESCO's review of comparative education.

We have a modest goal. We want to understand what the world would be like if all children had ten to twelve years of high-quality education, and what it would take to achieve such a world by 2050 or sooner.

One of the obstacles is the belief that we can't afford to provide a high-quality education to all children. We disagree, although it's difficult, for several reasons, to find out how much it would cost. First, the cost per child who is not now in school probably differs from the cost per child already in school. The children not in school live in more remote areas; they are poorer; they are often a minority; they may be handicapped. Second, access to schooling at the present level of quality, which is poor overall, may not entice parents to send their children to school in developing countries. We don't know how much more it would cost to get the quality improvements we need to make schooling attractive. Third, the Western model of the school, with a teacher in a building, is very expensive. It may not be the model that the developing world can afford or will want to use. With technological change, it may not even be the best way to deliver education. For all these reasons, costs of universal education are uncertain.

My colleagues, the economists who participated in this study, did some pioneering work. They estimated that universal basic and secondary education for developing countries would cost somewhere between $34 billion

and $69 billion more per year than these countries are presently spending on primary and secondary education.

But money is not the only problem. First, we lack good data about the situation. We guess that 100 – 115 million children are not in primary school, while hundreds of millions more are not in secondary school. It is a partially informed guess, but nevertheless a guess. Then there are *economic disincentives*. Families value more the time their children spend working and earning an income or handling chores than the time children spend in school. There are *competing demands*. Education competes for scarce national resources with building roads, providing medical care, strengthening national defense. There are *political obstacles*. When there's a civil war, school is the last thing that people think about. Some leaders may not want all their children educated. There are *cultural barriers*. Discrimination may inhibit educational participation for girls and ethnic minorities. And there's the *historical context*. Different countries have different histories, and it may well be that the needs for education systems differ. One size does not fit all in education.

Looking forward, at the current rate of progress, roughly one in six children at the primary school level will still not be enrolled by 2015. That's the year when the Millennium Development Goals promised that all children would be in primary school. Thirty percent of secondary-school-aged children are still not enrolled in school. Yet the participants in the Academy's UBASE project believe that universal, high-quality primary and secondary education is achievable by 2050.

We'll need many changes. One is open discussion of the goals of education. What do we want education to achieve? We need improved effectiveness and economic efficiency in education. Right now, it's a costly and ineffective process. We need a commitment to high-quality secondary education. We need international recognition that different kinds of education systems are appropriate. And finally, we need more money – which will follow from giving a higher priority to education.

Let me step back and propose a bigger picture. In the nineteenth century, the countries that mastered the chemistry and physics of the day and put materials to work by means of the Industrial Revolution had the economies at the leading edge of the world's economy. In the twentieth century, the countries that were at the leading edge of the world's economy mastered energy, principally from the fossil fuels of oil, coal, and natural gas, and put that energy to work driving their economies. We're now living with the consequences and problems of those achievements of the nineteenth and twentieth centuries. In the twenty-first century, I submit, the countries that will be at the leading edge of the world's economy are those whose people best master information and put that mastery to work in their economies.

If we do not educate all of the world's children well, with the skills required to master information, we prevent them from participating at the leading edge of the world's economy. And if we do not educate all children well, with the values required to solve the problems of poverty, the environment, conflict, and rapid population growth, those problems will still be with our children after we are gone. This applies to America's children and to children around the world.

Humanities Initiative

Norman M. Bradburn

Tiffany and Margaret Blake Distinguished Service Professor Emeritus, University of Chicago

In 1997, the American Academy of Arts and Sciences began work on an Indicators Project in the humanities. Its purpose is to establish a framework for the compilation, analysis, and publication of comprehensive trend data about the humanities that will serve researchers, policymakers, universities, foundations, museums, libraries, humanities councils, and other public humanities institutions. Better statistical tools will provide answers for basic questions about undergraduate and graduate degrees in the humanities, employment of humanities graduates, levels of program funding, public understanding and impact of the humanities, and other areas of concern within the humanities community. The project is supported by a generous grant from the Andrew W. Mellon Foundation.

The Humanities Indicators Project is modeled on the *Science and Engineering Indicators* produced biennially by the National Science Foundation under the auspices of the National Science Board. Although the National Endowment for the Humanities has had authorization since 1985 to support the production of similar data and indicators for the humanities, the agency's leadership has not felt financially able to launch such an undertaking, and Congress has not appropriated specified funding for such an effort.

What do we mean by the phrase "humanities indicators"? *Indicators* are descriptive statistics that chart trends in an area of interest. They describe; they do not explain. If done well, they can provide a common starting ground for arguments about the nature or rate of change in, for example, funding or employment. They answer "what" questions, not "why' questions. They can be somewhat like the Delphic oracle. Their interpretation is not always straightforward. They may mean different things to different observers.

We are currently organizing the Indicators around four large themes: 1) education in the humanities; 2) research and funding for the humanities; 3) the humanities workforce; and 4) the humanities in American life. There will be several subdivisions within each of those large categories, such as primary and secondary education; postsecondary education; graduate education and the scholarly pipeline; public and private funding; careers in humanities professions, particularly the fate of Ph.D.s in the humanities; public participation in the humanities; and the status of libraries and museums. We would like to have at least four indicators within each category that cover different aspects of the topic; although at present we think that we can do

The purpose of the Indicators Project in the humanities is to establish a framework for the compilation, analysis, and publication of comprehensive trend data about the humanities that will serve researchers, policymakers, universities, foundations, museums, libraries, humanities councils, and other public humanities institutions.

better than that. We are restricting ourselves to existing data from reliable sources. While we would like to disaggregate data both geographically and by discipline, it may be impossible to do so for many indicators. At a minimum, we will present national data and data, where appropriate, that contrast the humanities with other broad fields of scholarship. We are not commissioning any new data collection, although we are working with some groups to assemble existing data in new ways.

For some indicators there may be no available data that meet our quality standards. One of the tasks of the Indicators Project will be to call attention to areas where there are little or no data with the hope that some agency will find it important to gather such data.

Our goal is to have a prototype set of indicators by spring 2007 and to circulate them widely for comment. Because the meaning of the term "indicators" may be ambiguous, we will commission a series of essays for each of the main themes. Some of the essays will describe the apparent trends in the data and explain the data's limitations. Other essays will be more interpretive in nature and give the authors' views about what the data mean for the status and future of the humanities.

At a series of conferences to discuss the essays and critique the Indicators, we hope to get constructive feedback for revision of the Indicators. Our final goal is to produce a first edition of the Indicators in several forms – hardcopy, CD, and on the web – by the spring of 2008. The creation of a website in the near future will enable us to post progress reports and perhaps try out some ideas about possible indicators, as well as provide an opportunity for a wider audience to suggest new indicators.

The project will undoubtedly generate a lot of interest and possibly a lot of controversy. For example, I am sure there will be disagreement about the meaning of various indicators. Our aspiration is to provide a solid base of data that everyone will argue from, whether it is a glass that is half full, half empty, or has a hole in the bottom with the lifeblood draining out rapidly.

Patricia Meyer Spacks

Edgar F. Shannon Professor of English Emerita, University of Virginia

The Indicators Project, with the splendid guidance of Norman Bradburn, and the Template Project, expertly led by John Hammer, compose two important parts of the Humanities Initiative, one of the Academy's long series of undertakings in the humanities. The Initiative, however, pursues other enterprises as well. Its long-term purpose is to make the importance, meaning, and history of the humanities more widely comprehensible. The statistical information provided by the indicators offers one way of demonstrating the place of the humanities; various kinds of discursive prose supply others. Last year, we published two collections of essays on the recent history of humanistic academic disciplines. One, edited by David Hollinger, was issued by the Johns Hopkins University Press with the title, *The Humanities and the Dynamics of Inclusion since World War II*. The title pretty much says it: the essays concern the effects on humanistic disciplines of the new forms of diversity that developed in American colleges and universities in the twentieth century. The other collection, which I edited, was published as the Spring 2006 issue of *Dædalus*. It took a longer perspective on the histories of seven disciplines in the humanities, enunciating general principles of those academic pursuits.

We have two projects in view. One entails convening a group of college and university presidents and provosts to discuss the actual current situation of the humanities in higher education. . . . The second undertaking would begin with a symposium, one that included scholars and critics of the arts, practitioners, and museum curators and administrators. . . . Eventually, there would be a book of essays, one that articulated the tensions between preservation and innovation, and between those who make art and those who discuss it.

We expect, in the long run, to publish several more collections of essays, expanding to an international perspective and considering various institutions that support the humanities. How have changes in libraries and museums reflected changes in the understanding of humanities? What about funding sources? Have they increased or diminished? Have they altered their priorities for support? How have changes in funding affected projects pursued? What do the humanities look like in Europe, in Asia? Such questions have received little attention in recent years; even speculative answers to them would further a fruitful discussion.

More immediately, we have two projects in view. One, for which we've already secured funding, entails convening a group of college and university presidents and provosts to discuss the actual current situation of the humanities in higher education. If you read the *Dædalus* issue I mentioned, you will discover, from an essay by Steven Marcus, that the humanities originally filled a quasi-religious function in American institutions of higher learning, exemplifying the good, the true, and the beautiful; inculcating morality; and insisting on the students' attention to what the poet William Butler Yeats called "monuments of unaging intellect." Their purposes now, one suspects, are not quite the same. At any rate, those purposes are not articulated in the same way. It would be illuminating to know what the people who run universities see as the role of humanities in their institutions, what trends they perceive, and what they anticipate. A collection of essays that will ultimately emerge from the discussion should provide valuable perspective.

The second undertaking is at an earlier stage of development. It, too, would begin with a symposium, one that included scholars and critics of the arts, practitioners, and museum curators and administrators. The humanities, among other things, deal with artistic production of all kinds, particularly through such disciplines as literature, art history, and music history. This symposium would raise the question of the critic's responsibility to the present as well as to the past. The function of the humanities most widely understood is probably that of preserving and transmitting understanding of past art to the present. But scholars and critics must also engage in what is happening now. Dialogue between practitioners and critics rarely occurs; the proposed sym-

posium would provide an opportunity for it. Eventually, there would be yet another book of essays, one that articulated the tensions between preservation and innovation, and between those who make art and those who discuss it.

Both the volumes that have already appeared and those projected express controversy. The aim of the Humanities Initiative is not to provide answers for our questions about the humanities, but to help provide terms for discussion as well as facts to support the discussions. Controversy is part of the point.

There's one more project that's barely a gleam in our collective eye, something we've just started thinking about in tentative terms. An interest in the humanities implies interest in writing as a human activity. Writing, of course, is a means of communication, and academic prose often, notoriously, fails to communicate beyond a specialist audience. We've been pondering the possibility of initiating a writing workshop for academics, to be led by a professional editor, in which participants from diverse disciplines could talk together about their writing and, ideally, develop some new procedures for reaching broader audiences on occasion. Exactly how participants would be selected, how long the workshop would last, whether shifting populations for it would be possible, as is the case with many writing workshops – such questions remain to be worked out. If it happens, it will be an important new kind of experiment for us.

Of course new experiments take place all the time at the Academy. I hope many of you will want to take part in them.

Media and Democracy

Boyce Rensberger

Director, Knight Science Journalism Fellowships, Massachusetts Institute of Technology

In a democracy, the people are supposed to rule. But they can't be good rulers without access to good information and some skill and understanding in how to think about and analyze that information. In a rapidly changing democracy, shared new sources of information come from the news media. The American Academy is interested in evaluating how well the news media – newspapers, magazines, broadcast media, and the web media – inform the people. It is also interested in helping the media do a better job in covering changes in society. The Media and Democracy project was started just last year with funding from the Annenberg Foundation. It is an effort to understand how journalists influence public understanding and policymaking. We want to identify the strengths and weaknesses in the process, and to see if there is some way we can help make the media function better, so that the rulers, both the people and their governments, rule wisely.

This project is working on separate tracks in two different spheres: one is on science and technology, the other is on business and the economy. Each has its own committee. The business and the economy committee includes business leaders, economists, business journalists, and academics. One early product of that committee is a symposium on the future of news, to be held in New York City in early December. [The event took place on December 7, 2006.] Norman Pearlstine, the former editor-in-chief of Time Inc., is heading that initiative.

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The science and technology committee – of which I am a member – includes scientists, science journalists, and academics. It is cochaired by Donald Kennedy, former President of Stanford University and the current editor of *Science*, and by Geneva Overholser, former editor of the *Des Moines Register* and now a professor at the University of Missouri School of Journalism. Our group is concerned that the American public is weak in its understanding of science, science facts, and scientific ways of thinking. This is an acute problem when you look at the increasing rate at which science and technology are penetrating our lives. We think, not surprisingly, that the public ought to have a better grasp of scientific processes, especially in a democracy where they have to vote on issues that often have scientific dimensions and vote for candidates who take positions on these issues. You only have to think about some current examples to realize how important this is. Should the government fund embryonic stem cell research? Should we restrict the emissions of carbon dioxide? Should we teach evolutionary biology as science?

In a capitalist democracy, people need an understanding of science and technology if they are going to make sensible decisions in the marketplace, including, just to take one example, the market for health-care services and products. The drug industry is becoming ever more sophisticated in marketing new drugs to a public that has very little capacity to evaluate clinical trials and the nature of evidence as it pertains to the advertising claims for these drugs. We want the nation's science and medical reporters to get more sophisticated about these questions. The role of a journalist is important. I used to be a journalist, and I like to think I had some influence on my readers, in addition to entertaining them for a few minutes. For many people, their science education stops when they leave school, even though science keeps changing. The only way we can help people keep up is through the mass media, and that's a challenge when almost all the news organizations are cutting their staffs and budgets – not because they're losing money but because they want to keep profits extremely high.

Our committee is looking for ways to improve that situation, and we are working on several projects. One is to develop a mechanism that would consider each of the controversial or important scientific issues of the day. A group of experts would distill the evidence into some kind of "state-of-the-science" report that would provide an informational platform for national discourse on those issues. We would not take a position; we simply want to evaluate which sorts of evidence would apply. Some kinds of science should be more convincing than others. We also want to work to improve

the training of scientists because scientists need to be more knowledgeable about the public. We want scientists to get out of their labs and engage with the public, in small communities to the national stage. This means fighting one of the major cultures of academia, which very strongly discourages scientists from doing that kind of thing.

These two groups that I mentioned have proceeded on separate tracks, but there is one area where they come together, and that's the impact of technology on the way people get their news and the way journalists gather the news and deliver it to the public. We think these changes are going to have profound effects, altering the news business and how well the people are able to govern themselves.

We know that profound changes are taking place in newsrooms all across the country. It is exciting to be involved in this project.

Congress and the Court

Linda Greenhouse

Supreme Court correspondent, The New York Times

As some of you know, meetings at the Academy often include a musical interlude, but we've been so action packed with our verbal presentations today that we have not had any music. So, for three minutes, I'm going to interject a little musical interlude as an introduction to my brief discussion about the Academy's interest in the future of the judiciary.

[Editor's note: *At this point, the audience hears a recorded song parody in which "federal judges" proclaim, "I'm always right" and "think of me as royalty." The song is followed by audience laughter and applause.*]

Of course, we're all very amused by that, but it's a cultural artifact with some significance because we do have judges who are depicted as arrogant, unaccountable, and, as the song says, "appointed forever." There are a growing number of attacks on the judiciary, and the fact that this song is out there on the Internet (from which a law student downloaded it for me) underscores that this is an issue we need to address.

The Academy's current interest in the judicial process is an outgrowth of a project that we started a few years ago called "Congress and the Court." The project responded to the fact that the Supreme Court, in a series of cases, had started constraining the power of Congress in a way that had not been seen since the days of the New Deal. The project facilitated several conversations between members of the Supreme Court and members of Congress. With that era of Supreme Court decisions now in abeyance, the project has evolved to reflect what retired Justice Sandra Day O'Connor said in late September in the *Wall Street Journal*: "The breadth and intensity of rage currently being leveled at the judiciary may be unmatched in American history." This anger is not new, but in her perception and the perception of a number of people, it is unmatched. Justice O'Connor herself recently cochaired a conference at the Georgetown University Law Center on what she called "Fair and Independent Courts."

What the Academy is trying to do, at this early transitional stage of our project, is to stimulate some fruitful conversations about the state of the judiciary. Let me point to just one example of how judicial independence can be compromised. A recent story in the *New York Times* tied political campaign contributions made to members of the Ohio Supreme Court to the way its judges voted.

What we are trying to do, at this early transitional stage of our project, is to stimulate some fruitful conversations about the state of the judiciary. . . . We hope that the Academy's sustained interest in the independence of the judiciary will lead to new insights into the judicial process and greater opportunities to educate the public on this important issue.

This revelation was a reminder that the issue of judicial independence goes beyond the federal judiciary to the state courts, where 90 percent or more of the litigation in this country takes place.

In April 2007, I will chair a panel on this topic at a joint meeting of the American Academy and the American Philosophical Society in Washington, D.C. We are honored that Justice O'Connor will be one of the participants, along with Judith Kaye, Chief Judge of the New York State Court of Appeals.

Unlike many institutions that have taken an interest in the vulnerability of the judicial system, the Academy has the advantage of being a neutral arbiter with a broad-based fellowship. Lawyers are a tiny minority of the Academy's members, but all of us are stakeholders in the fairness and independence of our judicial system.

We have just heard Boyce Rensberger speak about the public misunderstanding of science. I would like to add that civics education is no longer part of many public-school curricula. An Annenberg survey, commissioned specifically for Justice O'Connor's conference, revealed a shocking amount of ignorance about the basic structures of our government in general and of the judiciary in particular. For instance, only a bare majority of the American public thought that the President had to obey a constitutional ruling of the Supreme Court. We hope that the Academy's sustained interest in the independence of the judiciary will lead to new insights into the judicial process and greater opportunities to educate the public on this important issue. ■

Visiting Scholars Program

2006–2007 Visiting Scholars: front (left to right): Anthony Mora, Chair of the VSP Patricia Meyer Spacks, and Ajay Mehrotra; back (left to right): Bethany Moreton, Victoria Cain, Chief Executive Officer Leslie Berlowitz, M. Taylor Fravel, Director of the VSP Alexandra Oleson, Anne Stiles, and Laura Thiemann Scales

This year the Academy welcomes its fifth class of Visiting Scholars and a new program chair, Patricia Meyer Spacks, Edgar F. Shannon Professor of English Emerita at the University of Virginia and former President of the Academy. A teacher, scholar, and expert on eighteenth-century literature, Spacks is committed to encouraging promising younger scholars in fields where few fellowship opportunities exist. As she has said, "the future of scholarship in this country depends on the ability to identify and foster individuals who are dedicated to teaching and research and to enrich their apprenticeship with time for study and contemplation as well as intellectual interaction." The Academy is deeply grateful for her continuing service as the leader of this important effort.

Founded in 2002 and supported by fifty University Affiliates nationwide, the Visiting Scholars Program supports the work of scholars who demonstrate extraordinary promise in the humanities, the social sciences, and policy studies. Each year, postdoctoral and junior faculty scholars are granted time to pursue their individual research in an environment that offers opportunities for collaboration with Academy Fellows and cooperation with neighboring institutions. The 2006 – 2007 class is undertaking a wide range of studies, from an examination of how China has settled territorial disputes since the establishment of the People's Republic to an analysis of the relation between neurobiology and popular fiction at the end of the nineteenth century to a project on the evolution of America's natural history museums. The scholars represent institutions from across the country: Columbia University, Harvard University, Indiana University, MIT, Texas A&M, UCLA, and Yale University.

The program would not be possible without a close association with the Humanities Center at Harvard. The Academy is indebted to the Director of the Center, Homi Bhabha, and the Executive Director, Steven Biel, for their generous assistance in providing scholars with access to Harvard's research facilities. Throughout the year, the Academy works with the Humanities Center to plan symposia and discussions and to host events.

This fall, for the first time, the Academy and the Humanities Center co-hosted a reception for Visiting Scholars and Fellows throughout the Boston-Cambridge area. Academy President Emilio Bizzi and Chief Executive Officer Leslie Berlowitz joined Patricia Meyer Spacks in welcoming visitors from throughout the country and abroad to the House of the Academy. The reception was preceded by a program featuring a presentation on the historic buildings of Cambridge by *Boston Globe* architectural critic Robert Campbell and remarks by the several directors of neighboring institutes.

Homi Bhabha and the Director of the Radcliffe Institute Drew Faust urged the scholars to become part of a multidisciplinary intellectual community by participating in seminars and conferences at the varied fellowship programs in the area. As Faust noted, "I want to remind you of the long tradition of visitors who came to this community in the hope of gaining from the intellectual experience it offers. After graduating from college in Maine, Henry Wadsworth Longfellow wrote a letter to his father in 1824 saying, 'I am very desirous to hear your opinion of my project for residing a year in Cambridge. I think a twelve-month's residence at Harvard would be exceedingly useful. . . . Whatever I do study ought to be engaged in with all my soul for I will be eminent in something.'" Faust added, "I wish for all of you a year of uninterrupted time that enables you to get engaged in your work 'with all your soul,' and I hope you succeed as well as Longfellow did in achieving eminence 'in something' as he put it."

Chair of the Visiting Scholars Program

Patricia Meyer Spacks – President of the Academy, 2001 – 2006. Edgar F. Shannon Professor of English Emerita, University of Virginia. Ph.D., University of California, Berkeley. M.A., Yale University. B.A., Rollins College. A renowned scholar of eighteenth-century literature and culture whose work encompasses issues of identity and selfhood, privacy, gossip, and feminism. Her most recent work is *Novel Beginnings: Experiments in Eighteenth-Century English Fiction*, an account of the diverse forms and themes that contributed to the development of the eighteenth-century novel.

Visiting Scholars, 2006 – 2007

Victoria Cain – Ph.D., Columbia University. B.A., Harvard University. *Selling Nature: America's Natural History Museums, 1869 – 1942*. An investigation of how consumer culture and Progressive reforms transformed American natural history museums, resulting in deep schisms between academic scientists and image-makers, and a new relationship between popular and professional conceptions of science.

M. Taylor Fravel – Assistant Professor of Political Science, MIT. Ph.D., Stanford University. B.A., Middlebury College. *The Long March to Peace – China's Settlement of Territorial Disputes*. An exploration of why and how China has settled its territorial disputes since the establishment of the People's Republic in 1949, demonstrating that leaders are more likely to compromise when confronted by internal threats to regime security, including rebellions and legitimacy crises, and suggesting that domestic conflicts often create incentives for cooperation.

Ajay Mehrotra – Associate Professor of Law and of History, Indiana University School of Law. Ph.D., University of Chicago. J.D., Georgetown University. B.A., University of Michigan. *Sharing the Burden: Law, Politics, and the Making of the American Fiscal State: 1880 – 1930*. An investigation of the transformation of U.S. public finance from a system of regressive indirect national taxes to a progressive income tax regime guided not only by the need for greater revenue but also by concerns for equity and social justice.

Anthony Mora – Assistant Professor of History, Texas A&M University. Ph.D., University of Notre Dame. B.A., University of New Mexico. *Race Rivals: African-Americans, Mexican-Americans, and Ideologies of Racial Difference, 1890 – 1940*. An attempt to shift historical studies of race away from the "white" and "other" dichotomy by examining the relationship between these two groups in Chicago, where they lived in close proximity to each other and created their own understanding of race in America.

Bethany Moreton – Ph.D., Yale University. B.A., Williams College. *Wal-Mart World: The Globalization of the Sunbelt Service Economy*. An examination of how Wal-Mart and its philanthropic foundations harnessed evangelical Christianity to foster trust in corporate actors and the free market.

Laura Thiemann Scales – Ph.D., Harvard University. B.A., Yale University. *Speaking in Tongues: Mediumship and American Narrative Voice*. A study of the influence of prophets, spiritual mediums, and psychics on ideas of narrative personhood in the works of Stowe, Hawthorne, James, Hopkins, Faulkner, and other writers from the Second Great Awakening to the modernist movement.

Anne Stiles – Ph.D., University of California, Los Angeles. B.A., Harvard University. *Reading the Neurological Romance: Popular Fiction and Brain Science, 1865 – 1905*. A consideration of the complex relationship between neurology and popular fiction at the *fin de siècle*, when such scientifically trained novelists as Bram Stoker, Robert Louis Stevenson, and H. G. Wells intervened in controversies spawned by late-Victorian neurology and actively shaped public opinion about neurological innovations.

Drew Faust (Radcliffe Institute for Advanced Study), Homi Bhabha (Humanities Center at Harvard), and Patricia Meyer Spacks (Visiting Scholars Program at the American Academy)

Fellows from research programs in the Greater Boston area at the fall reception.

University Affiliates Total 50

The Academy is pleased to announce that the number of University Affiliates has grown to 50. American University in Washington, D.C., and Boston College have become the newest members of this consortium, which includes colleges and universities from across the country. These institutions provide support and guidance for Academy research on higher education, including the Visiting Scholars Program. Representatives of the Affiliates will take part in a new study of the successes and failures of general education requirements in achieving science literacy; it will include an analysis of national data on student course-taking in the sciences as well as case studies of innovative approaches to teaching science to nonscience majors at American institutions of higher learning.

The Academy is grateful to Cornelius Kerwin, Interim President of American University; to Rev. William P. Leahy, S.J., President of Boston College; and to the leaders of all the Affiliates for their confidence in our efforts to advance studies on critical issues in higher education and to encourage the work of younger scholars who will become important contributors to their fields of study.

University Affiliates

American University – Cornelius Kerwin, Interim President
Boston College – Rev. William P. Leahy, S.J., President
Boston University – Robert A. Brown, President
Brandeis University – Jehuda Reinharz, President
Brown University – Ruth J. Simmons, President
City University of New York – Matthew Goldstein, Chancellor
Columbia University – Lee C. Bollinger, President
Cornell University – David J. Skorton, President
Dartmouth College – James Wright, President
Duke University – Richard H. Brodhead, President
Emory University – James W. Wagner, President
George Washington University – Stephen J. Trachtenberg, President
Harvard University – Derek Bok, Interim President
Indiana University – Adam W. Herbert, President
Johns Hopkins University – William R. Brody, President
Massachusetts Institute of Technology – Susan Hockfield, President
Michigan State University – Lou Anna K. Simon, President
New York University – John Sexton, President
Northwestern University – Henry S. Bienen, President
Ohio State University – Karen A. Holbrook, President
Pennsylvania State University – Graham Spanier, President
Princeton University – Shirley M. Tilghman, President
Rice University – David W. Leebron, President
Rutgers, The State University of New Jersey – Richard L. McCormick, President
Smith College – Carol T. Christ, President
Stanford University – John L. Hennessy, President
Syracuse University – Nancy Cantor, President & Chancellor
Tufts University – Lawrence S. Bacow, President
University of California, Berkeley – Robert J. Birgeneau, Chancellor
University of California, Davis – Larry N. Vanderhoef, Chancellor
University of California, Irvine – Michael V. Drake, Chancellor
University of California, Los Angeles – Norman Abrams, Acting Chancellor
University of California, San Diego – Marye Anne Fox, Chancellor
University of Chicago – Robert J. Zimmer, President
University of Illinois at Urbana-Champaign – Richard Herman, Chancellor
University of Iowa – Gary Fethke, Interim President
University of Maryland – C. D. Mote, Jr., President
University of Michigan – Mary Sue Coleman, President
University of Minnesota – Robert H. Bruininks, President
University of North Carolina at Chapel Hill – James Moeser, Chancellor
University of Notre Dame – Rev. John I. Jenkins, C.S.C., President
University of Pennsylvania – Amy Gutmann, President
University of Pittsburgh – Mark A. Nordenberg, Chancellor
University of Southern California – Steven B. Sample, President
University of Texas at Austin – William Powers, Jr., President
University of Virginia – John T. Casteen III, President
University of Wisconsin-Madison – John D. Wiley, Chancellor
Virginia Polytechnic Institute and State University – Charles W. Steger, President
Wellesley College – Diana Chapman Walsh, President
Yale University – Richard C. Levin, President

Project Publications

International Space Security

The project on Reconsidering the Rules of Space, funded by the Carnegie Corporation, has been examining major policy issues affecting the commercial, military, and scientific uses of space. This multi-volume project is led by Academy Fellow John D. Steinbruner (University of Maryland).

The newest publication from the project, *The Minimum Means of Reprisal: China's Search for Security in the Nuclear Age* by Jeffrey Lewis, was published by MIT Press in February. The book examines China's nuclear defense investments; strategic force deployments, including space weapons; and arms control behavior. Jeffrey Lewis is executive director of the Managing the Atom Project at the Belfer Center for Science and International Affairs in Harvard University's Kennedy School of Government.

Another recent publication, "Chinese Perspectives on Space Weapons," was released in January 2007 as part of *Russian and Chinese Responses to U.S. Military Plans in Space*, an Academy occasional paper. Physicist Hui Zhang examines Chinese security concerns about U.S. missile defense and space policies and how the Chinese government may respond to those concerns, and outlines technical and legal measures the international community might take to protect all countries' scientific, commercial, and military uses of space. Hui Zhang is a research associate at the Kennedy School's Belfer Center, where he focuses on nuclear arms control and space security.

Earlier studies in the series include:

- *The Physics of Space Security* (2005) by David Wright, Laura Grego, and Lisbeth Gronlund (all, Union of Concerned Scientists). This volume provides a review for nonspecialists of the physics governing a wide variety of space operations. The authors describe the capabilities of anti-satellite weapons and weapons in space and how these capabilities compare, in both effectiveness and cost, to alternative defense systems. They also consider the options open to nations that wish to defend against these capabilities, and explain the various methods for interfering with satellite systems and space-based weapons.
- *United States Space Policy: Challenges and Opportunities* (2005) by George Abbey (Rice University) and Neal Lane (Rice University). This study identifies three important shifts in U.S. plans for space – proposals by the military to place weapons in space, decreased funding for civilian space science, and an unwillingness to collaborate with international partners on space initiatives – as threats to the nation's long-term scientific interests in space.

These studies provide a historic, political, and technical context for major policy issues affecting the commercial, military, and scientific uses of space. Further information about the project and copies of the papers are available online on the Academy website. ■

Children and the Nazi Persecution

What Happened to the Children Who Fled Nazi Persecution, by Gerald Holton and Gerhard Sonnert with Preface by Bernard Bailyn, examines the 1930s and 1940s flight of nearly thirty thousand children and adolescents from National Socialist persecution in Central Europe to the safety of the United States. The first study of its kind, focusing on a generation of children who typically arrived without command of the English language or means of support, and often without parents, Holton and Sonnert's book documents the factors leading to the collective educational and occupational success of this refugee population. In addition to accounting for the psychological anguish that lingers for some members of this generation, they consider the ways in which gender might have affected individuals' experiences and career results. A product of Harvard's "Project Second Wave," the five-year study, which involved almost 2,500 participants, began with key questions concerning issues of identity and intellectual formation for these child and adolescent immigrants.

Approved by the Academy's Committee on Studies and funded by a generous grant from the Andrew W. Mellon Foundation, *What Happened to the Children Who Fled Nazi Persecution* was published in December 2006 by Palgrave Macmillan (ISBN 1-4039-7625-2).

Gerald Holton, a Fellow of the Academy since 1956, is Mallinckrodt Research Professor of Physics and Research Professor of the History of Science at Harvard University. **Gerhard Sonnert** is a sociologist of science and research associate in the Department of Physics at Harvard University. **Bernard Bailyn**, elected to the Academy in 1963, is Adams University Professor and James Duncan Phillips Professor of Early American History Emeritus at Harvard University.

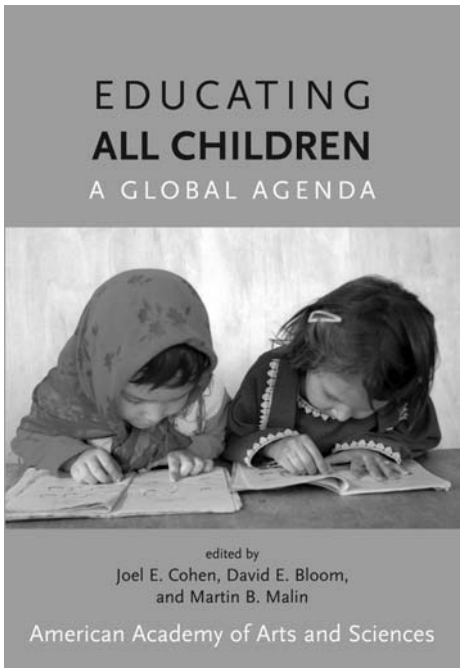
For ordering information, visit Palgrave Macmillan's website: http://www.palgrave-usa.com. For project information, see: http://www.physics.harvard.edu/holton/projectsecondwave.htm. ■

Educating All Children: A Global Agenda

A new book from an ongoing Academy study reports on the impact of providing high-quality education to every child in the world between the ages of 6 and 16. According to the authors, achieving universal basic and secondary education by the middle of the twenty-first century is both possible and affordable. The volume presents a cohesive picture of past, present, and future steps necessary to reach this goal, and concludes that five changes are essential to achieve universal primary and secondary education by mid-century:

- Open discussions, nationally, regionally, and internationally, on what people want primary and secondary education to achieve – that is, the goals of education;
- A commitment to improving the effectiveness and economic efficiency of education;
- A commitment to extending high-quality secondary education to all children;
- Recognition of the diverse character of educational systems in different countries, and adaptation of aid policies and educational assessment requirements to local contexts;
- More funding from rich countries for education in poor countries.

Although greater numbers of people are completing primary, secondary, and tertiary education than ever before, ensuring universally available high-quality schooling still faces major obstacles. In *Educating All Children*, leading experts discuss the current state of education and how to measure global educational progress, the history of compulsory education, political and financial obstacles to expanding education, the role of educational assessment and evaluation in developing countries, cost estimates for providing universal education (and why they differ so widely), the potential consequences of expanded global education, and the relationship between education and health.



Universal *primary* education has long been advocated in international forums, but the editors contend that *secondary* education must also be universally available. They note that many benefits of education do not accrue until students have had ten years or more of schooling and that "primary education is more attractive if high-quality secondary education beckons."

At the current rate of progress, the international commitment to universal primary education by 2015, as expressed in the United Nations' Millennium Development Goals, will not be met. According to the study, by 2015, roughly 114 million children – most in the world's poorest countries – will still not be enrolled in primary school and 185 million will not be receiving a secondary education.

The Academy is planning additional work to understand and help to overcome challenges to the implementation of universal, high-quality basic and secondary education by mid-century.

The volume is edited by Academy Fellows **Joel E. Cohen** (Rockefeller and Columbia Universities) and **David E. Bloom** (Harvard University School of Public Health) and Academy Program Director **Martin B. Malin**.

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"*Educating All Children: A Global Agenda* is a timely reminder of the importance of universal access to education in the fight against poverty."
– **Gordon Brown**, British Chancellor of the Exchequer

"This is among the most interesting books on education and development I have read in a decade."
– **Stephen P. Heyneman**, Professor of International Education Policy at Vanderbilt University

The "computers" at the Harvard College Observatory, standing in front of the observatory entrance, 1917. Henrietta Leavitt is fourth from the left. Courtesy Harvard College Observatory.

Great Scientific Discoveries of the Twentieth Century

Alan Lightman

This presentation was given at the 1901st Stated Meeting of the Academy and Joint Meeting with the Boston Athenæum, held at the Boston Athenæum on April 4, 2006.

Alan Lightman is Adjunct Professor of the Humanities at the Massachusetts Institute of Technology. He has been a Fellow of the American Academy since 1996.

Several years ago, I decided to explore some of the great discoveries in science in the twentieth century. I wanted to know: How do scientific discoveries happen? Which discoveries are accidental and which are intentional? Are there common patterns of discovery? How do styles of working and thinking vary from one science to the next and from one scientist to the next? How does the creative process in science compare to the creative process in the humanities and the arts?

I started by asking my friends – astronomers, physicists, biologists, chemists – to nominate the greatest discoveries in the twentieth century in their fields. I received about a hundred nominations, and I winnowed the list down to twenty-two.

Each of these twenty-two discoveries has profoundly changed the way we view ourselves and our place in the world. The original discovery papers themselves had a magic for me. I've often been puzzled why, in the humanities, we always read the original literature, but in science we rarely do. I think it's partly associated with the myth that in science it's only the bottom line that matters. But in the original papers we can hear the voices of the scientists; we can follow their lines of thought; we can see the great thinkers struggling to understand their place in the world. The original papers have something that no textbook summary can replace.

How do scientific discoveries happen? How does the creative process in science compare to the creative process in the humanities and the arts?

The great discoveries in the twentieth century that I chose to study are:

1. Max Planck's discovery of the quantum in 1900 revealed that energy is not continuous as people believed, but actually comes in little lumps called quanta. His findings revolutionized quantum physics and much of the computer technology that we have today.

2. In 1902, two British physiologists, William Bayliss and Ernest Starling, discovered the first human hormone. A few years later, we realized that hormones constitute a second mechanism, after the nervous system, for the body to communicate with itself.

3. Albert Einstein's 1905 discovery that light is not a continuous stream, but comes in little particles, laid the foundations of quantum mechanics.

4. Einstein's second great discovery that same year – probably the greatest discovery in physics of all time – was special relativity. He showed that the flow of time is not absolute, as it seems, but is actually relative to each observer.

5. In 1911, Ernest Rutherford found the nucleus of the atom – a tiny fraction of the volume of the atom that contains almost the entire atom's mass. If the entire atom were the size of Fenway Park, the nucleus would be the size of a marble.

6. Henrietta Leavitt, an astronomical assistant at the Harvard College Observatory, published a paper in 1912 that showed how to measure the distance to the stars, a finding of immense importance in astronomy.

7. In 1912, also, Max von Laue discovered a method for measuring the arrangement of atoms in solid matter using x-rays.

8. Neils Bohr, the great Danish physicist, put together the ideas of Planck, Einstein, and Rutherford in 1913 to construct, theoretically, the first quantum model of the atom.

9. In 1921, Otto Loewi discovered that nerves communicate with each other by secretion of a chemical.

10. Werner Heisenberg, one of the founders of modern quantum physics, published his famous Uncertainty Principle in 1927. It maintains, among other things, that we cannot predict with complete accuracy the future from the present, even if we knew all the laws of physics. The problem is that we cannot measure, or know, the positions and velocities of particles, or even a single particle, at any initial moment of time. In addition to having meaning for physics, this discovery has great philosophical, theological, and ethical meaning.

11. Linus Pauling, in 1928, published his first paper on the understanding of the chemical bond, the forces holding two or more atoms together to form a molecule. Pauling is the only person to have won the Nobel Prize in both a field of science and in peace.

12. Making extensive use of Henrietta Leavitt's earlier work, California astronomer Edwin Hubble, in 1929, found evidence showing that the universe is expanding.

13. In 1929, Alexander Fleming published his paper on penicillin, the first antibiotic, which led to the entire medical revolution that has saved millions of lives.

14. In 1937, Hans Krebs developed what is now called the Krebs cycle: the sequence of chemical reactions by which food is converted into energy in individual cells.

15. Physicist Lise Meitner and chemist Otto Hahn discovered nuclear fission in 1939 in an experiment that consisted of bombarding uranium atoms with neutrons. In previous experiments, when you bombarded a very heavy atom like uranium with a tiny subatomic particle, you only chipped off a bit of the larger nucleus. Hahn was expecting to find other atoms in the debris that were just a little less massive than uranium. But in his chemical test, he found that, after the bombardment, the remnants seemed to have the chemical properties of barium, which is half the mass of uranium. It was as if the uranium nucleus had been split in two by a diminutive neutron, similar to splitting a mountain in two with a stone from a slingshot. Hahn did the experimental work and Meitner made the theoretical interpretation.

The first category is the accident, in which the scientist discovers something that he or she was not looking for.

Hahn wrote in his paper: "As chemists, we really ought to revise the decay scheme given above and insert the symbol for barium instead of the symbol of radium, which is very close to uranium. However, as 'nuclear chemists' working very close to the field of physics, we cannot bring ourselves yet to take such a drastic step, which goes against all previous experience in nuclear physics. There could, perhaps, be a series of unusual coincidences which have given us false indications." Of course, we learn shortly later that his tests were correct: he was detecting barium, and this was the beginning of the nuclear age.

16. Barbara McClintock in 1948 discovered that genes could move around on individual chromosomes. Before that, people thought the chromosome was like a fixed chain, with fixed links.

17. Rosalind Franklin, James Watson, and Francis Crick discovered the structure of DNA in 1953.

18. Max Perutz, a physical chemist, discovered the structure of hemoglobin in 1960.

19. In 1965, Robert Wilson and Arnold Penzias accidentally discovered the radio waves left over from the Big Bang. Robert Dicke, a Princeton physicist, who was both an experimentalist and a theorist, first interpreted their discovery. In fact, a few months earlier, Dicke had predicted that radio waves left over from the Big Bang should be pervading all of space. He was building an experimental apparatus that would detect these radio waves when Penzias and Wilson told him that they had found this radio hiss in their antenna that they didn't recognize. Dicke realized that they had indeed made the discovery that he was only a month or two away from making himself. Penzias and Wilson eventually won the Nobel Prize.

20. In 1967, Steven Weinberg independently discovered the first modern unified theory in physics, showing that two fundamental forces were actually part of the same force.

21. In 1969, Jerry Friedman, with Henry Kendall and Richard Taylor, discovered quarks. The quark is the smallest known elemental bit of matter. When we were in school, we were told that the proton and neutron are the smallest particles in the nucleus of the atom. Since then, we have learned that each proton and neutron is composed of three quarks.

22. In 1972, Stanford biologist Paul Berg discovered recombinant DNA, where two strands of DNA from different organisms are joined together to create a new strand of DNA and an altered life form that never existed before in nature.

* * *

There are two particular discoveries that I'd like to describe in more detail: One is Otto Loewi's discovery that nerves communicate with each other by the secretion of a chemical. The other is Henrietta Leavitt's discovery of a method to measure the distances to stars.

In one of the most remarkable narratives of scientific discovery, Otto Loewi recalled how the idea for testing the way nerves communicate came to him in a dream: "The night before Easter Sunday of [1921] I awoke, turned on the light, and jotted down a few notes on a tiny slip of paper. Then I fell asleep again. It occurred to me at six o'clock in the morning that during the night I had written down something most important, but I was unable

The second category, which is very rarefied, is 'principles first.' Here the scientist begins with a philosophical principle and then explores the consequences of that principle.

to decipher the scrawl. The next night, at three o'clock in the morning, the idea returned. It was a design of an experiment to determine whether or not the hypothesis of chemical transmission [of the nervous impulse, from nerves to their organs] was true. I got up immediately, went to the laboratory and performed a simple experiment on a frog part, according to the nocturnal design. . . ."

At the time of his dream in 1921, it was well known that the nervous system is the primary means of communication in the body. It was also known that, in an individual nerve, the communication signal is electrical. What was not known was how the nerves conveyed their impulses from one nerve to the next, or from a nerve to an organ. In other words, how do nerves talk to the rest of the body? Most biologists believed that nerves communicated with other nerves and with organs by electricity. In this view, tiny electrical currents would flow from one nerve to the next.

Loewi's late-night experiment was not only simple but elegant. He took the hearts out of two frogs and removed all the nerves from the second heart. Into both hearts he inserted a metal tube filled with Ringer solution, which matches the concentration of salts in the body and keeps isolated hearts alive. It's hard to imagine, but these hearts were still beating outside of the animals. Loewi then stimulated the vagus nerve of the first heart – the heart that had the nerves still attached. The vagus nerve slows down the functions of organs, and the heart's rate of beating slowed down as expected.

After a few minutes, he took the fluid from the first heart and poured it into the tube going into the second, nerveless, heart. The second heart slowed down, just as if its own vagus nerve had been stimulated. Then he focused on the accelerator nerve, which speeds up all functions. When he stimulated the accelerator nerve of the first heart, it sped up. He then took the liquid out of the tube that had been stuck in the first heart and poured it into the tube going into the second heart, which sped up as well. The results provided conclusive evidence that the transmission from a nerve to an organ, or from a nerve to another nerve, is chemical, not electrical. The stimulated nerve secreted a chemical. Loewi had discovered neurotransmitters.

Henrietta Leavitt remains largely unknown to the public. Most astronomy books, even today, contain only a few sentences about her. She received no medals, no honors, no awards, and no honorary degrees during her lifetime. She left behind only a very small number of letters, mostly written to Edward C. Pickering, the director of the Harvard College Observatory, where she worked. There is a recent book about Henrietta Leavitt by George Johnson, which contains most of what little is known about her.

Leavitt developed an important new method for measuring distance in astronomy. When you go outside on a clear night and look up in the sky, you see only a two-dimensional image. You don't know how far away those tiny points of light are. If all stars had the same luminosity – think of luminosity like wattage – then the closer ones would appear brighter and the further ones dimmer, and you could judge distance by brightness. But, in fact, stars come in a wide range of luminosity. So if you see a little light there in space, you don't know whether it's the equivalent of a 1-watt penlight that's very nearby, or a 10,000-watt floodlight that is far away.

Without knowing the distance to objects in space, we didn't know anything about the cosmos beyond the solar system: we didn't know how big our galaxy is or whether there are other galaxies in addition to ours. What we need is a little label on each star telling us what its wattage is. Henrietta Leavitt found a way of putting that little label on each star. She gave astronomy the third dimension.

Leavitt was born on July 4, 1868, in Lancaster, Massachusetts. She was the daughter of a Congregationalist minister, and she remained religious her entire life. She never married. From 1888 to 1892 she studied classics, languages, and astronomy at the Society for Collegiate Instruction of Women in Cambridge, which is now Radcliffe College.

In 1895, she became a volunteer assistant at the Harvard College Observatory, joining a dozen other women who were working for its dictatorial director, Edward C. Pickering. Such women were called computers: they literally computed. Working in two rooms at the Harvard College Observatory with about eight women to a room, they did incredibly painstaking work. Photography had just come into astronomy around 1900 or so. With it came the ability to analyze vast quantities of data, because one photographic plate could hold the images of a thousand or more stars. These women computers were hired to calibrate and analyze each of these little points of light on the photographic plate. Since these were negatives, they were black points. You can imagine how tedious and painstaking this work was. Pickering hired these women

The third category is the timely clue, in which the scientist is confronted with an important clue just at the moment when he's struggling with a recognized problem.

because he could pay them much less than he would have had to pay a man to do the same work – and when you had all this data to analyze, you needed a cheap source of labor. On the other hand, this was the first opportunity for many women in the United States to start scientific careers.

A family crisis in 1900 called Leavitt away from the observatory. After an absence of two years, she wrote to Pickering: "I am more sorry than I can tell you that the work I undertook with such delight, and carried to a certain point, with such pleasure, should be left uncompleted." But in 1902, at the age of thirty-four, she came back to the Harvard College Observatory and was hired full-time, at a salary of thirty cents an hour, which corresponds in today's dollars to about eight dollars an hour. She gradually became deaf. So now imagine her working on these photographic plates with a thousand little spots on each plate in a world of silence.

The fourth category is analogy, in which the scientist applies a concept or a pattern from a previous problem.

The project Pickering assigned her, resulting in her great contribution in astronomy, was to analyze a certain kind of star called a Cepheid variable. These stars, unlike our sun, do not remain constant in brightness; instead they get brighter, then dimmer, then brighter, then dimmer, in a regular, periodic way, in cycles ranging from one day to thirty days. Leavitt's assignment was to measure the cycle times, and the brightnesses, of a group of faint Cepheid stars, all huddled together in a particular region of space called the Small Magellanic Cloud. Leavitt did this work by comparing photographic plates taken at different times and determining which little black spots had become bigger and which ones were staying the same. She noticed a pattern, an unexpected one: the brighter Cepheid stars had longer cycle times. The correlation was sufficiently good that she could infer a Cepheid's brightness by measuring its cycle time.

This finding was critical because all of these stars were in the same region of space, and so it could be assumed that they were all physically close together. If they're all very close together, that means that the brighter stars actually have a higher luminosity. It's like seeing a bunch of lights in a distant office building. Since the light bulbs are all in the same location, you know the brighter ones have greater intrinsic luminosity, or greater wattage.

Leavitt had, in effect, found a way to put that tag on a Cepheid star by discovering a correlation between intrinsic luminosity and cycle time. Once we know the intrinsic wattage of a star, we can measure its distance by how bright it appears.

Her work was published in a three-page paper in the *Harvard College Observatory Newsletter*, signed by Pickering. In 1918, Harlow Shapley, who would later become director of the Observatory and President of the American Academy, used her method of measuring cosmic distance to measure the size of our galaxy, the Milky Way. In 1924, Edwin Hubble used Leavitt's findings to show that other galaxies lie beyond ours, and in 1929, he used her work to show that the universe as a whole is expanding. Playing that expansion backwards in time, we were able to conclude that the universe as a whole began about 10 billion years ago. All of those incredible discoveries came from Henrietta Leavitt's initial finding of how to measure the distances to stars.

Leavitt's title at the Harvard College Observatory, from the beginning to the end, was "assistant." She never asked for anything more. She died of cancer on December 12, 1921, at age fifty-three, unknown by almost everyone except a few astronomers who were aware of her work. Shortly before her death, Henrietta Leavitt wrote out her will, leaving her possessions to her mother: bookcase and books, $5; folding screen, $1; rug, $40; table, $5; chair, $2; desk, $5; bedstead, $15; two mattresses, $10; one bond at $100 face value; one bond at $48.56; one bond at $50.

Harvard astronomer Solon Bailey wrote this about Leavitt in her 1922 obituary: "Her sense of duty, justice, and loyalty was strong. Miss Leavitt was of an especially quiet and retiring nature, and absorbed in her work to an uusual degree." Three years after her death, in 1925, Professor Mittage-Leffler of the Swedish Academy of Scientists wrote a letter to Henrietta Leavitt, saying that he would like to nominate her for a Nobel Prize. He didn't know that she had died three years earlier.

* * *

From my sample of these twenty-two discoveries, I've tried to see if I can make any generalizations. I have developed what one might call a taxonomy of scientific discovery, in which I've grouped all of the discoveries into six categories. Of course, any such taxonomy is subjective; no one knows exactly what's going on in the creative process. The real test is to see if this system applies to discoveries in the nineteenth century, the eighteenth century, and so on.

The first category is the accident, in which the scientist discovers something that he or she was not looking for. About a quarter of the discoveries that I looked at fall into this category. The discovery by Penzias and Wilson in 1965 of the cosmic background radiation – those radio waves – is an example of an accident. Alexander Fleming's discovery of penicillin in 1928 was also an accident. He came into his laboratory one day and found white fluff growing on his staphylococci colonies; where it touched the colonies, they were killed.

The second category, which is very rarefied, is 'principles first.' Here the scientist begins with a philosophical principle and then explores the consequences of that principle. The premier example of this is Einstein's discovery of the way time behaves, the Special Theory of Relativity. Here, Einstein started with the philosophical principle that there is no such thing as a state of absolute rest in the universe. If you were in a car going at a constant speed and pulled the shades down so that you could not look out of the window, you would not be able to tell how fast you're moving, or even if you're moving at all. From this principle, Einstein deduced all of the equations of special relativity.

The fifth category is new tools. Sometimes a new instrument comes along, to which a particular scientist has exclusive access, and he or she uses it to make a great discovery.

The third category is the timely clue, in which the scientist is confronted with an important clue just at the moment when he's struggling with a recognized problem. Barbara McClintock's discovery in the late 1940s that genes could move around on chromosomes is an example of this type. She was attempting to understand how pigment-controlling genes were turning on and off in the growth cycle of a single corn plant. The phenomenon appeared not in a random mutation but in some regular way. One day in 1946, while looking at the colored stripes on the leaves of her corn plant, she noticed that these mutations came in pairs. That was the critical hint she needed.

The fourth category is analogy, in which the scientist applies a concept or a pattern from a previous problem. A good illustration of this is Krebs's discovery of the cycle of chemi-

The last category . . . is what I call the 'long haul,' in which there's not a single insight, nor a single brilliant idea, but slow, steady, committed, incremental work over a long period of time that produces a great discovery.

cal reactions in which energy is released in an individual cell. A few years earlier, he had discovered another cycle in biochemistry, the "ornithine cycle," which starts with a chemical called ornithine, then changes into citrulline, which changes into arginine, before turning back into ornithine. In the process, ammonia, which is toxic to the body, is absorbed and urea is given off. Krebs had the idea of cycles in his mind.

The fifth category is new tools. Sometimes a new instrument comes along, to which a particular scientist has exclusive access, and he or she uses it to make a great discovery. An example is Edwin Hubble's discovery of the expansion of the universe. I'm not saying that Hubble wasn't a brilliant man, but he had exclusive access to the new hundred-inch Hooker telescope on Mt. Wilson. Other astronomers were working on the same problem, but Hubble had the largest telescope in the world.

The last category, one that gives hope to me and to many people, is what I call the 'long haul,' in which there's not a single insight, nor a single brilliant idea, but slow, steady, committed, incremental work over a long period of time that produces a great discovery. An example is Max Perutz's discovery of the three-dimensional structure of hemoglobin, which took him twenty-two years, from 1938 to 1960.

There are some common patterns across these six categories of discovery. Most discoveries involve a synthesis, in which the scientist brings together strands of information from previous discoveries. For example, Bohr's discovery of the quantum atom used the work of Planck, Einstein, and Rutherford.

Another pattern that occurs in many, but not all, discoveries is the following sequence of events: First comes the research and hard work, leading to what I call 'the prepared mind.' Then, a scientist will get stuck on a problem. Finally, after being stuck, he or she will have a shift in perspective, a new way of looking at the problem. Lise Meitner's understanding of nuclear fission followed this pattern. So did Watson, Crick, and Franklin's discovery of the structure of DNA. And others as well.

The prepared mind is critical. I don't know of any examples of major scientific discoveries in the twentieth century made by untrained amateurs. Even when the discovery was accidental, even when the scientist was not looking for the discovery, his or her mind was prepared to realize the discovery's importance. Being stuck is also a very important part of the creative process. This frustrating mental condition – after you've done your homework, after you know what the important problem to be solved is – somehow catalyzes the creative imagination.

I've seen this pattern of discovery in the arts as well as the sciences. As both a novelist and a physicist, I have experienced this pattern of discovery. I've recognized the same pattern when writers and actors talk about their creative process. Let me read a snippet from *The Paris Review*, which has a wonderful, long-standing set of interviews with writers. In 1990, Wallace Stegner commented: "I don't go in search of projects. Sometimes they appear before my eyes, and sometimes they grow over a long period of time, as I brood." With the case of *Crossing to Safety*, one of his novels, he said, "I knew from the beginning it was going to be a book. You have that feeling. It's like a fish on the line. But I didn't know what book it was going to be. I had to discover that by trial and error."

In Janet Sonenberg's book *The Actor Speaks: Twenty-Four Actors Talk About Process and Technique*, John Turturro (who was in, among other things, *Barton Fink* and *The Secret Window*) wrote: "Once the scene's dynamic is starting to occur, I'll go with it and then try to shift it, too, just like you would in life. The shifting is important. Then, if I can get to the point when I know that that's happening, and I don't know what I'm doing, that's inspiration. I've done all my work, and then I try to achieve this other living dimension."

Finally, there is no single scientific personality. A scientist can be bold and self-confident, like Einstein or Rutherford or Watson. A scientist can also be modest and quiet, like Leavitt or Krebs or Fleming or Meitner. William Bayliss, who discovered the first hormone in 1902, was cautious, meticulous, in love with the details. His collaborator, Ernest Starling, was just the opposite. He was brisk, impatient, engaged mainly in the broad sweep of things.

What all of these men and women shared – and this I saw in every single discovery, whether the people received encouragement or discouragement from their parents, whether they were the revolutionary type or the retiring type – was a passion to know, a sheer pleasure in solving puzzles, an independence of mind. The American biologist Barbara McClintock recalled that in high school science classes, "I would solve some of the problems in ways that weren't the answers the instructor expected. It was a tremendous joy, the whole process of finding that answer, a pure joy." When the German nuclear physicist Lise Meitner was a little girl, her grandmother warned her that she should never sew on the Sabbath because the heavens would come tumbling down. So the little girl decided to do an experiment. She touched her needle to her embroidery, waited, and looked up; but nothing happened. Then she took a single stitch, waited, looked up, and nothing happened. Finally, satisfied that her grandmother had been mistaken, she continued her sewing. ■

Our Undemocratic Constitution: Where the U.S. Constitution Goes Wrong (And How We the People Can Correct It)

Sanford Levinson
Response by Barney Frank and Robert C. Post

This presentation was given on October 30, 2006, at the House of the Academy.

Sanford Levinson holds the W. St. John Garwood and W. St. John Garwood, Jr. Centennial Chair in Law at the University of Texas School of Law. He has been a Fellow of the American Academy since 2001.

Barney Frank was elected to the U.S. House of Representatives in 1981 and represents the Fourth Congressional District of Massachusetts. He is the Chairman of the Financial Services Committee.

Robert C. Post is the David Boies Professor of Law at Yale Law School. Elected to the American Academy in 1993, he is currently Librarian of the Academy.

Sanford Levinson

Looking ahead to the forthcoming election, I know that I, and many others, anticipate a changing of the guard, but I'm not sure how important such a change may be in terms of enacting new legislative programs. Why am I not more optimistic? One reason is related to the internal rule of the Senate called the filibuster; another centers on the undemocratic nature of the Senate. Let's take what is, at least according to the Iowa prediction market, the most likely outcome next Tuesday – a Democratic House and a very slimly Republican-controlled Senate. Would that mean a majority of the American public had voted to keep the Senate in Republican hands? No, not at all. Over the last three election cycles, three million more Americans have voted Democratic in races for the Senate than have voted Republican. But the Senate is not a little "d" democratic body. It allocates power on the basis of each state having an equal vote, so there is a preposterous overrepresentation of small states, meaning not only Vermont but also the upper Midwest and the Rocky Mountain states. Roughly 5 percent of the population has roughly 25 percent of the vote. In our bicameral system, even if one assumes optimistically that the Democrats have working control of the House and could pass some of the legislation that Barney Frank, or my friend Texas Representative Lloyd

We don't have merely a bicameral system; because of the presidential veto, we have a functioning tricameral system.

Doggett, might support, the Senate has absolute veto power.

But let's take the better case for some of us (I'm not assuming all of us) that the Democrats get both the House and the Senate. That would, presumably, increase to some degree (putting the filibuster to one side, since it is not part of what I call the hardwired Constitution, but simply a rule of the Senate) the probability of passing some of that legislation. But then, of course, the president can veto it. One of the arguments I make in my book, *Our Undemocratic Constitution*, is that we don't have merely a bicameral system; because of the presidential veto, we have a functioning tricameral system, where the third house of the legislature consists of one person, or the institutionalized presidency, who can, with a stroke of the pen, make it next to impossible for legislation to pass. Next to impossible doesn't mean impossible. But of 2,501 presidential vetoes in our history, roughly 5 percent have been overridden – a 95 percent success rate in blocking legislation. The only national president who has a better success rate is the president of Cyprus, who has an absolute veto.

Many of my colleagues in the legal academy have contributed to chopping down forests in discussing the so-called countermajoritarian difficulty, that is, the ability of courts – the federal courts are the central obsession of most law schools – to declare primarily federal legislation unconstitutional. In our entire history, approximately 165 acts have been declared unconstitutional by the U.S. Supreme Court. Most of them were of no great importance, but many presidential vetoes were extraordinary important. It's also the case that the threat to veto shapes legislation in a way that the abstract possibility of a federal court declaring a law unconstitutional some years from now does not seem able to do. Unfortunately, the very best example of this is the recent Military Commissions Act; in this instance, Arlen Specter, for example, said that although the parts of the act dealing with habeas were flagrantly unconstitutional, they didn't stop him from voting for it. That feeling is relatively common, whereas the veto threat has much more teeth.

These are among the problems with the Constitution that I call the 'hardwired problems.' One of the central theses of my book is that the hardwired parts of the Constitution tend rather systematically to be ignored in most legal education, precisely because we are obsessed with what is litigated before the courts. Equal membership in the Senate is not going to be litigated; the presidential veto, except for some fairly exotic aspects dealing with the so-called pocket veto, will not be litigated; the Electoral College will not be litigated. A political scientist at the University of Houston, Donald Lutz, has determined that the United States Constitution is the most difficult constitution to amend in the world – so none of these things will go before the courts.

Life tenure for Supreme Court justices has also turned out to be a grievous error in at least two different ways. First, I see no good reason that members of the Supreme Court should serve for twenty-five, thirty-five, or even forty years. Second, and even worse, is the ability of Supreme Court justices to time their resignations in order to enable the right president with the right politics to pick their successors. This tactic has been used to favor both Republicans and Democrats. It seems to me that there's no particularly good reason to cherish a system that behaves this way. Most countries around the world have term limits for members of their highest courts, usually called constitutional courts. My own recommendation would be a single eighteen-year term for Supreme Court justices. Eighteen neatly divides by nine, meaning there would be a new appointment every two years. I believe this would also diminish the present acrimony that surrounds any new appointment to the Supreme Court, at least a bit.

Now, there are many state constitutions that recognize the possibility of their own imperfection. Indeed, the president of the Constitutional Convention and a member of the American Academy, George Washington, wrote these words to his nephew Bushrod just two months after the Convention:

> The warmest friends and the best supporters the Constitution has do not contend that it is free from imperfections. I do not think we are more inspired, have more wisdom or possess more virtue than those who will come after us.

Washington was right. But this very sensible and admirable attitude has tended to lose out historically to a very different view, promoted particularly by James Madison, which contends that we should venerate the Constitution and that we should not, in fact, subject it to the lessons of experience or engage in real scrutiny as to how well it is serving us.

I discovered as I was writing this book that I'm much more Jeffersonian than I had thought. It was Thomas Jefferson who, indeed, not only recommended frequent revolutions, which I'm not quite willing to sign on to, but more to the point supported the idea of frequent conventions to examine the adequacy of our institutions. From my perspective, altogether unfortunately, most people tend to agree with the James Madison who wrote the 49th Federalist Paper and said, in effect: 'Look, we were extraordinarily lucky; all of the stars aligned in the summer of 1787 to get us this constitution. It would just be disastrous if we reopened the issue. Instead, teach people to venerate it.'

I am not arguing that there aren't aspects of the Constitution that are indeed great. But there are also aspects of the Constitution . . . that contribute in their own way to making ours a dysfunctional political system.

Whatever else one can say about the adequacy of American civics education, constitutional veneration is part and parcel of what children learn in our public and private schools – people really do believe that we have a great constitution. I am not arguing that there aren't aspects of the Constitution that are indeed great. But there are also aspects of the Constitution, some of which I've touched on, that contribute in their own way to making ours a dysfunctional political system, in which it is extraordinarily difficult to pass innovative legislative programs, precisely because there are so many veto points throughout – the absolute bicameralism; the presidential veto.

Let me say one word about the Electoral College. Following the 1968 election debacle,

Most people are scared to death of the idea of a new constitutional convention. A lot of people agree with the diagnosis, but believe that the cure is beyond possible acceptance.

the House passed a proposed amendment in 1969 to abolish the Electoral College; the Senate vetoed it. One of the defenses of the veto was, 'Well, at least the president represents the majority of the American public.' Unfortunately, that's false. Because of the way the Electoral College operates, we have regularly, since World War II, sent to the White House presidents who did not have a majority of the popular vote. Some you might like; some you might not. They include Harry Truman, John F. Kennedy, Richard Nixon in 1968, Bill Clinton in both of his elections, and, very notably, George W. Bush in 2000.

But even those presidents who manage to put together a majority compose it out of a very peculiar kind of politicking: the emphasis is almost exclusively on large battleground states. My wife and I split our time between Massachusetts and Texas. In terms of reading newspapers, watching television, and the like, we would have had no idea presidential elections were going on in 2000 and 2004, because, for obvious reasons, neither of the candidates thought it worth their while to visit Massachusetts or Texas or to have campaign advertisements in those states. But it's not only Massachusetts and Texas. It's also California, New York, Illinois. One would have thought, in 2000, that the most important political issues facing us were prescription drugs for the elderly and maintaining the boycott against Cuba. In the immediate past election, one might have thought the most important issue facing us as a nation was the security of the steelworkers in Ohio.

So not only does the Electoral College fail to guarantee presidents who can plausibly claim to be the tribunes of the people, but it also makes the president, in a curious sense, as much of a local official as any senator. It's simply that the locality is a larger locality – the safe base states plus some privileged battleground states. It seems to me that Congress in many ways better represents a collective voice of the people (putting to one side for the moment partisan gerrymandering, which is a monstrosity but is certainly not constitutionally required).

Some state constitutions acknowledge their own imperfection and offer the electorate, at intervals, the opportunity to vote for a new constitutional convention. In New York, for example, voters get an opportunity every twenty years to call for a new constitutional convention. I built my book around the conceit that the creators of the U.S. Constitution were wise enough to build in a provision like that one, allowing for the possibility of rational reflection about whether we are well served. The book makes the case that, if given that opportunity, one ought to vote for a new constitutional convention as a way of grappling with these issues, in part because it is unlikely, to the point of impossibility, that these kinds of changes would ever happen through congressional proposals. One literally cannot imagine the Senate and the representatives of small states agreeing to the loss of their own power.

In speaking to friends, family, and others, I have discovered that most people are scared to death of the idea of a new constitutional convention. A lot of people agree with the diagnosis, but believe that the cure is beyond possible acceptance. If one is truly scared of the idea of the national convention and the politics leading up to it, then consider this: it would take an extended time anyway. I'm not going to be able to wave a magic wand and call a convention into being tomorrow, or next year, or even by 2010.

But if one is basically fearful of taking one's chances with one's fellow citizens on basic issues of American politics, then much more than the Constitution is in trouble. This fear bespeaks a rejection of all that is admirable in the Jeffersonian legacy. There are things that are distinctly unadmirable in that legacy, but what is admirable is a certain trust in popular democracy. I don't think I'm flagrantly naive about the problems attached to populism and popular democracy. But the fear that is widely expressed, particularly by people who view themselves as progressive, is extremely ominous not only in terms of the future of the United States as a democracy, but also in terms of achieving progressive political programs. I don't know how you do it without convincing people of the desirability of these programs and without a political system that can effectuate such desires instead of frustrate them.

Barney Frank

I agree with most of the criticisms that Sandy makes of the Constitution. I don't think anyone ever thought the bicameral solution was a good idea. It was a political deal between small states and big states. Nobody was for that compromise; it was just what you needed to do to get through the process.

I would love to make some of the changes Sandy suggests. The most important one to me is the Electoral College. The fact that most people's votes don't count is an absolute disaster. It has very distorting effects on what happens in our country. I also think nonrenewable term limits for members of the Supreme Court are a good idea. In Yiddish, eighteen is the symbol for life. So you'd be substituting life for lifetime appointments.

I don't think anyone ever thought the bicameral solution was a good idea. It was a political deal between small states and big states.

However, I differ with Sandy in two respects. He's certainly right: it is fear of public reaction, particularly to changes to individual liberties, that is a deterrent to holding a new constitutional convention. But I also think that having one would make less of a difference than Sandy thinks it will. His analysis of our system, while a legitimate analysis of its mechanics, leaves out the political situation. For example, politics is capable of overcoming the presidential veto. In fact, when

Politics is capable of overcoming the presidential veto.

the Republicans controlled Congress for much of Bill Clinton's years, they forced him to agree to some legislation: welfare reform and the defense of marriage act, for example. He could have vetoed them, but he was afraid of the political consequences.

The fact is that politics does cut through. Obviously, the notion of two senators per state is ludicrous by any theory other than 'that's what the deal was to pass the Constitution.' But my impression is that political opinion works in such a way that the actual differences between the House and the Senate over time have been far less than one might expect. Also, it has not always been the case that the House has traditionally been more liberal and progressive, while the Senate has held it back. There have been times in our history when the orientations were flipped.

I would like to add that another factor contributing to the undemocratic nature of the Senate is the staggered term. Having only one-third up for election at a time is a restraint on democracy. If the entire U.S. Senate were up for reelection this year instead of only one-third, I would be a much happier person.

Second, I would be interested, Sandy, to hear your response to the phrase in the Constitution that says that no state shall be deprived of its equal representation without its permission. If you had a constitutional convention, could you knock out that piece when the very Constitution that empowered the constitutional convention would appear to make that piece not amendable? Do you think that's binding, or do we just ignore it? If that phrase holds – and I'd love to ignore it – then it seems to me that the whole idea of holding constitutional conventions is in some trouble.

I would throw in another flaw in the Constitution. One of the central distinctions in the Constitution no longer makes any sense: the distinction between interstate and intrastate commerce. That made sense when you thought electricity came from a kite, and it took you a long time to get anywhere. Now, geography doesn't mean anything, and there really is no distinction between interstate/intrastate commerce. So that part of the Constitution is about as relevant as whether or not we are allowed to issue Letters of Marque and Reprisal.

I would love to get rid of the Senate. I mean that seriously. I've long been an advocate of unicameralism; I think we are overchecked and overbalanced. It is also the case that most people's views of governmental mechanics at any given time are overwhelmingly influenced by what they think the outcome will be. There are very few neutral principles there. The liberals fell in love with the filibuster. When many of us were growing up, it was generally reserved for great occasions. But now the filibuster has become the norm, and we need sixty votes to pass just about anything.

It would certainly be good to get rid of the Electoral College. Because each state has two senators, and because the number of electoral votes a state has is based on the number of representatives and senators it has, nearly 20 percent of the population is not represented in the Electoral College. For instance, the number of citizens per electoral vote is much greater in California than it is in Delaware.

I believe that the reason we don't have better, more progressive legislation has more to do with the structure of public opinion than the structure of the government.

But the undemocratic nature of these institutions makes less difference than Sandy's analysis might lead one to believe. Political opinion makes itself felt throughout the system. I would be interested to see the difference between House and Senate votes over time, particularly since we started electing senators directly. Before the direct election of senators, you'd have too many differences. I think the answer is that there have been many fewer disparities than the structural analysis suggests, because political opinion does force itself on both bodies.

The power of the presidential veto, in fact, can also be easily overstated. I was just leafing through the section in Sandy's book where he talks about the excessive powers of the presidency. After twenty-six years in the House, I'm completely convinced that the problem we have with regard to the powers of the presidency is not presidential overreaching but congressional dereliction of duty. That is certainly the case in foreign policy and elsewhere.

In summary, although I agree on both the Electoral College and the Senate, there is a technical problem that I had hoped you would address about how to get around the provision in the Constitution that says that even if you had a constitutional convention, you couldn't deprive each state of its equal representation. And it says equal representation; it doesn't say at least two senators. We couldn't, for instance, increase the number of senators from California to twenty-seven and keep Vermont at two.

I also believe that the reason we don't have better, more progressive legislation has more to do with the structure of public opinion than the structure of the government. I agree with you on the structural issues, but the problems we have in achieving certain outcomes are much more political, in the broadest sense, than they are structural.

Robert C. Post

Sandy Levinson is one of the nation's best and most imaginative constitutional scholars. So when *he* says that the Constitution has gone sadly awry, we had better sit up and take notice.

Although Sandy's book is packed with analysis and observations, I think his ultimate target is not any specific defect of our Constitution, but rather the way in which custom, veneration, and sheer complacency have turned our Constitution into an "iron cage with regard to our imagination." He is most deeply moved because the defects of our Constitution – what he calls, appropriating the language of psychology, the "abuses" of the Con-

stitution – have become invisible to us. We cannot experience them, and so we cannot be moved to correct them.

Sandy's book has two parts. The first details defects in the Constitution; the second recommends a remedy for these defects. Sandy lists seven "truly grievous defects" that he believes are "sufficiently" serious "to warrant significant revision and repair." Five of these defects include: the democratically maldistributed allocation of power in the Senate; excessive presidential power; the Electoral College; the hiatus between the electoral loss of a sitting president and the inauguration of a successor; and the functional impossibility of amending the Constitution with regard to anything truly significant.

The most controversial aspect of this book no doubt is the remedy that Sandy suggests to fix these defects. He calls for "a new constitutional convention that would feel itself legitimately empowered, and psychologically free, to do what the framers of 1787 did, which was to look at all existing constitutions as well as the lessons derived from their own experiences." Sandy wants to redesign the machine from the ground up.

Most of us are scared to death about the possibility of a constitutional convention. When we look at the Congress that just passed the Detainee Treatment Act of 2006 (DTA) withdrawing federal jurisdiction over habeas petitions by Guantanamo detainees, and stripping legal aliens in the United States of important rights they have enjoyed since the creation of the Republic, we thank God that we have the Constitution that we do. We fear that a constitutional convention would focus on prohibiting flag burning and same sex marriage, rather than on the serious structural reforms that Sandy suggests.

Sandy, to his credit, has anticipated this apprehension, which he calls a "fear of the uncaged beast of American democracy – a view identified far more with the quasi-monarchical Hamilton than with the unabashedly democratic Jefferson." The metaphor of the "cage" does a great deal of work in Sandy's book. Because Sandy seeks to liberate us from the "iron cage" of our imaginative preconceptions, he urges us not to fear the uncaged beast:

> I continue to have sufficient faith in the democratic ideal that I believe that most of the public, in a truly serious debate about the Constitution, could be persuaded to support the essential rights that are required for membership in a republican political order. If one does not have this degree of democratic faith, then it is very difficult to know why one would prate about the importance of democracy and encourage foreign countries, many of which lack the level of mass education and literacy of our own, to join us in the democratic experiment. It would be highly ironic if constitutional faith at bottom were synonymous with an utter lack of faith in the democratic potential of our fellow Americans. (Levinson, *Our Undemocratic Constitution*, 175)

Sandy has posed a forceful challenge to those of us who are reluctant even to contemplate a constitutional convention – and I should say that includes just about everybody I have talked to about this book.

Most of us are scared to death about the possibility of a constitutional convention.

Because there is some risk associated with a constitutional convention, we can only decide whether to hold one if we conduct some crude form of a cost-benefit analysis. We must ask whether the potential benefits that could result from a convention will likely outweigh its potential risks, and whether these same benefits can be secured in ways that do not pose the degree of risk we anticipate arising from a convention. I do not believe that some of the defects that Sandy explicates can be remedied only by a constitutional convention. For example, the hiatus in power between when a new president is elected in November and when he takes office in January can be reduced by a constitutional amendment. I see no reason whatever why such an amendment cannot be passed, if the nation agrees that in fact this hiatus poses a truly grievous defect. Since Sandy believes that this is a truly grievous defect, it must follow that it is also false to say that it is impossible to amend the Constitution with regard to anything truly significant.

Similarly, I do not believe that the "excessive presidential power" that Sandy analyzes is an issue of constitutional design. This danger persists in every powerful constitutional state, and in the United States the danger it poses depends upon the ebb and flow of deep and contingent political forces, such as whether the Congress and the President are of the same or different parties, whether the President is popular, or whether there is a crisis. I am not convinced that a constitutional convention could ever cabin this beast, which seems to be rooted in the development of an administrative state that must defend itself under conditions of rapid, far-ranging, and lethal military technology deployed in circumstances of global insecurity.

I do agree, however, that at least two of the defects that Sandy has listed – the Senate and the Electoral College – will never be repaired by constitutional amendment, because small states and battleground states have too great an interest in maintaining the present arrangement. So the question arises whether the damage inflicted by these two defects are so severe as to warrant taking the risk of a constitutional convention.

At precisely this point in his argument, Sandy's thinking takes a very interesting turn. On the one hand, he tells us that these defects are terrible because they interfere with the transparent, unitary transmission of majority will into governmental policy. On the other hand, he tells us that we should not fear the risks of a constitutional convention because we should embrace the unitary expression of majority will that would emerge from a constitutional convention. Sandy explicitly appeals to an ideal of democracy in which an aroused national majority can more or less efficiently translate its preferences into public policy. At root, then, is the question of whether Sandy is correct to equate democracy with an omnipotent national majority.

This is, of course, a hugely complicated problem, which I cannot address here. Suffice it to say that although we have always believed that the will of the people is the ultimate source of political legitimacy, we have also always been ambivalent about simple majoritarianism, precisely because we believe that popular will is subject to certain well-known deformities, including passion, fickleness, demagoguery, inconsistency, and superficiality. In American constitutional law, therefore, we have always struggled to appeal, so to speak, from Philip drunk to Philip sober, from the people who are immediately and passionately aroused to the people who are thoughtfully committed.

And we have always realized that different forms of decision-making procedures bring out very different qualities of public deliberation. Some procedures, like referenda in Cal-

ifornia, bring out the worst in majoritarian policymaking. Other procedures can bring out greater care and consideration. From this perspective it is not enough to say, as Sandy does, that a convention is democratic and that we must trust democracy. We must ask instead what kind of decision-making procedure is a constitutional convention, and whether it will bring out the best or the worst expression of a popular will.

This point goes to the risks of a constitutional convention. But it also applies to our assessment of the gravity of the defects that Sandy has identified. Sandy assumes that any deviation from the pure and transparent expression of the will of a national majority is a serious defect. He seems to imagine that a country like England is the implicit model of a true democracy. In England the parliament sits as a more or less continual constitutional convention – there is no written constitution and there is no judicial review (putting aside EU law). There is no geographical maldistribution that functions, like our Senate, to check the will of a national majority.

In effect Sandy asks why we can't be more like the English. One answer might be that we differ from the English because their lawmaking has always taken place within the context of very strong and constraining traditions, so that the exuberance of majoritarian preferences have always been chilled by the damp air of ancient customs. In America, as a new land, we have never had the benefit of these traditions. We have been a land of nutty idealists and fierce entrepreneurs, and our lawmakers, in response to these forces, have been free to go literally anywhere. Perhaps we have evolved the checks and balances of the Senate and of bicameralism in order to slow down our governmental decision-making so as to make it more thoughtful.

Another answer might be that in twentieth-century England, government policy has always been implemented by a strong, spirited, and professional bureaucratic corps of officials, who have been more or less nonpolitical. Whatever policy Parliament enacted was always filtered through the operational expertise of this professional bureaucratic corps. America does not possess a comparable administrative elite. Our bureaucracy is mostly politicized. If Congress goes off the rails, there is no administrative counterweight to tone down and diminish the excess.

These considerations might have led us to be less tolerant of simple majoritarian decision-making than our English counterparts, because the danger that such majoritarianism might run amuck was greater in America. Throughout his book Sandy makes much of the fact that lawmaking is so much harder here than in parliamentary democracies like England – laws in the United States have to be passed by both Houses of Congress, they can be vetoed by the President, etc. But the question of whether lawmaking is too hard or too easy has to be assessed in light of all the risks of pathological majoritarianism, and Sandy does not do this.

Although we have always believed that the will of the people is the ultimate source of political legitimacy, we have also always been ambivalent about simple majoritarianism.

Sandy's main indictment of the Senate is not that it delays legislation, but that it distorts majority will by over-representing under-populated states. He writes that "Almost a full quarter of the Senate is elected by twelve states whose total population, approximately 14 million, is less than 5% of the total U.S. population." This is pretty bad, and I strongly doubt that anyone now would agree to such a fundamental distortion of representation if they were to design the Constitution from scratch. I agree with Sandy that *this* problem will not be cured by any foreseeable constitutional amendment.

But if the remedy in view is a constitutional convention, which carries its own significant constitutional risks, the question is the extent of damage caused by this misrepresentation. Sandy argues that this misrepresentation causes a maldistribution of resources – that income is transferred from big states to small states, and he attributes this to the Senate. This may well be true; I am not a political scientist, and so I cannot judge. But I would want evidence that establishes the causal connection that Sandy assumes. I would want to know how other federalist entities, like Canada, Germany, or the EU, distribute resources. Is there a similar maldistribution of resources, even though there is not a similar misrepresentation? In the United States before the 1960s, virtually all states had legislatures with upper houses that were malapportioned in the same way as the Senate. The Supreme Court ended this malapportionment by ruling that states had to apportion legislatures based upon the principle of one-man-one-vote. I would like to know whether states before this constitutional revolution maldistributed resources in the same way as now apparently happens in the Congress. I would need to see, in short, a strong causal case before I would risk a constitutional convention in order to avoid these damages.

There remains, however, Sandy's very strong normative point, which persists independently of any specific, contingent empirical consequences: Why should we continue to live under such a horrible system of misrepresentation? I don't want to defend this system, but I do want to point out an important complexity that I'm not sure Sandy has fully considered.

Sandy unself-consciously equates democracy with majoritarianism. He assumes that we exercise the privilege of self-government whenever a majority exercises its will. But this assumption masks a very great difficulty. If I am in the minority, why should I consider the decision of the majority to be *my* decision? I did not vote for President Bush, and I have opposed his policies. In what way does he "represent" me or my will? The answer has to be that in some respect I identify with the authority exercised by a majority, even if I am opposed to its policies. This suggests that every democracy must presuppose some institutional unit of identification, which I believe must have the right to represent me even if I happen to disagree with the policies adopted by a temporary majority that controls the decisions of the unit.

This notion of identifying with an institutional unit is extremely complicated. In 1787 we formed a common nation – the United States – but the people of the United States nevertheless did not identify with the national government as a majoritarian unit of decision-making for all purposes. They identified with the national government only for *some* purposes, like foreign affairs or the regulation of coastal navigation. The limited identification with the national government persisted long after the Civil War.

The history of American federalism is a history of growing identification with the federal government as a proper unit of majoritarian decision-making for all purposes.

In 1919, for example, the nation adopted the 18th Amendment establishing Prohibition. It is nevertheless plain that inhabitants of wet states, like New York, viewed prohibition as a regional imposition by dry states. To quote one representative comment from the era: "The Marylander is quite willing to yield even respect and obedience to a law he believes oppressive, provided it was passed by his own people, but his innate sense of independence resents the effort of Kansans to impose a law on him through what he believes to be a smug piece of sanctimonious humbuggery." Even though the 18th Amendment had been ratified by 46 states, and even though the Volstead Act enforcing it had been enacted in the Congress of the United States, citizens in wet states like New York or Massachusetts did not view prohibition as an act of their own self-governance. They viewed it as a form of domestic imperialism, of red states stepping on blue states.

The history of American federalism is a history of growing identification with the federal government as a proper unit of majoritarian decision-making for all purposes. Turning points were the Civil War, the New Deal, and World War II. This suggests that identification with the federal government should not be taken for granted. We need to ask how it occurs. It is plain that in the course of our history it has not happened merely because the federal government has unproblematically represented the will of a national majority. The composition of the Senate ensured that different national regions, with different value frameworks, would buy into the federal government as *their* government. Sandy's proposal in effect tells us that this is not necessary in the twenty-first century, and that what even now persists as a quarrel between red states and blue states is irrelevant to the creation of national democratic legitimation. We will identify with the enactments of the national government, regardless of whether our regional state interests have disproportionate influence.

Whether Sandy is correct about this proposal is a fundamental normative challenge posed by his thought-provoking book.

Sanford Levinson:

Just one quick response to Barney's altogether accurate reference to Article V, which does serve as an ace of trumps against eliminating equal membership in the Senate. I try very deliberately – both because I believe it and also, frankly, as an effort to make it appear a reasonable book – to stay within existing constitutional conventions of change, even if I argue that there needs to be radical change. Article V does allow for the possibility of a convention, but as Barney points out, it does not seem to allow for eliminating equal membership. At that point, I would invoke the framers, who flagrantly ignored the Articles of Confederation, particularly Article XIII, which said that you need the advice and consent of all the states in order to have an amendment.

Now, again, I'm assuming that this is not waving the magic wand. I'm also assuming that if there is a scintilla of reality to the proposals in the book, then it would come through an extensive political movement, at which time a convention, assuming it's viewed as legitimate, could say the ratification rule will be a popular referendum. At that point, it would put Article V on the shelf – there's no way to get around it.

Barney Frank:

Are you suggesting then that your constitutional convention could ignore Article V but could not change the Bill of Rights?

If we could just deal with the Electoral College and the Senate, and exclude the Bill of Rights from revision, I'd be willing to take on the task of rewriting the Constitution. But I do not think the Fifth Amendment's self-incrimination provision has a chance of surviving if we held a constitutional convention. I'm not sure where we'd be on search and seizure either; and at this point, I'm not sure what we would get on separation of church and state, even on the phrase in the Constitution that says there shall be no religious test for holding office.

Even though I agree that the Electoral College is a terrible idea, I think, Sandy, you exaggerated its antidemocratic effects. You mentioned all these presidents who didn't get a majority, but only one of them, George W. Bush, actually got fewer votes than his main opponent. If it's undemocratic that Harry Truman and Bill Clinton and Richard Nixon won with pluralities, then so are a lot of gubernatorial and mayoral elections. As you know, the principle that you have to get an absolute majority only held in America during that period when Southerners didn't want the black vote to count, and they had runoffs only so that no black could have a major impact.

As I was listening to Professor Post, I calculated the partisan breakdown of those twelve states that you said have 25 percent of the Senate. It's twelve to twelve. And after this election, given Rhode Island, it may be thirteen Democrat and eleven Republican. It's hard to argue that those small states have been a block to progressivism, because if you take into account the partisan breakdown of those twelve smaller states as of next week, they're going to be Democrat by a narrow amount.

I think more damage would be done by a substantial diminution of the Bill of Rights than good would be done by changing the Electoral College. In my mind, that's the trade-off.

Sanford Levinson:

I want to pick up on another point that Barney made earlier, that is, the collapsed distinction between interstate and intrastate commerce. He's absolutely correct: by and large, that's become a working part of American constitutional law since the New Deal. The current Supreme Court has tried to revive a little bit of protection of federalism, but it's not really going anywhere because, at the end of the day, what Barney says is right. If you fear a strong centralized government, then that fight was lost during the New Deal, and it appears increasingly clear that the New Deal understanding of national power is not going to be reversed by the courts. The question now is, what will an empowered national government do? In the case of the various veto points that block certain kinds of legislation, is deciding against getting rid of them simply a matter of doing the risk analysis on whether the legislation being blocked would impose on our liberties rather than make the country better?

Barney Frank:

Sandy, are there major public policies that you would have liked to have seen adopted that you think were frustrated by the existence of too many veto points? To be honest, I can't think of any. I think it's more the lack of political will. I'd like to see something done about health care and something done about global warming, but it does not seem to me that in any case it's been the existence of multiple veto points that has stopped us. If we had your constitution, what do you think would be different about public policy today?

Sanford Levinson:

Let me answer that after just a very short dodge – that I don't have in my mind a full-scale version of my Constitution. What I really want is a conversation about the inadequacies of the current Constitution and what a better constitution might be. A more direct answer – and this goes to the point about unicameral parliamentarianism and the way the United Kingdom does it, which I confess to having mixed feelings about – is that one of the really profound moments in contemporary American politics was when Bill Kristol wrote his 1993 letter saying that enacting medical-care reform would be fatal to the interests of the Republican Party, because of what that would do to its electoral prospects in the future. Republicans had a vested party interest in preventing it, and they succeeded in blocking this legislation – with the help of the mistakes that Bill Clinton made – even though at that point the Democrats held both houses of Congress. ■

Orlando Patterson (Harvard University) and Sanford Levinson (University of Texas School of Law)

Robert Campbell (Cambridge, Massachusetts), Anthony Lewis (New York Times), and Margaret Marshall (Massachusetts Supreme Judicial Court)

Francis Bator (Harvard University) and Laurence Tribe (Harvard Law School)

New Members: Class of 2006

Class I: Mathematical and Physical Sciences

Section 1: Mathematics

Jeff Cheeger

Courant Institute of Mathematical Sciences, New York University, New York, NY

Silver Professor of Mathematics. Leading researcher in Riemannian geometry. Creator or cocreator of theories of finiteness/compactness/collapse, analysis on singular spaces, almost rigidity, and differentiation of Lipschitz functions on singular spaces. Responsible for fundamental results on eigenvalue inequalities, rigidity, analytic torsion, eta-invariants, diffraction, Poincaré duality, Hodge theory, and degeneration of Einstein metrics.

David Eisenbud

University of California, Berkeley, Berkeley, CA

Director of Mathematical Sciences Research Institute; Professor of Mathematics. Author of over 100 professional articles on algebra, singularities, and computational methods. President of the American Mathematical Society. Former member of the Board of Mathematical Sciences and Their Applications, the National Research Council, and the U.S. National Committee of the International Mathematical Union.

Martin Golubitsky

University of Houston, Houston, TX

Cullen Distinguished Professor of Mathematics. Pioneered an approach to the dynamics and the formation of spatial patterns based on the unifying mathematical principles of singularity theory and group theory. Demonstrated the role of symmetry in pattern selection. Known for interdisciplinary work with physicists, biologists, and engineers.

Robert K. Lazarsfeld

University of Michigan, Ann Arbor, MI

Professor of Mathematics. Has worked in several areas of algebraic geometry, including modern intersection theory, positivity, connectedness, linear series, the Nullstellensatz, syzygies, and multiplier ideals.

Charles M. Newman

Courant Institute of Mathematical Sciences, New York University, New York, NY

Professor of Mathematics. Director of Courant Institute from 2002 – 2006. Contributed to probability and mathematical physics, with particularly significant contributions to the study of complex stochastic systems, such as aging in systems with disorder, scaling limits of coalescing random walks, and critical percolation.

Craig A. Tracy

University of California, Davis, Davis, CA

Distinguished Professor of Mathematics. Leading researcher in integrable systems. Made contributions to solvable model in statistical physics/field theory, the theory of Fredholm and Toeplitz determinants, and random matrix theory. With colleagues, was the first to show relationship between solvable statistical models and integrable systems. Codiscoverer of the Tracy-Widom distributions.

Harold Widom

University of California, Santa Cruz, Santa Cruz, CA

Professor of Mathematics, Emeritus. Researcher on concrete operatory theory and related asymptotic problems. Made contributions to the theory of Fredholm determinants, Toeplitz determinants, orthogonal polynomials, Painleve equations, and random matrix theory. Together with Craig Tracy, discovered the Tracy-Widom distributions.

Section 2: Physics

David D. Awschalom

University of California, Santa Barbara, Santa Barbara, CA

Professor of Physics. Developed new temporal and spatial optical probes of matter for pioneering studies of spin dynamics in semiconductors and nanostructures. Leader in the electrical and optical control of both electron and nuclear magnetization. Discoveries include observation of magnetic polarons, long-lived electron spin coherence, and the spin Hall effect.

Susan N. Coppersmith

University of Wisconsin-Madison, Madison, WI

Professor of Physics and Department Chair. Developed theories of sliding charge density waves in solids and of force fluctuations in bead packs. Demonstrated the importance of residual frustration in disordered materials in the presence of dipolar interactions. Effective collaborator with experimentalists and leader on many national physics bodies.

Savas Dimopoulos

Stanford University, Stanford, CA

Professor of Physics. Contributed to all of the major theoretical approaches to new TeV-scale physics beyond the standard model, including the idea of extended technicolor, the supersymmetric standard model and supersymmetric grand unified theories, and the proposal of TeV-scale quantum gravity with large extra dimensions.

Stuart Jay Freedman

University of California, Berkeley, Berkeley, CA

Luis W. Alvarez Memorial Chair in Experimental Physics. Precision studies of neutrinos include leadership role in Kam-LAND, a terrestrial verification that oscillations account for the solar-neutrino problem. In nuclei and atoms, probed "hidden variables," tested quark mass-matrix unitarity in precise beta-decay experiments, and derived new constraints on axions and other exotic particles.

Margaret Mary Murnane

University of Colorado, Boulder, Boulder, CO

Professor of Physics; Fellow, JILA. Scientist in ultrafast laser science. Pioneered the generation of very short, sub-10 femtosecond, pulses from Ti:sapphire lasers. Applications of work range from ultrafast coherent X-ray generation, frequency metrology using frequency combs, attosecond chemical physics, and materials and biological imaging.

Nai-Phuan Ong

Princeton University, Princeton, NJ

Eugene Higgins Professor of Physics. Experimentalist studying the electronic transport properties of unusual metals. Used this specialty to make a sequence of discoveries from sliding charge-density waves to many theoretically significant properties of the high-temperature cuprate superconductors.

Stephen H. Shenker

Stanford University, Stanford, CA

Richard Herschel Weiland Professor of Physics. Contributions include basic insights into gauge theory dynamics; discovery of representations of conformal symmetry important in statistical mechanics, mathematics, and string theory; and covariant quantization and nonperturbative matrix formulations of string and M-theory.

Section 3: Chemistry

Dale L. Boger

Scripps Research Institute, La Jolla, CA

Richard and Alice Cramer Professor of Chemistry. Contributed to the synthesis and understanding of the structure-activity relationships of complex natural products of medicinal importance. Contributed to organic and natural products synthesis as well as medicinal and bioorganic chemistry, including the development of new synthetic methodology used to synthesize biologically important natural products and key analogs used to define their mode of action and chemical behavior.

Barbara J. Finlayson-Pitts

University of California, Irvine, Irvine, CA

Professor of Chemistry. Led investigations of sea-salt aerosols in atmospheric chemistry. Re-

search spans fundamental laboratory studies, particularly on heterogeneous reactions in the atmosphere. Findings are recognized as key to understanding chemical processes in the Earth's boundary layer. Book on atmospheric chemistry widely used.

J. Andrew McCammon

University of California, San Diego, La Jolla, CA

Joseph E. Mayer Professor of Theoretical Chemistry; Professor of Pharmacology; Investigator, Howard Hughes Medical Institute. Introduced molecular dynamics simulations into biochemistry. Invented methods for predicting and interpreting molecular recognition using schemes based on statistical mechanics; calculating rates of diffusion-controlled reactions; and showing how macromolecular dynamics govern biological activity, molecular recognition, and macromolecular assembly.

Geraldine L. Richmond

University of Oregon, Eugene, OR

Richard M. and Patricia H. Noyes Professor of Chemistry. Led studies of molecular structure and adsorption at complex interfaces that have advanced contemporary surface science and spectroscopy. Contributions include understanding water structure and hydrogen bonding at surfaces, surfactant and biomolecular assembly at fluid interfaces, and structure and dynamics at semiconductor and metal/liquid junctions.

James Lauriston Skinner

University of Wisconsin-Madison, Madison, WI

Joseph O. Hirschfelder Professor of Chemistry; Department Chair. Research has produced fundamental understanding and widely used models of spectral lineshapes in crystals and amorphous solids, of single molecule spectroscopy in solids, of lineshapes and dynamics of chromophores in liquids, and of vibrational and electronic relaxation in liquids, solids, and supercritical fluids.

Amos Brittain Smith III

University of Pennsylvania, Philadelphia, PA

Rhodes-Thompson Professor of Chemistry. Leader in stereo-rational synthesis of architecturally complex natural and unnatural products, possessing important bioregulatory properties of significance to medicine; the design and synthesis of novel peptidomimetics devoid of an amide backbone capable of existing in extended β-strands/sheets and β-turn like conformations; and the early exploration of fullerene chemistry.

Timothy Manning Swager

Massachusetts Institute of Technology, Cambridge, MA

John D. MacArthur Professor of Chemistry and Department Head. Designed polymeric and liquid crystalline materials with emphasis on the translation of molecular structure and properties to materials with technologically useful properties. Demonstrated and applied self-amplifying sensory polymers using energy and charge transport. Designed liquid crystals with improved order, extended dipoles, and amplified chirality.

Abraham Nitzan (FHM)

Tel Aviv University, Tel Aviv, Israel

Professor of Chemistry. Uses physical insight, close experimental collaboration, and sophisticated formal and numerical methods to explore, explicate, and solve significant problems in molecular chemistry and physics. Invented new theoretical techniques for experimental prediction and interpretation.

Section 4: Astronomy (including Astrophysics) and Earth Sciences

Charles R. Alcock

Harvard-Smithsonian Center for Astrophysics, Cambridge, MA

Director. Led the search for Massive Compact Objects in the halo of the Milky Way (MACHOS) via gravitational micro-lensing and showed that they were not a major contributor to the Dark Matter inventory of the universe. Invented one of the first clean tests for the Cosmological Constant (the Alcock-Paczynski effect).

Subir Kumar Banerjee

University of Minnesota, Minneapolis, MN

I.T. Distinguished Professor and Director of the Institute for Rock Magnetism. Central figure in development of rock magnetism as a field of geophysics with applications to magnetization of the seafloor, paleoclimatic and paleoenvironmental change, and disordered magnetism in nanophase particles. Founder of the Institute for Rock Magnetism, a community-based research facility emphasizing cross-fertilization between condensed-matter physics and earth sciences.

James William Head III

Brown University, Providence, RI

Louis and Elizabeth Scherck Distinguished Professor of Geological Sciences. Instrumental in the transformation of planets from astronomical objects to geological objects and in the documentation and understanding of planetary volcanism, tectonism, and climate change and their role in planetary history.

Robert Peichung Lin

University of California, Berkeley, Berkeley, CA

Professor of Physics. Pioneered the study of the acceleration and propagation of solar energetic particles through *in situ* measurements. Responsible for the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) satellite mission that makes high spatial resolution images of solar X-rays and gamma rays to determine the sites of local electron and ion acceleration on the sun.

Guust Nolet

Princeton University, Princeton, NJ

George J. Magee Professor of Geophysics and Geological Engineering. Early pioneer in the development of the major tool for studying the interior of the Earth: broadband digital seismology. Contributed to geophysical inverse theory and seismic tomography, which have revolutionized understanding of the three-dimensional structure of the Earth's 3000-kilometer-thick rocky mantle.

Anneila Isabel Sargent

California Institute of Technology, Pasadena, CA

Benjamin M. Rosen Professor of Astronomy; Director of Combined Array for MM Astronomy. Observational astronomer. Discoveries show how stars and planetary systems form in our own and other galaxies.

Joanne Simpson

NASA/Goddard Space Flight Center, Greenbelt, MD

Chief Scientist Emeritus for Meteorology. Developed the first analytical cumulus cloud model. Improved understanding of the effects of cloud radiation and precipitation on climate using satellite measurements of tropical rainfall. Originated "hot tower hypothesis," showing the vital role that clouds and mesoscale processes play on tropical wind circulations and their variability, and on the formation and growth of hurricanes.

Section 5: Engineering Sciences and Technologies

Linda Marie Abriola

Tufts University, Medford, MA

Dean of Engineering; Professor of Civil and Environmental Engineering. Expert in groundwater contamination and remediation, specifically the mathematical modeling of the subsurface transport of nonaqueous phase liquid contaminants and the processes influencing the migration, entrapment, persistence, and recovery of these organic compounds. Work inspired a new discipline within groundwater studies.

Robert Alan Buhrman

Cornell University, Ithaca, NY

John Edson Sweet Professor of Engineering; Director of the

Center for Nanoscale Systems. In quantum and nanoelectronic science, inventions include Ballistic Electron Magnetic Microscopy for magnetic structure imaging; nanofabricated point contacts for electron scattering spectroscopy, yielding understanding of electromigration, two-level tunneling defects, and spin transport; superconducting nanostructures for sensors and logic; metallic nanoparticle fabrication; and magnetic nanostructures for spin-polarized-current switching and microwave excitation of nanomagnets.

Shu Chien

University of California, San Diego, La Jolla, CA

Professor of Bioengineering and Medicine. Using approaches ranging from molecular biology and cell biophysics to integrative physiology and engineering modeling, contributed to understanding of the determinants of blood viscosity, cell deformability, cell interaction, and effects of mechanical forces on signal transduction and gene expression in endothelial cells in health and disease.

Robert Willis Hellwarth

University of Southern California, Los Angeles, CA

George T. Pfleger Chair in Electrical Engineering; Professor of Physics. Contributed to early developments in lasers at the Hughes Research Laboratories. Contributor to the new field of photonics and to improving instruments for astronomy. Developed a widely used technique for generating time-reversed replicas of image-bearing optical beams.

Pravin P. Varaiya

University of California, Berkeley, Berkeley, CA

Nortel Networks Professor of Electrical Engineering and Computer Science. Research encompasses a broad range of problems in systems and control, including game theory and stochastic control, measurement and analysis of highway performance, economics of power systems, and wireless communication and sensor networks.

Choon Fong Shih (FHM)

National University of Singapore, Singapore, Republic of Singapore

President. Work has provided the basis for several key aspects of nonlinear fracture mechanics. Approaches to structural integrity analysis have been widely adopted by industry and government. Technical and educational leadership has influenced the educational enterprise in Singapore.

Section 6: Computer Sciences (including Artificial Intelligence and Information Technologies)

Leonard M. Adleman

University of Southern California, Los Angeles, CA

Distinguished Henry Salvatori Professor of Computer Science; Professor of Molecular Biology. Conducts research on the problem of primality testing. Exhibited a fast algorithm to distinguish prime numbers from composite numbers. Work on cryptography led to a method of encoding digital information (RSA) that is virtually impossible to break. Introduced the notion of DNA computers and the area of molecular computation. Winner of the 2002 Turing Award.

Erich Bloch

The Washington Advisory Group, Washington, DC

Principal. Led the IBM System/360 semiconductor and manufacturing effort. As Director at the National Science Foundation (1984–1990), raised the stature, size, and scope of the institution. As advisor to governments, industry, and educational institutions, improved U.S. industrial competitiveness as well as science and engineering research and education.

David Haussler

University of California, Santa Cruz, Santa Cruz, CA

Professor of Biomedical Engineering; Investigator, Howard Hughes Medical Institute. Leader in the fields of computational learning theory and bioinformatics. Introduced the use of powerful statistical models (hidden Markov models and related methods) to the analysis of biological sequences of DNA, RNA, and proteins. Contributed to the International Genome Project by helping to provide a computational solution that allowed the completion of the first working draft of the human genome.

Donald A. B. Lindberg

National Institutes of Health, Bethesda, MD

Director, U.S. National Laboratory of Medicine (NLM). Leader in applying computer technology and artificial intelligence to the health sciences. Chaired the U.S. Government's High Performance Computing Initiative. Made contributions to information and computer activities in medical diagnosis, artificial intelligence, and educational programs. Responsible for implementing state-of-the-art digital library and its worldwide services at the NLM. Recipient of numerous awards.

A. Richard Newton

University of California, Berkeley, Berkeley, CA

Dean of the College of Engineering; Roy W. Carlson Professor of Engineering. Contributed to the design of microelectric circuits. Research and teaching have influenced electronic design in academia and industry. National and international spokesperson for the role of engineering in service to society.

David Andrew Patterson

University of California, Berkeley, Berkeley, CA

E. H. and M. E. Pardee Professor of Computer Science. President of the Association for Computing Machinery (ACM). Coauthor, with John Hennessy, of a book on computer architecture that transformed the field from art to engineering and science. Pioneer of Redundant Arrays of Inexpensive Disks (RAID) and Reduced Instruction Set Computer (RISC) and also coined those terms. Current work is on fault-tolerant systems.

Charles P. Thacker

Microsoft Corporation, Redmond, WA

Distinguished Engineer. Computer system designer. Accomplishments include the Xerox PARC Alto (world's first personal workstation), the DEC SRC Firefly (world's first multiprocessor workstation), Autonet/AN2 (a high-bandwidth self-healing mesh-connected local area network), and the Microsoft Tablet PC (pen-based computing).

Class II: Biological Sciences

Section 1: Biochemistry and Molecular Biology

Michael R. Botchan

University of California, Berkeley, Berkeley, CA

Professor of Biochemistry and Molecular Biology. Impacted current views of eukaryotic replication, recombination, gene expression, and neoplastic transformation in DNA tumor virus genome integration and excision, Bovine Papilloma Virus, DNA replication in vitro, and characterization of origin replication complexes in *Drosophila*.

Solomon Walter Englander

University of Pennsylvania School of Medicine, Philadelphia, PA

Jacob Gershon-Cohen Professor of Medical Science; Professor of Biochemistry and Biophysics. Developed the chemistry and structural physics of protein and nucleic acid hydrogen exchange processes and their use to analyze structure, stability, dynamics, and structure change. Found the basic foldon substructure of protein molecules and its role in protein folding mechanisms.

Joachim Frank

State University of New York, Albany, NY

Professor of Biomedical Sciences; Adjunct Professor of Biology; Investigator, Howard Hughes Medical Institute. Developed single-particle methods in cryo-electron microscopy. Work on the structures of ribosomes during protein synthesis explains many features

of the mechanics of these complex molecular machines.

James L. Manley

Columbia University, New York, NY

Judith Clarence Levi Professor of Life Sciences. Made contributions to eukaryotic gene expression. Identified the key factors and elucidated the mechanism of mRNA polyadenylation. Discovered the first alternative splicing factor (SR protein) and provided first direct evidence for RNA catalysis of mRNA splicing. Demonstrated unexpected links between RNA processing, transcription, and DNA damage signaling.

Lynne E. Maquat

University of Rochester Medical Center, Rochester, NY

Dean's Endowed Chair and Professor of Biochemistry and Biophysics. Scientific work defined a conserved pathway that identifies and degrades aberrant RNAs that prematurely terminate protein synthesis in eukaryotic cells. Discoveries have had an impact on the understanding of how mutations cause human disease and have illuminated fundamental mechanisms evolved by cells to avoid the expression of defective proteins.

Cecile M. Pickart

Johns Hopkins University, Baltimore, MD

Professor of Biochemistry and Molecular Biology. Conducted research in the ubiquitin-proteasome field. Made contributions to the understanding of ubiquitin-conjugating enzymes in mammals. Provided first mechanistic analysis of a de-ubiquitylating enzyme and the discovery of its inhibitor ubiquitin-aldehyde. Performed functional dissection of topologically distinct multi-ubiquitin chains. Identified poly-ubiquitin chain receptor of the 26S proteasome. Deceased.

George F. Vande Woude

Van Andel Research Institute, Grand Rapids, MI

VARI Founding Director and Distinguished Scientific Investigator. Established molecular cloning of retrovirus genomes and cellular protooncogenes, discovering the structure and enhancer function of proviral long terminal repeats. Demonstrated that a normal cellular gene can be activated as an oncogene. Found that Mos protooncoprotein regulates vertebrate meiosis. Discovered that Met protooncoprotein is hepatocyte growth factor receptor and is involved in human cancer.

Maurizio Brunori (FHM)

University of Rome, Rome, Italy

Professor of Chemistry and Biochemistry. Conducts research in the biochemistry and biophysics of metalloproteins, with discoveries on the structure, function, evolution, and dynamics of myoglobins and hemoglobins. Main contributions include allosteric properties of hemoglobin, evolution of oxygen carriers, structural dynamics and folding of proteins, biological electron transfer and energy transduction. Member of the Academia dei Lincei and President of the Pasteur Institute in Rome.

Section 2: Cellular and Developmental Biology, Microbiology, and Immunology (including Genetics)

Don W. Cleveland

University of California, San Diego, La Jolla, CA

Professor of Medicine, Neuroscience, Cellular and Molecular Medicine. Discovered mechanisms that maintain faithful chromosome inheritance and cell cycle control during normal cellular division in mammals. Discovered the principles of neuronal cell growth and the mechanisms of selective neuronal death in human neurodegenerative disease, especially the pathway underlying paralysis in Amyotrophic Lateral Sclerosis.

Margaret Tatnall Fuller

Stanford University School of Medicine, Stanford, CA

Reed Hodgson Professor of Human Biology/Professor of Developmental Biology and Genetics. Made discoveries in the field of regulation of stem cell self-renewal and differentiation. Working on spermatogenesis in *Drosophila*, found that the neighboring micro-environment, or niche, plays critical role in maintaining germ line stem cells by activating the JAK-STAT signal transduction pathway to specify stem cell self-renewal. Elucidated critical role of spindle orientation in stem cell fate and underlying mechanisms through which stem cells orient toward the niche to ensure a normally asymmetric outcome of stem cell divisions.

Mark Terry Groudine

Fred Hutchinson Cancer Research Center; University of Washington School of Medicine, Seattle, WA

Member, Division of Basic Sciences and Deputy Director; Professor of Radiation Oncology. Made contributions to understanding eukaryotic gene regulation, including establishing locus control regions (LCRs) and transcriptional elongation control as novel and fundamental paradigms in eukaryotic gene expression. Demonstrated that the organization of the eukaryotic nucleus is dynamic, with changes in subnuclear location of proteins and genes playing an important role in controlling gene expression.

R. Scott Hawley

Stowers Institute for Medical Research, Kansas City, MO

Investigator. Known for genetic and molecular dissection of meiosis in *Drosophila*. Accomplishments include the demonstration that heterochromatic pairing is critical for chromosome segregation and discovery of a novel membrane that surrounds the meiotic spindle.

Susan K. McConnell

Stanford University, Stanford, CA

Susan B. Ford Professor of Biological Sciences. Expanded our understanding of the mechanisms directing development of the cerebral cortex of the mammalian brain. Application of transplantation and molecular techniques elucidated mechanisms of cell fate determination and neuronal identity in the central nervous system.

Peter J. Novick

Yale University, New Haven, CT

Professor of Cell Biology. Led the genetic and molecular discovery of the role of small GTPases in targeting vesicles within the eukaryotic cell. Defined regulatory proteins that activate the GTPase, Sec4p, and a multisubunit "exocyst" that guides the Sec4-vesicle complex to the cell surface.

George F. Oster

University of California, Berkeley, Berkeley, CA

Professor of Cell and Developmental Biology; Professor of Environmental Science, Policy and Management. Created mathematical modeling of biological mechanisms that yielded landmark studies in population, evolutionary, developmental, and molecular biology. Introduced the concept of a Brownian ratchet to explain protein translocation, molecular motors, and cell locomotion. Provided insight into the ATP synthase mechanism.

Edward Dickinson Salmon

University of North Carolina at Chapel Hill, Chapel Hill, NC

James Larkin and Iona Mae Ballou Distinguished Professor of Biology. Cell biologist and biophysicist who studies the molecular mechanisms governing the assembly of spindle microtubules and the segregation of chromosomes during mitosis. Led the development of video and digital imaging microscopy for analysis of molecular and structural dynamics in living cells.

Denis Duboule (FHM)

University of Geneva, Geneva, Switzerland

Director and Professor of Zoology and Animal Biology. Made contributions to the revolution that has occurred in mammalian embryology since the discovery of the homeobox. Work on Hox gene complexes has shown their conservation among animals and how temporal and spatial colinearity of gene expression regulates the development of complex body structures.

Section 3 : Neurosciences, Cognitive Sciences, and Behavioral Biology

Laurence F. Abbott
Columbia University, New York, NY
William Bloor Professor of Theoretical Neuroscience. Began career in particle physics and moved into computational neuroscience. Has applied theoretical and computational approaches to numerous problems in neuroscience, including the role of synaptic depression, spike-timing dependent plasticity, cortical processing, and gain modulation. Coauthor of the predominant textbook in the field.

Randolph Blake
Vanderbilt University, Nashville, TN
Centennial Professor of Psychology ; Fellow, The Kennedy Center for Human Development. Advanced our understanding of visual perception and its neural bases. Using psychophysical and brain imaging techniques, isolated and characterized stages of visual processing, with emphasis on binocular vision and motion perception. Spokesman for science in the classroom and the community.

Michael Ellis Goldberg
Columbia University, New York, NY
David Mahoney Professor of Brain and Behavior. Combined physiological and behavioral techniques in the awake, behaving monkey. Made contributions to our understanding of the physiological bases of cognitive processes, including the cerebral cortical mechanisms underlying visual attention, the generation of eye movements, and the accurate perception of space for action.

William Tallant Greenough
University of Illinois at Urbana-Champaign, Urbana, IL
Swanlund and Center for Advanced Study Professor of Psychology, Psychiatry and Cell and Structural Biology. First to demonstrate that differences in experience early in life result in altered branching of neuron dendrites and synapse formation in the mammalian brain. Research provided the first clear evidence for the structural basis of memory.

Joseph E. LeDoux
New York University, New York, NY
University Professor ; Henry and Lucy Moses Professor of Science. Bridge-builder linking neuroscience, psychology, and psychiatry. Established a neurobiological basis for emotions. Demonstrated how environmental events trigger fear reactions unconsciously through amygdala circuits. Demonstrated that plasticity in the amygdala is key to emotional learning and memory, and identified underlying molecular mechanisms.

Henry Allen Lester
California Institute of Technology, Pasadena, CA
Bren Professor of Biology. Applied a wide range of techniques, including flash-activated molecules, mutagenesis, and incorporation of unnatural sidechains, to the study of the structure and function of ion channels and neurotransmitter receptors. Created mouse models with mutated channels and receptors to study and explain pathophysiology, including nicotine addiction.

Gordon Murray Shepherd
Yale University, New Haven, CT
Professor of Neuroscience. Integrative neurophysiologist. Led the discovery and analysis of brain microcircuits and odor maps. Authored books on brain organization and history of neuron theory. Edited the *Journal of Neuroscience*. Leader in the Human Brain Project, constructing databases supporting neuroscience research.

Section 4 : Evolutionary and Population Biology and Ecology

Stephen Russell Carpenter
University of Wisconsin-Madison, Madison, WI
Stephen Alfred Forbes Professor of Zoology. Leading international ecologist. Carried out empirical and theoretical studies on lake productivity and nutrient cycling, and on the resilience of lake ecosystems.

Phyllis D. Coley
University of Utah, Salt Lake City, UT
Professor of Biology. Made contributions to understanding how the environment shapes the evolution of anti-herbivore defenses of plants by altering the costs and benefits, and, in turn, how this affects both herbivores and predators. Applied this ecological insight to design a drug discovery program in tropical forests with the goals of linking economic development and conservation.

Bryan Thomas Grenfell
Pennsylvania State University, University Park, PA
Alumni Professor of Biology. Developed new approaches to understanding the dynamics of infectious diseases of humans and animals by combining modeling and statistics. Applied this approach in particular to the dynamics of childhood infections, such as measles, and the control of foot-and-mouth disease.

Nancy A. Moran
University of Arizona, Tucson, AZ
Regents' Professor of Ecology and Evolutionary Biology. Conducts research on the evolutionary aspects of plant-insect and insect-microbe interactions. Work elucidated the evolution of mutualistic endosymbiotic associations between aphids and their bacterial endosymbionts, and has revolutionized views of the nature of coevolutionary interactions and adaptations to host plants by insects.

Robert Eugene Page, Jr.
Arizona State University, Tempe, AZ
Foundation Professor and Founding Director, School of Life Sciences. In sociogenetics, determined origin and evolutionary consequences of polyandry in social insects. Genetically isolated the primary sex-determining mechanisms for honeybees and most haplodiploid insects. Demonstrated feasibility of genetically mapping behavior in non-model organisms. Maps of honeybee physiology and behavior have revealed novel aspects of the evolution of social insects.

William B. Provine
Cornell University, Ithaca, NY
Charles A. Alexander Professor of Biological Sciences. Authority on the history of population genetics and the evolutionary synthesis. Advocate of communicating the evolutionary perspective to a wide audience of scientists, historians, sociologists, and philosophers of science. Recent publication (2005) is on evolutionary biology, free will, and moral responsibility. Currently writing a history of the theories of neutral molecular evolution.

Barbara Anna Schaal
Washington University in St. Louis, St. Louis, MO
Spencer T. Olin Professor of Biology. Innovative use of molecular methods to document unexpected patterns of genetic diversity in plant populations. Has been instrumental in the development of DNA fingerprinting used universally throughout the discipline. Genetic markers based on work are critical in conservation efforts as well as in phylogeography studies.

Eugenia María del Pino Veintimilla (FHM)
Pontificia Universidad Católica del Ecuador, Quito, Ecuador
Professor of Biological Sciences. Led the study of derived reproductive modes and embryonic development in amphibians with molecular, cellular, endocrinological, developmental, and natural history techniques and analysis. Champion of the conservation of the flora and fauna of the Galápagos Islands.

Takashi Gojobori (FHM)
National Institute of Genetics, Shizuoka-ken, Japan
Professor and Director, Center for Information Biology and DNA Data Bank of Japan. In molecular and genomic evolution, developed methods for DNA sequence data analysis, discovered extremely high rates of viral evolution, found strong functional bias of horizontally transferred bacterial genes, and led teams to annotate the human, mouse, and rice genomes.

Ilkka Aulis Hanski (FHM)

University of Helsinki, Helsinki, Finland

Professor of Zoology. Developed an understanding of the dynamics of fragmented populations or metapopulations through models and field studies with butterflies. Work has implications for understanding both the dynamics of populations and the consequences of human-caused habitat fragmentations.

Yoh Iwasa (FHM)

Kyushu University, Fukuoka, Japan

Professor of Biology. Theoretical ecologist. Research combines theoretical analyses with empirical grounding to produce results in evolutionary ecology. Provides insights into the impacts of global change on vegetation.

Section 5: Medical Sciences (including Physiology and Pharmacology), Clinical Medicine, and Public Health

Jeffrey Allen Bluestone

University of California, San Francisco, San Francisco, CA

A. W. and Mary Margaret Clausen Distinguished Professor of Metabolism and Endocrinology; Director, UCSF Diabetes Center. Made contributions to the biological basis of immunologic tolerance and to defining T-cell regulation in auto-immunity, including diabetes and transplantation. Director of NIH-sponsored international Immune Tolerance Network. Awarded American Society of Transplantation/Roche Distinguished Scientist Award; Juvenile Diabetes Research Association's Mary Tyler Moore and Robert Levine Excellence in Clinical Research Award; and the JDRF Grodsky Distinguished Basic Scientist Award.

Kevin Peter Campbell

University of Iowa, Iowa City, IA

Roy J. Carver Professor of Physiology and Biophysics and Neurology; Investigator, Howard Hughes Medical Institute. Elucidated the molecular pathogenesis of several forms of muscular dystrophy. Identified key components of the dystroglycan complex, showed how they connect the cytoskeleton to the extracellular matrix, and discovered abnormal structure and function in disease. Studies have clinical implications for diagnosing and treating these forms of muscular dystrophy.

Helen Haskell Hobbs

University of Texas Southwestern Medical Center, Dallas, TX

Eugene McDermott Distinguished Chair for the Study of Human Growth and Development; 1995 Dallas Heart Ball Chair in Cardiology Research; Investigator, Howard Hughes Medical Institute. Discovered gene defects causing premature heart disease and characterized the essential role of these genes in limiting cholesterol accumulation. Demonstrated that low-frequency alleles collectively contribute to concentrations of plasma lipoproteins and identified genetic differences that protect against heart disease by lowering blood-cholesterol levels.

Kenneth Kaushansky

University of California, San Diego, La Jolla, CA

Helen M. Ranney Professor; Chair, Department of Medicine. Brought platelet biology into the molecular era by devising the strategy for the cloning of thrombopoietin (TPO), the key platelet development factor; elucidating the role of TPO in platelet formation and stem cell expansion; and showing how TPO controls the expression of specific homeobox proteins, helping to explain its effects on stem cell biology.

Mark Taylor Keating

Novartis Institutes for Biomedical Research, Cambridge, MA

Global Head of Human Genetics and Ophthalmology. Revolutionized understanding of cardiac arrhythmia by discovering ion channel genes underlying long QT syndrome. Discovered genes causing supravalvular aortic stenosis and Williams syndrome. Pioneering studies advanced the diagnosis and treatment of arrhythmia and understanding of cardiovascular physiology.

Robert W. Mahley

The J. David Gladstone Institutes, San Francisco, CA

President. Made contributions to understanding the pathobiology of apolipoprotein E in atherosclerosis and Alzheimer's disease. Under his leadership, Gladstone has grown to more than 325 employees in three institutes.

Paul Maxime Nurse

Rockefeller University, New York, NY

President and Professor. Biochemist. Awarded the 2001 Nobel Prize in Physiology or Medicine with Leland H. Hartwell and R. Timothy Hunt for their discoveries relating to cell-cycle regulation by cyclin and cyclin-dependent kinases. Current research focuses on the cell cycle of fission yeast. Knighted in 1999 and awarded the French Legion d'Honneur in 2002.

Nahum Sonenberg (FHM)

McGill University, Montreal, Canada

James McGill Professor. Worked on the regulation of translation initiation. Discovered the mRNA 5' cap binding protein, e1F4E. Showed that e1F4E is an oncogene that is activated by the P13K signaling pathway via modulation of newly discovered e1F4E-inhibitory proteins. Described for the first time an e1F4E independent mechanism of translation via an IRES (internal ribosome entry site).

Class III : Social Sciences

Section 1: Social and Developmental Psychology and Education

Richard N. Aslin

University of Rochester, Rochester, NY

William R. Kenan Professor of Brain and Cognitive Sciences. Demonstrated the perceptual abilities of human infants and illuminated the mechanisms by which they learn the structure of their visual and linguistic world.

Reid Hastie

University of Chicago, Chicago, IL

Robert S. Hamada Professor of Behavioral Science. Researcher on judgment and decision making across a wide range of areas. Originator of the "story model" of jury decision making and the theory of explanation-based decision making. Expert on social cognition and memory. Served on the editorial boards of 16 journals and review panels of NSF, NIMH, and NRC.

E. Tory Higgins

Columbia University, New York, NY

Stanley Schachter Professor of Psychology and Professor of Business. Studies the ways cognitive information processing affects human social behavior. Made contributions to social cognition, self-regulation, motivation, and decision making. Recipient of the American Psychological Society's William James Award for Distinguished Achievements in Psychological Science (2000).

Rachel Keen

University of Massachusetts Amherst, Amherst, MA

Professor of Psychology. Developmental psychologist whose research sheds light on the origins and early development of human perception, memory, and representation of objects and events. Conducts experiments on human infants' dawning knowledge of the world and on the developing brain systems that make this knowledge possible.

Joseph E. LeDoux

New York University, New York, NY

University Professor; Henry and Lucy Moses Professor of Science. Bridge-builder linking neuroscience, psychology, and psychiatry. Established a neurobiological basis for emotions. Demonstrated how environmental events trigger fear reactions unconsciously through amygdala circuits. Demonstrated that plasticity in the amygdala is key to emotional learning and memory, and identified underlying molecular mechanisms.

Nora S. Newcombe

Temple University, Philadelphia, PA

James H. Glackin Distinguished Faculty Fellow. Psychologist specializing in cognitive development. Research focuses on spatial competence and autobiographical memory. Author of numerous articles, chapters, and books on topics including the nativism-empiricist debate, the relation of cognitive and neural development, and how cognitive research can be used in education.

Section 2 : Economics

K. Daron Acemoglu

Massachusetts Institute of Technology, Cambridge, MA

Charles P. Kindleberger Professor of Applied Economics. Innovator in labor economics, political economy, and the economics of long-term growth. Recent work suggests important links between a nation's political and legal institutions, often dating to colonial heritage, and long-term economic performance. Made contributions to the analysis of search models when agents follow informed "directed search" strategies ; to the empirical analysis of labor-market competition and the returns to education ; and to the understanding of technical change, among other topics.

Alberto Alesina

Harvard University, Cambridge, MA

Nathaniel Ropes Professor of Political Economy. Contributor to the field of political economy. Seminal research on political institutions, partisan politics, and macroeconomic outcomes such as budget deficits. Drew attention to the effects of divided-party government. Recent research on international economic institutions.

Donald Wilfrid Kao Andrews

Yale University, New Haven, CT

T. C. Koopmans Professor of Economics. Developed methods now in widespread use in applied econometrics. Provided theoretical insights that serve as the basis for new lines of work in areas including optimal estimation of standard errors in the presence of heteroskedasticity and autocorrelation ; testing for structural breaks ; and inference in a variety of nonregular models.

Joshua Angrist

Massachusetts Institute of Technology, Cambridge, MA

Professor of Economics. Developed identification strategies in empirical economics and popularized the use of "natural experiments." Provided econometric tools for evaluating instrumental variable estimates when there are heterogeneous treatment effects. Empirical contributions in labor economics include estimating the impact of military service on civilian earnings, the economic returns to education, the effect of family size on labor supply, and the effect of class size on achievement.

Judith Chevalier

Yale University, New Haven, CT

Professor of Finance and Economics. Demonstrated the effects of a firm's access to capital markets on its pricing behavior in product markets. Developed empirical evidence of the ways in which incentives in the compensation of mutual-fund managers affect risk-taking behavior by these managers. Pioneered the study of pricing behavior by Internet retailers and their offline competitors. Demonstrated factors that affect pricing over business and seasonal cycles.

Andrew Postlewaite

University of Pennsylvania, Philadelphia, PA

Harry P. Kamen Professor of Economics and Professor of Finance. Microeconomist who has done work on incentives, information, and social norms. Known for illuminating which incentive problems vanish and which become intractable when there are many people. Recently branched out into empirical work, investigating the effect of juvenile height on self-esteem and career performance.

David Romer

University of California, Berkeley, Berkeley, CA

Herman Royer Professor in Political Economy. Contributor to understanding how monetary policy affects aggregate economic fluctuations. Developed microfoundations for models with nominal price rigidities. Utilized detailed historical records from Federal Reserve meetings to develop indicators for the stance of monetary policy and to evaluate its effects.

James H. Stock

Harvard University, Cambridge, MA

Professor of Economics. Coauthor of a body of research on the joint movements of unemployment and inflation that forms the basis for much modern thinking on this subject. Made contributions to economic forecasting and inference with highly persistent time-series data. Developed methods for inference when instrumental variables are only weakly correlated with endogenous variables.

Stephen Nickell (FHM)

London School of Economics, London, England

Professor of Economics. Established duration models as a means of analyzing unemployment spells, introducing a tool that is now widely used in many fields of economics. Made theoretical and empirical contributions to understanding the determinants of unemployment in the United Kingdom and other European nations and to evaluating how government policies affect labor-market outcomes. Early conceptual work on factor demands under uncertainty remains a standard reference for studies of corporate investment as well as labor demand.

Section 3 : Political Science, International Relations, and Public Policy

Nathaniel Beck

New York University, New York, NY

Professor of Political Science ; Chair of the Department of Politics. Political methodologist who introduced and elaborated upon a range of statistical methods, such as time-series cross-sectional, event history, nonparametric regression, and time-series methods, influencing empirical research in many areas of political science. Current substantive research is on comparative political economy and the study of conflict. Has done prior work on American political economy (particularly monetary policy) and presidential approval. Former Editor of *Political Analysis*.

Michael C. Dawson

University of Chicago, Chicago, IL

John D. MacArthur Professor of Political Science and the College. Author of numerous articles and two books on African American political behavior and public opinion : *Behind the Mule : Race and Class in African-American Politics* and *Black Visions : The Roots of Contemporary African-American Political Ideologies*. Principal investigator of several studies of race and politics in the United States.

Lee Epstein

Northwestern University, Chicago, IL

Beatrice Kuhn Professor of Law and Professor of Political Science. Author of works on law, courts, interest-group litigation, and strategic judicial interactions. Author of twelve books, including the *Constitutional Law for a Changing America* series, and over seventy articles. Former President of the Midwest Political Science Association.

David A. Lake

University of California, San Diego, La Jolla, CA

Professor of Political Science. Led efforts to integrate the study of international relations with ideas drawn from economics, especially transactions costs and problems of incomplete contracting. Work explored strategic interactions among states, international institutions and domestic structures, trade and security, ethnic conflict and terrorism, and democracy and war.

Keith T. Poole

University of California, San Diego, La Jolla, CA

Distinguished Professor of Political Science. Coinvented NOMINATE algorithm, the standard in studies of roll-call voting worldwide. Coauthored studies of po-

larization in American politics, the dimensionality of American politics, party discipline, and party switching. Invented "common-space" and nonparametric scaling methods, allowing comparisons of politicians from different branches of government and in legislatures where parametric methods fail.

John E. Roemer

Yale University, New Haven, CT

Elizabeth S. and A. Varick Stout Professor of Political Science and Economics. Produced works on the concepts of exploitation, equality of opportunity, and electoral competition. Formulated a realistic theory of electoral competition and applied it to illuminate the conditions under which a regime of equal opportunity will be implemented.

Pierre Hassner (FHM)

Fondation Nationale des Sciences Politiques, Paris, France

Professor of Political Science. Combines political philosophy and the historical sociology of international affairs. Leading French specialist of international relations. Disciple of Raymond Aron. Taught at Harvard, Chicago, and Johns Hopkins (Bologna). Author of *La Violence et la Paix* and *La Terreur et l'Empire*, as well as many articles. Received the Prix Tocqueville in 2003.

Section 4: Law (including the Practice of Law)

Ian Ayres

Yale University, New Haven, CT

Townsend Professor of Law. Uses economic theory as a tool to generate counterintuitive legal conclusions in areas such as contract and antidiscrimination law. Empiricism – from taxi-cab tipping and kidney transplantation to car theft and reckless sex – demonstrated the real-world relevance of his theoretical conclusions.

Richard H. Fallon, Jr.

Harvard Law School, Cambridge, MA

Ralph S. Tyler Jr. Professor of Constitutional Law. Scholar of the theory and doctrine of constitutional law and federal jurisdiction. Author of *Implementing the Constitution*, *The Dynamic Constitution: Introduction to American Constitutional Law*, and numerous articles. Coeditor of leading casebooks in constitutional law and federal jurisdiction.

Benjamin Walter Heineman, Jr.

Harvard Law School and John F. Kennedy School of Government, Harvard University, Cambridge, MA

Senior Fellow. Pioneered in applying lawyer-statesman concept to role of corporate general counsel and creating a new model and stature for corporate legal departments. Author of books on British race relations and the American presidency. Career in government (Supreme Court law clerk, Assistant Secretary of HEW), law (public-interest lawyer, leader of major law firm, Supreme Court practice), and business (GE general counsel responsible for law, environmental programs, governance, public policy, and corporate social responsibility). Commentator on business, public policy, and their interrelationship.

Larry D. Kramer

Stanford University, Stanford, CA

Dean and Richard E. Lang Professor of Law. Made use of historical sources to develop novel arguments about American constitutionalism: that constitutional interpretation was meant to be the province of the people more than of the Supreme Court, and that the growth of political parties was crucial in making the Constitution work.

Lawrence Lessig

Stanford University, Stanford, CA

Professor of Law. Founder of Stanford's Center for Internet and Society. Teaches and writes in the areas of constitutional law, contracts, and the law of cyberspace. Author of *Free Culture*, *The Future of Ideas*, and *Code and Other Laws of Cyberspace*. Chairs the Creative Common project. Serves on the board of the Free Software Foundation, the Electronic Frontier Foundation, the Public Library of Science, and Public Knowledge.

John Glover Roberts, Jr.

Supreme Court of the United States, Washington, DC

Chief Justice. Formerly a judge on the U.S. Court of Appeals for the District of Columbia Circuit. Was U.S. Supreme Court advocate in the Solicitor General's office and lawyer in private practice.

Seth Paul Waxman

Wilmer Cutler Pickering Hale and Dorr, LLP; Georgetown University Law Center, Washington, DC

Partner; Faculty member. Supreme Court, appellate, and trial advocate. Lecturer and writer on legal issues. Served as Solicitor General of the United States, 1997 – 2001. Practice and scholarly interests focus on complex challenges involving governments, public policy, and constitutional issues.

Robert Badinter (FHM)

Senate of the French Republic, Paris, France

Senateur des Hauts de-Seine. Former President, French Constitutional Court. Former French Minister of Justice. Former professor, University of Paris. Author of many books and articles, including *A European Constitution*. Leading campaigner against capital punishment. Visiting professor and lecturer at many U.S. law schools.

Section 5: Anthropology, Archaeology, Sociology, Geography, and Demography

Lawrence D. Bobo

Stanford University, Stanford, CA

Martin Luther King Jr. Centennial Professor; Director of the Center for Comparative Studies in Race and Ethnicity and Program in African and African American Studies. Authority on racial attitudes and relations, political behavior, and social psychology. Founding Editor of the *DuBois Review: Social Science Research on Race*. Coauthor of *Racial Attitudes in America: Trends and Interpretations* and of *Prejudice in Politics: Group Position, Public Opinion, and the Wisconsin Treaty Rights Dispute*.

Michael F. Goodchild

University of California, Santa Barbara, Santa Barbara, CA

Professor of Geography and Faculty Lecturer. Produced original research on the use of digital geographic information in spatial and environmental analysis and modeling and its visualization in cartography; on the theory of massive repositories of geographic information; on the question of accuracy and uncertainty in geographic data; and on the design of databases.

Judith Temkin Irvine

University of Michigan, Ann Arbor, MI

Professor of Anthropology. Writings constitute ethnographic corpus on role of language in the social life of Wolof speakers, their ideologies of language, and their social history. Understanding of linguistic ideology has been adopted in anthropology and in sociolinguistics. Past President of Society for Linguistic Anthropology and former Editor of *Journal of Linguistic Anthropology*.

Robert David Sack

University of Wisconsin-Madison, Madison, WI

Clarence J. Glacken and John Bascom Professor of Geography; Professor of Integrated Liberal Studies. Philosopher and logician of geographic thought. Developed a rationale for spatial and place-based understanding built from the character of space-place itself and transcending individual explanatory perspectives. Work informs a wide range of disciplinary concerns, including rules of territorial control and the meaning of artificial worlds.

Charles S. Spencer

American Museum of Natural History, New York, NY

Chairman, Division of Anthropology. Known for explaining the origins of hierarchical societies and the rise of the world's first political states. Combines evolutionary concepts like tempo, mode, variation, and selection with sociopolitical concepts like agency, factionalism, and militarism. Proposed a mathematical model of pristine state formation.

Charles Stanish

University of California, Los Angeles, Los Angeles, CA

Director, The Cotsen Institute of Archaeology; Professor of Anthropology. Work on ecological adaptation showed the way elites overcame Chayanov's rule to create agrarian economies that can support urbanism and stratified society even at 3,800 meters elevation. Explained the rise of civilization on the altiplano of Peru and Bolivia.

Mary C. Waters

Harvard University, Cambridge, MA

M. E. Zukerman Professor of Sociology. Using a combination of demographic analysis, interviews, and fieldwork, explored how white Americans choose alternative possible ethnic identities and analyzed the impact of the U.S. racial order on the life chances of immigrants of color and their children. Research has influenced measurements in the U.S. Census.

Peter Haggett (FHM)

University of Bristol, Bristol, England

Emeritus Professor in Urban and Regional Geography; Senior Research Fellow, School of Geographical Sciences. Instrumental in laying out the foundations of modern geographical science during the 1960s and 1970s. Made contributions to the analysis of disease epidemics, modeling diffusion in original ways and clarifying the relationship between epidemic diseases and their environments.

Victor Pérez-Díaz (FHM)

Analistas Socio Politicos, Madrid, Spain

Professor of Sociology. Established the concept of civil society in his book on the transition of the Franco regime to democracy. Directs a research institute and has written on problems of education, health, trade unionism, and employment in Spain. Taught at a number of American universities.

Class IV: Humanities and Arts

Section 1: Philosophy and Religious Studies

Kit Fine

New York University, New York, NY

Silver Professor of Philosophy of Mathematics. Helped lay the mathematical foundations of modal and relevance logic in the 1960s and 1970s, and went on to develop distinctive views in metaphysics, philosophy of language, and philosophy of mathematics.

William A. Graham

Harvard University, Cambridge, MA

Murray A. Albertson Professor of Middle Eastern Studies and Dean and John Lord O'Brian Professor of Divinity at Harvard Divinity School. Leading expert on Islam. Publications include *Divine Word and Prophetic Word in Early Islam* (ACLS book prize) and *Beyond the Written Word*. Directed Harvard's Center for Middle Eastern Studies.

Anil K. Gupta

University of Pittsburgh, Pittsburgh, PA

Distinguished Professor of Philosophy. Works in logic, philosophy of language, and epistemology. Discovered mathematical approach in the logic of definitions that makes sense of interdependence. Used this approach to construct and defend the revision theory of truth, a prominent theory in the subject. Recent book, *Empiricism and Experience*, offers a new epistemological account of experience.

Richard Kieckhefer

Northwestern University, Evanston, IL

Professor of Religion and History. Working mainly on pre-Reformation Europe, explored the complex interaction of elite and popular (clerical and lay) culture; the relationship between religious ideas and ordinary experience; and the conditions leading to repression of dissent and deviance. Most recently, proposed a new analytical framework for interpreting religious architecture.

Richard Kraut

Northwestern University, Evanston, IL

Charles E. and Emma H. Morrison Professor in the Humanities; Professor of Philosophy and Classics. Research concentrates on the interpretation of the moral and political philosophy of Socrates, Plato, and Aristotle. Books seek both to understand these thinkers in the context of their social world and to retrieve from them insights that remain vital to debates in contemporary philosophy.

David Curtis Steinmetz

Duke University, Durham, NC

Amos Ragan Kearns Professor of the History of Christianity. Intellectual historian known for studies in the history of biblical interpretation in late medieval and early modern Europe. Redefined the terms of debate in several areas of Reformation research, especially in Calvin studies. Founding editor of the series, *Oxford Studies in Historical Theology*.

Nicholas Wolterstorff

Yale University, New Haven, CT

Noah Porter Professor Emeritus of Philosophical Theology. Contributed to metaphysics, aesthetics, philosophy of religion, epistemology, and early modern philosophy. President of American Philosophical Association (Central Division). Authored publications on social, political, and religious questions. Gifford Lecturer, St. Andrews University, and Wilde Lecturer, Oxford University.

Section 2: History

Christopher R. Browning

University of North Carolina at Chapel Hill, Chapel Hill, NC

Frank Porter Graham Distinguished Professor. Author of seven books on the Holocaust. Examines the decision-making process that led to Nazi genocide, and explores how ordinary Germans became mass murderers.

William Cronon

University of Wisconsin-Madison, Madison, WI

Frederick Jackson Turner and Vilas Research Professor of History, Geography, and Environmental Studies. Won the Society of American Historians' Francis Parkman Prize for *Changes in the Land* and several other awards, including the Bancroft Prize for *Nature's Metropolis*. Former Rhodes Scholar, Guggenheim and MacArthur Fellow, and Vice President of the American Historical Association.

Jack P. Greene

Johns Hopkins University, Baltimore, MD

Andrew D. Mellon Professor in the Humanities, Emeritus. Colonial American historian. Authored (or edited) numerous books and articles, such as *Pursuits of Happiness: The Social Development of Early Modern British Colonies and the Formation of American Culture* and *The Intellectual Construction of America: Exceptionalism and Identity from 1492 – 1800*.

Tulio Halperin-Donghi

University of California, Berkeley, Berkeley, CA

Muriel McKevitt Sonne Professor of Latin American History, Emeritus. Historian of Latin America. Studies on Argentina centered initially on the era of post-independence and subsequently on the nineteenth and twentieth centuries. Held appointments at the University of Buenos Aires, Harvard, and Oxford. Authored over twenty books.

Darlene Clark Hine

Northwestern University, Evanston, IL

Board of Trustees Professor of African American Studies and Professor of History. Scholar of African American women's history. Opened new areas of inquiry and approaches to questions of gender, race, and class. Examination of the nuances of rape and its broader psychological affects on black women have been influential. Edited compilations of research materials. Editor of the Oxford University Press 2nd edition of *Black Women in America*, 3 volumes.

James Oliver Horton

George Washington University, Washington, DC

Benjamin Banneker Professor of American Studies and History. Director of Afro-American Communities Project of the National Museum of American History at the Smithsonian Institution. Author of *Black Bostonians*, *Free People of Color*, and *In Hope of Liberty*. Editor of Oxford University Press series, *The Landmarks of American History*. Advisor to museums, historical societies, and the 2005 PBS series *Slavery and the Making of America*. President of the Organization of American Historians, 2004 – 2005.

Kenneth T. Jackson

Columbia University, New York, NY

Jacques Barzun Professor of History and the Social Sciences; Director of the Herbert H. Lehman Center for the Study of American History. Urban, social, and cultural historian. Made contributions to understanding of the history of New York City and of American suburbanization. Former President of the Organization of American Historians, the Society of American Historians, the Urban History Association, and the New York Historical Society.

Dominick C. LaCapra

Cornell University, Ithaca, NY

Bowmar Professor of Humanistic Studies. Leading European intellectual historian (studies of Durkheim, Sartre, and Flaubert). Interpreter of contemporary theoretical discourses and of poststructuralist theories for historians. Advocate of historical perspectives for theorists. Books on writing history after Auschwitz provide a critique of the uses of trauma theory and psychoanalysis for historical analysis.

Kenneth L. Pomeranz

University of California, Irvine, Irvine, CA

Chancellor's Professor of History. Wrote three books that contributed to our understanding of the interactions of state, society, and economy in the making of late Imperial and twentieth-century China. Reframed the growth of the world economy as the intersection of efforts emanating from many places, tracing its surprising impacts on the lives of so-called ordinary people around the world.

Hans-Ulrich Wehler (FHM)

Universität Bielefeld, Bielefeld, Germany

Professor of History. Draws on American as well as German influences in insisting that historical analysis be treated as a social science open to theoretical organization. One of the leaders of a generation of German historians who reformed the German historical profession and addressed the deeper roots of National Socialism in German politics and society.

Section 3: Literary Criticism (including Philology)

Dudley Andrew

Yale University, New Haven, CT

Professor of Film Studies and Comparative Literature. Authority on European and world film. Founding Director of Iowa's Institute for Cinema and Culture. Cochair of Yale's Film Studies Program. Author of 10 books, including *Film in the Aura of Art*, *Concepts in Film Theory*, and *Mists of Regret: Culture and Sensibility in Classic French Film*.

Harry Berger

University of California, Santa Cruz, Santa Cruz, CA

Professor Emeritus of Literature and Art History. Scholar of Renaissance English literature, especially Shakespeare and Spenser, with interests that include art history, anthropology, and philosophy. Founding member of the UCSC English Department, where he has taught for over 30 years. Founder of the critical school of Reconstructed Old New Criticism. Presented with a lifetime achievement award from the International Spenser Society in 2003.

Charles Bernstein

University of Pennsylvania, Philadelphia, PA

Regan Professor of English. Coeditor of *L=A=N=G=U=A=G=E*, a forum for innovative and eccentric poetics in the 1970s, and The Electronic Poetry Center and PennSound, two web archive projects. Books include *Girly Man*, poems and ballads; *Shadowtime*, libretto; *My Way: Speeches and Poems*; *A Poetics*; and *Content's Dream: Essays 1975 – 1984*.

Richard Charles Murray Janko

University of Michigan, Ann Arbor, MI

Professor and Chair of Classical Studies. Published books on Greek literature and literary criticism, including Homer, Aristotle, and the Philodemus papyri from Herculaneum. Currently working on Orphism, Greek religion, and the Aegean Bronze Age.

David R. Knechtges

University of Washington, Seattle, WA

Professor of Asian Languages and Literature. Philologist. Specialist in early medieval China. Studies and translations have opened up genres and works of Chinese literature and established linkages between Chinese and Western scholars.

Franco Moretti

Stanford University, Stanford, CA

The Danily C. and Laura Louise Bell Professor of English and Comparative Literature; Director of Center for the Study of the Novel. Work on the modern novel combines formal analysis with social history, with a growing emphasis on explanatory models of a scientific nature.

Michael Murrin

University of Chicago, Chicago, IL

David B. and Clara E. Stern Professor in Humanities. Authority on Medieval and Renaissance romance and epics. Analyzed Renaissance allegory as it informs the longer narratives, and studied heroic narratives as expressions of European and extra-European historical, political, and geographic realia. Views them as reflections of their creators.

Peter Ackroyd (FHM)

London Times, London, England

Chief Book Reviewer. Poet, critic, literary theorist, cultural historian, novelist, and nonfiction writer. Wrote biography of T.S. Eliot and biographies of Charles Dickens, William Blake, Thomas More, and Shakespeare. Wrote *London: The Biography* and *Albion: The Origins of the English Imagination* as well as twelve novels, among them *Hawksmoor*, *Chatterton*, *The Clerkenwell Tales*, and *The Lambs of London*. Was Literary Editor (1973 – 1977) for *The Spectator* magazine in London as well as joint Managing Editor (1978 – 1982) and film critic.

Section 4: Literature (Fiction, Poetry, Short Stories, Nonfiction, Playwriting, Screenwriting)

Rita Dove

University of Virginia, Charlottesville, VA

Commonwealth Professor of English. U.S. Poet Laureate (1993 – 1995), and Virginia's Poet Laureate. Awards include the 1987 Pulitzer Prize in Poetry, the National Humanities Medal, the Heinz Award, the Common Wealth Award, and fellowships from the NEA, NEH, and Guggenheim Foundation. Also writes fiction and drama.

Xuefei (Ha) Jin

Boston University, Boston, MA

Professor of English. Won the PEN/Faulkner Award for Fiction in 2000 for *Waiting* and in 2005 for *War Trash*. Other awards include the National Book Award (1999 for *Waiting*), the PEN/Hemingway Award (1998 for *Ocean of Words*), and the Flannery O'Connor Award (1998 for *Under the Red Flag*).

Phillip Lopate

Hofstra University, Brooklyn, NY

John Crawford Adams Professor of English. Memoirist, essayist, novelist, poet, and anthologist. Observer of the urban scene, the world of cinema, and the literary landscape. Author or editor of nine books, including *The Art of the Personal Essay*.

Lore Segal

New York, NY

Novelist, essayist, translator, and writer of short stories and children's literature. Best known publication, *Other People's Houses*, details her experience as a refugee. Awards include 1986 Academy Award for *Her First American*, American Library Association Notable Book Award in 1970 for *Tell Me a Mitzi*. Contributor of short stories to *The New Yorker*, *The Saturday Evening Post*, *The New Republic*, *Epoch*, and *Commentary*. Contributor of essays to *Social Research*, *Harper's Magazine*, *The Antioch Review*, *Parnassus*, and book reviews to *The New York Times*. Translated several of the Grimm brothers' fairy tales (with cotranslator Randall Jarrell and illustrator Maurice Sendak) in such works as *The Juniper Tree and Other Tales from Grimm*.

Paula Vogel

Brown University, Providence, RI

Adele Kellenberg Seaver Professor of Creative Writing. *How I Learned to Drive* garnered the Pulitzer Prize, Lortel, Drama Desk, the Obie, and the New York Drama Critics Award for Best Play. Winner of numerous other awards. Work was selected for the 2004 – 2005 season of the Signature Theatre.

Ellen Bryant Voigt

Marshfield, VT

Poet. Author of seven books, most recently *Kyrie* and *Shadow of Heaven*. Awards include a Guggenheim Fellowship, Pushcart Prize, NEA Grant, and an Award in Literature from the American Academy of Arts and Letters.

Rosmarie Waldrop

Providence, RI

Poet; Translator. Produced eighteen books of poetry. Translation of Edmond Jabès' *The Book of Margins* won the Harold Morton Translation Award (1998), and translation of *Some Thing Black* by Jacques Roubaud received the PEN Book of the Month Club Citation (1991). Editor and publisher of Burning Deck Press with husband, poet Keith Waldrop.

William Trevor (FHM)

London, England

Short Story Writer; Playwright; Novelist. Recipient, among other honors, of the Whitbread Book of the Year award for *Felicia's Journey*. Knighted in 2002 by Queen Elizabeth II of Great Britain for his service to literature.

Section 5: Visual and Performing Arts – Criticism and Practice (including Art, Architecture, Sculpture, Music, Theater, Film, Dance)

Alan Alda

New York, NY

Actor; Writer; Director on stage, television, and film. Recently nominated for the Oscar, Tony, and EMMY – and made the *New York Times* bestseller list for *Never Have Your Dog Stuffed* – all in the same year. Thirty-two EMMY nominations, winning six (five for *M*A*S*H* and one for *The West Wing*). Eleven years as host of PBS's *Scientific American Frontiers*.

Keith Christiansen

Metropolitan Museum of Art, New York, NY

Curator of Italian Paintings and adjunct professor at the Institute of Fine Arts of New York University. Has been at The Metropolitan for thirty years, organizing exhibitions ranging from painting in fifteenth-century Siena to Caravaggio and Tiepolo. Has promoted many lesser known Italian artists and artistic movements and has been a keen acquisitor for the museum. Received recognition for his contributions to catalogues and scholarly journals.

Meredith Monk

The House Foundation for the Arts, New York, NY

Composer; Singer; Director/Choreographer; Creator of new opera, music theater works, films, and installations. Pioneer in what is now called "extended vocal technique" and "interdisciplinary performance." Started career in the 1960s; tours with her Vocal Ensemble. Acclaimed by audiences and critics as a major force in the performing arts.

Anne Litle Poulet

Frick Collection, New York, NY

Director. Authored works on sculpture and decorative art of the eighteenth and nineteenth centuries. International exhibitions *Clodion* (1992) and *Houdon* (2003) and their catalogues have been models. Curator since the late 1960s. Served at the Metropolitan Museum and the Museum of Fine Arts, Boston.

Martin Scorsese

New York, NY

Actor; Director; Film Producer. Highly admired, if at times controversial, director. Often approaches difficult subject matters in realms of inner-city turmoil, violence, and sex in films such as *Taxi Driver* (1976) and *Gangs of New York* (2002). President of the Film Foundation, a nonprofit organization dedicated to film preservation and decaying motion picture film stock.

Peter Sellars

University of California, Los Angeles, Los Angeles, CA

Professor; Theater and Opera Director. Director of over 100 opera, music, and television productions, specializing in twentieth-century opera. Named Director of Kennedy Center's American National Theater at age 26; Artistic director of Los Angeles Festivals in 1990 and 1993. Recipient of Erasmus Prize and MacArthur Fellowship. Collaborates with contemporary poets, artists, and composers to create innovative projects that challenge the traditional role of performing arts in the modern world.

Steven Stucky

Cornell University, Ithaca, NY

Given Foundation Professor of Composition. Major force in American music. Composer and advocate for American music in post as Resident Composer of the Los Angeles Philharmonic. Conductor at the Green Umbrella series, Ensemble X, and the Aspen Festival. Taught at Eastman, Cornell, Berkeley, and in master classes around the country. Second Concerto for Orchestra won the Pulitzer Prize in Music in 2005.

Richard Taruskin

University of California, Berkeley, Berkeley, CA

Class of 1955 Professor of Music. American musicologist with wide-ranging interests, including prize-winning work on fifteenth-century sacred music, twentieth-century modernism, and the concept of "early music" performance. Authority on music in Russia. Publications include *Defining Russia Musically* and *Stravinsky and the Russian Traditions*.

Michael Tilson Thomas

San Francisco Symphony, San Francisco, CA

Music Director. Principal Guest Conductor, London Symphony Orchestra; Music Director, Ojai (California) Festival; Founder and Artistic Director, New World Symphony Orchestra.

Don Harrán (FHM)

The Hebrew University of Jerusalem, Jerusalem, Israel

Artur Rubinstein Professor of Musicology, Emeritus. Interested in the subjects of humanism and music; the history of music theory; the Renaissance madrigal; word-tone relationships; music historiography; Jewish music traditions in Renaissance and early Baroque culture; and Jewish women as poets and musicians in the early modern era.

Henri Loyrette (FHM)

Musée du Louvre, Paris, France

President and Director. Scholar of nineteenth-century French art, specifically the art and life of Edgar Degas. Led the French museum system through a period of change. Former Director of the Musée d'Orsay.

Bridget Riley (FHM)

London, United Kingdom

Abstract painter. By 1965 was one of the leading figures in the emerging Op Art movement. In 1968 became the first British painter to win the International Prize at the Venice Biennale. Has had numerous international solo exhibitions and retrospectives.

Class V: Public Affairs, Business, and Administration

Section 1: Public Affairs, Journalism, and Communications

Floyd Abrams

Cahill Gordon & Reindel LLP; Columbia University, New York, NY

Partner; William J. Brennan Visiting Professor. First Amendment lawyer. Co-counsel to the *New York Times* in the Pentagon Papers case before the Supreme Court. Defended numerous clients in freedom of speech and press cases. Served as counsel to the Brooklyn Museum of Art in its case against Rudolph Giuliani. Published *Speaking Freely*, a memoir, in 2005.

Dean Paul Baquet

Los Angeles Times, Los Angeles, CA

Editor. Served as Managing Editor for 5 years. Won a Pulitzer Prize for investigative reporting at the *Chicago Tribune* in 1988. Held reporting and editorial positions at the *New York Times* and other newspapers.

George H. W. Bush

Houston, TX

Forty-first President of the United States (1989 – 1993). Former Vice President of the United States, Congressman from Texas, and Director of the CIA. Led the United Nations coalition during the 1990 – 1991 Gulf War. With Soviet President Mikhail Gorbachev, declared a U.S.-Soviet strategic partnership at the summit of July 1991. Spearheaded negotiations that led to the signing of NAFTA in 1993. With former President William Jefferson Clinton, launched efforts to raise funds for victims of Asian tsunamis as well as Hurricane Katrina.

William Jefferson Clinton

William J. Clinton Foundation, New York, NY

Forty-second President of the United States (1993 – 2001). Created more than 22 million jobs during his presidency and led the strongest economic expansion in U.S. history. Founded the Clinton Foundation, which focuses on health security (with an emphasis on HIV/AIDS), economic empowerment, leadership development and citizen service, and racial, ethnic, and religious reconciliation. Honored with the Jimmy and Rosalynn Carter Award for Humanitarian Contributions to the Health of Humankind from the National Foundation for Infectious Diseases. With former President George H. W. Bush, launched efforts to raise funds for victims of Asian tsunamis as well as Hurricane Katrina.

Gwen Ifill

WETA, Arlington, VA

Moderator and Managing Editor, *Washington Week*; Senior Correspondent, *The NewsHour with Jim Lehrer*. Was Chief Congressional and Political Correspondent at NBC News; and Journalist for the *New York Times*, *The Washington Post*, *Baltimore Evening Sun*, and *Boston Herald American*. Serves on the boards of Harvard University's Institute of Politics, the Committee to Protect Journalists, and the University of Maryland's Phillip Merrill College of Journalism.

Steven E. Miller

Harvard University, Cambridge, MA

Director, International Security Program, Kennedy School of Government. Editor-in-Chief of *International Security*. Co-author of *Soviet Nuclear Fission*, *Avoiding Nuclear Anarchy*, and the American Academy monograph, *War With Iraq: Costs, Consequences, and Alternatives*. Editor or coeditor of several books, including *Offense, Defense, and War* and *The Russian Military: Power and Policy*. Cochair of the U.S. Pugwash Committee. Member of the Council of International Pugwash, the Advisory Committee of the Stockholm International Peace Research Institute (SIPRI), the Scientific Committee of the Landau Network Centro Volta (Italy), and former member of the Council of the International Institute for Strategic Studies (IISS).

Victor S. Navasky

The Nation; Columbia University Graduate School of Journalism, New York, NY

Publisher Emeritus; George Delacorte Professor of Magazine Journalism. Served as editor and publisher of *The Nation*. Directs the Delacorte Center for Magazine Journalism and chairs the *Columbia Journalism Review*. In 1970s served as an editor at *The New York Times Magazine*. Books include *Kennedy Justice*, *Naming Names*, which won a National Book Award, and *A Matter of Opinion*, which received the 2005 George Polk Book Award.

Peter G. Peterson

Blackstone Group, New York, NY

Senior Chairman and Cofounder. Former U.S. Secretary of Commerce. Former Chair, Federal Reserve Bank of New York (2000 – 2004). Chairman, Council on Foreign Relations; Founding Chairman, Institute for International Economics; Founding President, The Concord Coalition. CEO of Lehman Brothers (1973 – 1977) and of Lehman Brothers, Kuhn, Loeb Inc. (1977 – 1984). Author of several books, including *Running on Empty* and *Facing Up: How to Rescue the Economy from Crushing Debt*.

David Remnick

The New Yorker, New York, NY

Editor since July 1998. Staff writer at the magazine since September 1992. *Lenin's Tomb: The Last Days of the Soviet Empire* received both the Pulitzer Prize for nonfiction and a George Polk Award for excellence in journalism.

Section 2: Business, Corporate, and Philanthropic Leadership (Private Sector)

Peter A. Brooke

Advent International Corporation, Boston, MA

Chairman. Global and civic-minded venture capitalist. Founder of TA Associates and Advent International. Played an active role in the development of new technological enterprises and global technology transfer. Devoted to using venture capital as an economic development tool both domestically and internationally. Former Chairman of the Board of Trustees of the Boston Symphony Orchestra; former Trustee of Colgate University and Overseer of Harvard University.

Marshall N. Carter

New York Stock Exchange, New York, NY

Chairman. Throughout career in governmental, military, and private sectors, focused on reorganizing world securities clearance and settlement systems, applying new technologies to disaster-relief efforts, and advancing business management. Former Chairman and CEO of State Street Bank and Trust Co. Taught at MIT and Harvard. Chairs Board of Trustees of Boston Medical Center; former board member of the American Bankers Association, National Securities Clearing Corporation, and Honeywell International, Inc. Decorated Marine Corps veteran of Vietnam.

Kenneth Irvine Chenault

American Express Company, New York, NY

Chairman and CEO. Serves on the boards of IBM, Mount Sinai NYU Medical Center and Health System, NCAA, and the Arthur Ashe Institute for Urban Health. Member of the Dean's Advisory Board for Harvard Law School and of the Council on Foreign Relations.

Jack Connors

Hill, Holiday, Connors, Cosmopoulos, Boston, MA

Founding Partner and current Chairman. Chairman of the Board of Directors of Partners HealthCare (Massachusetts General Hospital and Brigham and Women's Hospital) and Dana-Farber/Partners CancerCare and Harvard CancerCare. Chair of the Board of Fellows at Harvard Medical School and former Chairman of the Board of Trustees at Boston College. Board Member of Partners In Health, Brandeis University, and Emmanuel College.

Joseph Harold Flom

Skadden, Arps, Slate, Meagher & Flom, New York, NY

Partner. Pioneer of corporate law. Philanthropic endeavors include Chairman Emeritus, Woodrow Wilson International Center for Scholars; Trustee, Paine Foundation; service on many New York City Mayoral Commissions, including Chair of the New York City Board of Education's Capital Task Force on Financing and Construction.

William R. Hambrecht

WR Hambrecht + Co, San Francisco, CA

Founder, Chairman, and Co-CEO. Cofounded Hambrecht & Quist in 1968. Led the initial public offerings of many Silicon Valley firms, such as Apple Computer, Genentech, and Adobe Systems. Introduced OpenIPO® as a means to level the playing field for both investors and issuers. Serves on the Board of Trustees for The American University of Beirut; on the Advisory Investment Committee to the Board of Regents of the University of California; and on the Advisory Council to the J. David Gladstone Institutes. Former Chair of the Council on Competitiveness.

Fred Kavli

Kavli Foundation, Oxnard, CA

Founder and Chairman of the Board. As Founder and former Chairman and CEO of Kavlico Corp., Kavlico became one of the world's largest suppliers of sensors for aeronautic, automotive, and industrial applications. Educated as a physicist. Is a business leader and philanthropist dedicated to education and research. Established the Kavli Foundation and the Kavli Institute to support interdisciplinary scientific research at leading universities worldwide.

Gershon Kekst

Kekst and Company, New York, NY

Founder and President. Made contributions to the world of business and financial communications. Chairman of the Board of The Jewish Theological Seminary.

Jerome Kohlberg, Jr.

Mt. Kisco, NY

Cofounder, Kohlberg & Co. Formed Campaign Reform Project, pivotal in passing McCain-Feingold Campaign Finance Reform Bill. Chairman, Kohlberg Foundation. Chairman, Salk Institute. Senior Founding Partner, Kohlberg Kravis & Roberts & Co. Formerly with Bear Stearns & Co, Inc. Named to Private Equity Hall of Fame, 1994. Swarthmore College Emeritus Trustee.

Helen Bowdoin Spaulding

Boston Foundation, Boston, MA

Retired Chairman of the Board. Served on boards of more than 30 nonprofit organizations, including Georgetown, Boston University, University of Vermont, New England Aquarium, Wang Center for the Performing Arts, Children's Hospital, Spaulding Rehabilitation Hospital, and United Way of Massachusetts Bay. Member of the Advisory Councils of two programs at Harvard's Kennedy School of Government. Philanthropist of the arts.

Wilma Stein Tisch

Tisch Foundation, New York, NY

Trustee. Philanthropist in education, the arts, and humanitarian causes, both individually and as Cochair of the Board of the Tisch Foundation. President Emerita of WNYC (New York public radio) and of the Federation of Jewish Philanthropies of New York. Serves or has served as a Trustee of Skidmore College as well as a Member of the Board of the Carnegie Corporation of New York, the UJA Federation of New York, the United Way of New York City, and the September 11th Fund.

Leslie H. Wexner

Limited Brands, Inc., Columbus, OH

Founder, Chairman, and CEO. Philanthropist for community causes. Chairman Emeritus, Board of Trustees of the Ohio State University. Provided funding for the Wexner Center for the Arts at the Ohio State University, the Wexner Institute for Pediatric Research at Columbus Children's Hospital, the Wexner Heritage Village, and the Center for Public Leadership at Harvard University. Founding Chairman, the Columbus Partnership. Trustee, the Columbus Jewish Federation and Foundation. Recipient of numerous international honors and awards, including the United Way of America Alexis de Tocqueville Award, Woodrow Wilson Award for Citizenship, Ordre des Arts et des Lettres, and Knight of the Italian Republic.

Section 3: Educational, Scientific, Cultural, and Philanthropic Administration (Nonprofit Sector)

John David Alexander

Claremont, CA

Former President of Pomona College. Rhodes Scholar. Served as American Secretary of the Rhodes Trust. President of Southwestern at Memphis and Trustee of several foundations and corporations. Awarded a CBE (Hon.) in 1998. President of the American Friends of the National Portrait Gallery, London.

Matthew Goldstein

City University of New York, New York, NY

Chancellor. Former President of Baruch College, President of the Research Foundation, Acting Vice Chancellor for Academic Affairs at CUNY, and President of Adelphi University. Author of three publications on statistics. Member of the Board of Trustees of the JP Morgan Funds, the Albert Einstein School of Medicine, New Plan Excel Realty Trust, Inc., and United Way of New York City.

Lee Herbert Hamilton

Woodrow Wilson International Center for Scholars, Washington, DC

President and Director. Former Congressman from Indiana. Elected to the Eighty-Ninth and to the sixteen succeeding Congresses (January 3, 1965 – January 3, 1999); served as Chair, Select Committee on Intelligence; Chair, Select Committee to Investigate Covert Arms Transactions with Iran; Chair, Joint Economic Committee; Chair, Committee on Foreign Affairs; and Vice Chair, National Commission on Terrorist Attacks upon the United States, 2002 – 2004. Author of *How Congress Works and Why You Should Care*.

Thomas H. Kean

Robert Wood Johnson Foundation, Princeton, NJ

Chairman, Board of Trustees. Former Governor of New Jersey and President of Drew University. Served on the President's Education Policy Advisory Committee and as Chair of the Education Commission of the States and the National Governors Association's Task Force on Teaching. Chair of the National Commission on Terrorist Attacks upon the United States.

Arthur Elliott Levine

Woodrow Wilson National Fellowship Foundation, Princeton, NJ

President. National spokesperson for education. Recent research focuses on education and schools and improving students' access to higher education. Author of a dozen books and articles, including coauthored book, *When Hope and Fear Collide: A Portrait of Today's College Student*.

Noteworthy

Select Prizes and Awards

Nobel Prizes, 2006

Chemistry
Roger D. Kornberg (Stanford University)

Physics
John C. Mather (NASA/Goddard Space Flight Center) and George F. Smoot (University of California, Berkeley)

Physiology or Medicine
Andrew Z. Fire (Stanford University) and Craig C. Mello (University of Massachusetts Medical School)

Economics
Edmund S. Phelps (Columbia University)

Presidential Medals of Freedom

Norman C. Francis (Xavier University of Louisiana)

Joshua Lederberg (Rockefeller University)

David McCullough (West Tisbury, MA)

William Safire (Dana Foundation)

National Humanities Medals, 2006

James Buchanan (George Mason University)

Robert Fagles (Princeton University)

Bernard Lewis (Princeton University)

Mark Noll (University of Notre Dame)

Other Awards

Elizabeth Blackburn (University of California, San Francisco) is among the recipients of the 2006 Albert Lasker Awards for Basic Medical Research.

Eugene Braunwald (Brigham and Women's Hospital) is among the recipients of the first annual Katz Prizes in Cardiovascular Research.

Sarah Broadie (University of St Andrews) has been elected a Member of the Academia Europaea (2006).

Archie Brown (Oxford University) was made a Companion of the Order of St Michael and St George (CMG) in the Queen's Birthday Honors List of 2005.

Amyand David Buckingham (University of Cambridge) has been awarded the first Ahmed Zewail Prize in Molecular Sciences, given by Elsevier in collaboration with the journal *Chemical Physics Letters*.

William J. Clinton (William J. Clinton Foundation) is among the recipients of the 2007 TED Prize, given by the Sampling Foundation.

James Comer (Yale University) is the winner of the 2007 University of Louisville Grawemeyer Award for Education.

G. Robert A. Conquest (Stanford University) received Ukraine's Medal of Iaroslav Mudryi for his scholarship on Ukraine.

Norman Dorsen (New York University) is the first recipient of the Association of American Law Schools Award for Lifetime Contributions to the Law and Legal Education.

Shmuel N. Eisenstadt (Hebrew University of Jerusalem) has been awarded the 2006 Holberg International Memorial Prize, given by the Ludvig Holberg Memorial Fund.

Richard W. Fisher (Federal Reserve Bank of Dallas) was awarded the Dwight D. Eisenhower Medal for Service to Democracy by the American Assembly.

John Hope Franklin (Duke University) is among the recipients of the 2006 John W. Kluge Prize for the Study of Humanity, given by the John W. Kluge Center at the Library of Congress.

Joseph G. Gall (Carnegie Institution of Washington) is the recipient of the 2006 Albert Lasker Award for Special Achievement in Medical Science.

Carol W. Greider (Johns Hopkins University School of Medicine) is among the recipients of the 2006 Albert Lasker Awards for Basic Medical Research.

Leroy Edward Hood (Institute for Systems Biology) is the recipient of the 12th Annual Heinz Award for Technology, the Economy and Employment, given by the Heinz Family Foundation of Pittsburgh.

Rudolf Jaenisch (Massachusetts Institute of Technology) was awarded the Max Delbrück Medal by the Max Delbrück Center for Molecular Medicine in Berlin.

Jon H. Kaas (Vanderbilt University) is the recipient of the 2006 Karl Spencer Lashley Award, given by the American Philosophical Society.

Laura L. Kiessling (University of Wisconsin, Madison) is the recipient of the 2005 Harrison Howe Award.

Arthur Kleinman (Harvard University) is the recipient of the 2006 Career Achievement Award, given by the Society for Medical Anthropology.

Peter D. Lax (New York University) received the Distinguished Service to the Profession of Applied Mathematics Prize, established by the Society for Industrial and Applied Mathematics.

Edward Lazear (Stanford University) was awarded the 2006 Society of Labor Economists' Jacob Mincer Prize.

Maya Lin's (Maya Lin Studio) Vietnam Veterans Memorial in Washington has been chosen by the American Institute of Architects to receive its 2007 AIA Twenty-Five Year Award.

Susan Lindquist (Whitehead Institute for Biomedical Research) was awarded the 2006 Sigma Xi William Procter Prize for Scientific Achievement.

Mary Frances Lyon (Medical Research Council Mammalian Unit, United Kingdom) was awarded the Pearl Meister Greengard Prize by Rockefeller University.

Michael A. Marletta (University of California, Berkeley) is the recipient of the 2007 Repligen Award for the Chemistry of Biological Processes.

Ruth Nussenzweig (New York University School of Medicine) and **Victor Nussenzweig** (New York University School of Medicine) are the recipients of the Bristol-Myers Squibb Freedom to Discover Award for Distinguished Achievement in Infectious Diseases Research.

Carl Phillips (Washington University in St. Louis) is the recipient of the 2006 Academy of American Poets Fellowship for Distinguished Poetic Achievement.

Richard Powers (University of Illinois at Urbana-Champaign) is the recipient of the 2006 National Book Award for Fiction for *The Echo Maker*.

Frank M. Richter (University of Chicago) is the recipient of the 2006 Geological Society of America Arthur L. Day Medal.

Giacomo Rizzolatti (University of Parma, Italy) is among the recipients of the 2007 University of Louisville Grawemeyer Award for Psychology.

Ellen Rosand (Yale University) is among the recipients of the Andrew W. Mellon Foundation's Distinguished Achievement Awards.

Richard Sennett (London School of Economics and New York University) was awarded the 2006 Hegel Prize.

Eric Sundquist (University of California, Los Angeles) is among the recipients of the Andrew W. Mellon Foundation's Distinguished Achievement Awards.

Jack W. Szostak (Harvard Medical School and Massachusetts General Hospital) is among the recipients of the 2006 Albert Lasker Awards for Basic Medical Research.

Eva Tardos (Cornell University) was awarded the George B. Dantzig Prize by the Mathematical Programming Society and the Society for Industrial and Applied Mathematics.

Mark H. Thiemens (University of California, San Diego) was honored for his work with meteorites when a minor planet was designated (7004) Markthiemens.

Bill Viola (Bill Viola Studio) received the French Order of Arts and Letters Award.

Richard White (Stanford University) is among the recipients of the Andrew W. Mellon Foundation's Distinguished Achievement Awards.

Edward O. Wilson (Harvard University) is among the recipients of the 2007 TED Prize, given by the Sampling Foundation. He is also the recipient of the 2006 George B. Stibbitz Communications Pioneer Award of the American Computer Museum.

New Appointments

Dennis A. Ausiello (Harvard Medical School and Massachusetts General Hospital) has been elected to the Board of Directors of Pfizer, Inc.

Robert A. Brown (Boston University) has been elected to the Board of Directors of Citizens Bank.

Jonathan R. Cole (Columbia University) has been appointed to the Board of Trustees at the Center for Advanced Study in the Behavioral Sciences.

Avinash Dixit (Princeton University) has been elected President-Elect of the American Economic Association.

Lawrence Gold (SomaLogic, Inc.) has been appointed to the Board of Directors of Lifeline Therapeutics, Inc.

Susan Hockfield (Massachusetts Institute of Technology) has been elected to the Board of Trustees of the Carnegie Corporation of New York.

Leroy Edward Hood (Institute for Systems Biology) has joined the Scientific Advisory Board of Cellumen, Inc.

Steven E. Hyman (Harvard University) has been appointed Chairman of the Board of Directors of Seaside Therapeutics.

Louis J. Ignarro (University of California, Los Angeles) has joined the Scientific Advisory Board of Metagenics, Inc.

Jeffrey Leiden (Abbott Laboratories) has joined Clarus Ventures as a partner in its Cambridge office.

Cora B. Marrett (University of Wisconsin, Madison) has been appointed Assistant Director for Education and Human Resources at the National Science Foundation.

Abner J. Mikva (University of Chicago) has been appointed Chairman of the Illinois Human Rights Commission.

Craig B. Thompson (University of Pennsylvania) has been named Director of the Abramson Cancer Center of the University of Pennsylvania and Associate Vice President for Cancer Services of the University of Pennsylvania Health System.

George F. Vande Woude (Van Andel Research Institute) has joined the Scientific Advisory Board of Curis, Inc.

John F. Welch, Jr. (Boston, MA) has joined the Alfred P. Sloan Management Society at the MIT Sloan School of Management.

Eugene Wong (University of California, Berkeley) has been named interim Director of Information & Communication Technologies at Science Foundation Ireland.

Select Publications

Poetry

Robert Fagles (Princeton University), trans. *The Aeneid* by Virgil. Viking, November 2006

Rachel Hadas (Rutgers University). *The River of Forgetfulness*. David Robert Books, June 2006

Galway Kinnell (New York University). *Strong Is Your Hold*. Houghton Mifflin, November 2006

Carl Phillips (Washington University in St. Louis). *Riding Westward*. Farrar, Straus and Giroux, April 2006

Charles Tomlinson (University of Bristol, United Kingdom). *Cracks in the Universe*. Carcenet Press, May 2006

Ellen Bryant Voigt (Marshfield, VT). *Messenger : New and Selected Poems 1976 – 2006*. Norton, January 2007

Fiction

Louis Auchincloss (New York, NY). *The Friend of Women and Other Stories*. Houghton Mifflin, March 2007

Paul Auster (New York, NY). *Travels in the Scriptorium : A Novel*. Henry Holt and Co., January 2007

Margaret Drabble (London, United Kingdom). *The Sea Lady*. McClelland & Stewart, October 2006

Norman Mailer (Provincetown, MA). *The Castle in the Forest : A Novel*. Random House, January 2007

Toni Morrison (Princeton University), Slade Morrison (Rockland County, NY), and Pascal Lemaitre (Brussels, Belgium and Brooklyn, NY). *Who's Got Game ? The Ant or the Grasshopper ? The Lion or the Mouse ? Poppy or the Snake ?* Scribner, January 2007

Alice Munro (Clinton, Ontario, Canada). *Carried Away : A Selection of Stories*. Introduction by **Margaret Atwood** (Toronto, Canada). Everyman's Library, September 2006

Alice Munro (Clinton, Ontario, Canada). *The View from Castle Rock : Stories*. Knopf, November 2006

Lore Segal (New York, NY). *Shakespeare's Kitchen*. The New Press, April 2007

Jane Smiley (New York, NY). *Ten Days in the Hills*. Knopf, February 2007

Nonfiction

Bruce Ackerman (Yale University). *Before the Next Attack : Preserving Civil Liberties in an Age of Terrorism*. Yale University Press, April 2006

Alberto Alesina (Harvard University) and Francesco Giavazzi (Bocconi University). *The Future of Europe : Reform or Decline*. MIT Press, September 2006

Truman F. Bewley (Yale University). *General Equilibrium, Overlapping Generations Models, and Optimal Growth Theory*. Harvard University Press, February 2007

Rebecca M. Blank (University of Michigan), **Sheldon H. Danziger** (University of Michigan), and Robert F. Schoeni (University of Michigan), eds. *Working and Poor : How Economic and Policy Changes Are Affecting Low-Wage Workers*. Russell Sage Foundation Publications, December 2006

R. Howard Bloch (Yale University). *A Needle in the Right Hand of God : The Norman Conquest of 1066 and the Making and Meaning of the Bayeux Tapestry*. Random House, December 2006

Glen Warren Bowersock (Institute for Advanced Study). *Mosaics as History : The Near East from Late Antiquity to Islam*. Harvard University Press, October 2006

Noam Chomsky (MIT) and Gilbert Achcar (University of Paris-VIII). *Perilous Power : The Middle East and U.S. Foreign Policy*. Paradigm, November 2006

Michael Cole (University of California, San Diego) and the Distributed Literacy Consortium. *The Fifth Dimension : An After-School Program Built on Diversity*. Russell Sage Foundation Publications, October 2006

John Dunn (University of Cambridge). *Democracy : A History*. Atlantic Monthly Press, June 2006

Freeman Dyson (Institute for Advanced Study). *The Scientist as Rebel*. New York Review Books, December 2006

Joel L. Fleishman (Duke University). *The Foundation : A Great American Secret ; How Private Wealth is Changing the World*. PublicAffairs, January 2007

Dario Fo (Milan, Italy). *My First Seven Years (Plus a Few More)*. Thomas Dunne Books, October 2006

Charles Fried (Harvard Law School). *Modern Liberty*. W. W. Norton, November 2006

Philip Gossett (University of Chicago). *Divas and Scholars : Performing Italian Opera*. University of Chicago Press, August 2006

Anthony Grafton (Princeton University) and Megan Williams (University of Montana). *Christianity and the Transformation of the Book : Origen, Eusebius, and the Library of Caesarea*. Harvard University Press, November 2006

Gerald Holton (Harvard University) and Gerhard Sonnert (Harvard University). *What Happened to the Children Who Fled Nazi Persecution*. Palgrave Macmillan, December 2006

Michael Hout (University of California, Berkeley) and Andrew M. Greeley (University of Arizona). *The Truth about Conservative Christians : What They Think and What They Believe*. University of Chicago Press, October 2006

Michael Hout (University of California, Berkeley) and Claude S. Fischer (University of California, Berkeley). *Century of Difference : How America Changed in the Last One Hundred Years*. Russell Sage Foundation Publications, November 2006

George Kateb (Princeton University). *Patriotism and Other Mistakes*. Yale University Press, November 2006

Thomas Keneally (Avalon Beach, Australia). *A Commonwealth of Thieves : The Improbable Birth of Australia*. Doubleday/Nan Talese, October 2006

David S. Landes (Harvard University). *Dynasties : Fortunes and Misfortunes of the World's Great Family Businesses*. Viking, September 2006

Sanford Levinson (University of Texas at Austin). *Our Undemocratic Constitution : Where the Constitution Goes Wrong (And How We the People Can Correct It)*. Oxford University Press, September 2006

William S. McFeely (University of Georgia). *Portrait : A Life of Thomas Eakins*. Norton, November 2006

Douglas L. Medin (Northwestern University), Norbert O. Ross (Vanderbilt University), and Douglas G. Cox (Hilary J. Waukau Environmental Services Center, Menominee Reservation). *Culture and Resource Conflict : Why Meanings Matter*. Russell Sage Foundation Publications, September 2006

Paul Muldoon (Princeton University). *The End of the Poem : Oxford Lectures*. Farrar, Straus & Giroux, October 2006

Benjamin I. Page (Northwestern University) and Marshall M. Bouton (Chicago Council on Foreign Relations). *The Foreign Policy Disconnect : What Americans Want from Our Leaders but Don't Get*. University of Chicago Press, October 2006

Elaine Pagels (Princeton University) and Karen L. King (Harvard Divinity School). *Reading Judas : The Gospel of Judas and the Shaping of Christianity*. Viking, March 2007

Richard Posner (United States Court of Appeals, Chicago). *The Little Book of Plagiarism*. Pantheon, January 2007

Kenneth Prewitt (Columbia University), Mattei Dogan (International Sociological Association), Steven Heydemann (Georgetown University), and Stefan Toepler (George Mason University), eds. *The Legitimacy of Philanthropic Foundations : U.S. and European Perspectives*. Russell Sage Foundation Publications, October 2006

Joan Roughgarden (Stanford University). *Evolution and Christian Faith : Reflections of an Evolutionary Biologist*. Island Press, July 2006

Bruce Russett (Yale University). *Purpose and Policy in the Global Community*. Palgrave Macmillan, June 2006

Charles Tilly (Columbia University). *Regimes and Repertoires*. University of Chicago Press, September 2006

Mary C. Waters (Harvard University) and Reed Ueda (Tufts University), eds., with Helen B. Marrow (Harvard University). *The New Americans : A Guide to Immigration since 1965*. Harvard University Press, January 2007

Daniel Yankelovich (Viewpoint Learning, Inc.). *Profit with Honor : The New Stage of Market Capitalism*. Yale University Press, May 2006

Anthony C. Yu (University of Chicago), trans. and ed. *The Monkey and the Monk : An Abridgment of The Journey to the West*. University of Chicago Press, November 2006

Exhibitions

Jasper Johns (Sharon, CT). "Jasper Johns : An Allegory of Painting, 1955 – 1965" at the National Gallery of Art, Washington, DC, January 28 – April 29, 2007.

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. ■

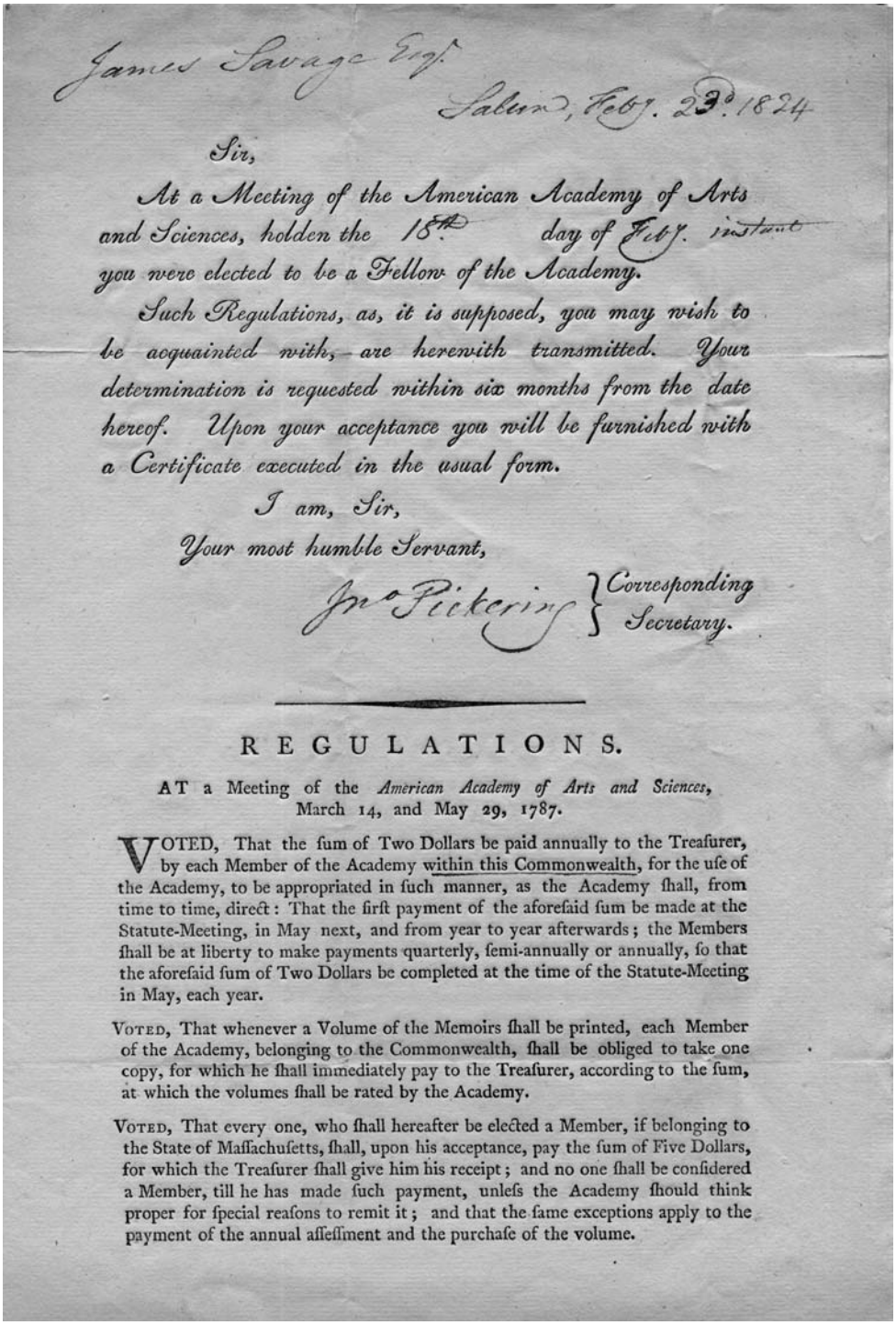
Academy Dues

The Council has approved a $15 increase in dues effective April 1, 2007. Dues account for only a small portion of the Academy's budget, but they are critical in helping to cover the rising costs of meetings and symposia throughout the country; membership activities, including the election process; the development of new research projects and publications; and greater efforts to inform members about the Academy's work. ■

From the Archives

Letter from John Pickering, Corresponding Secretary of the Academy, to James Savage, February 23, 1846, informing Savage of his election to the Academy. From its earliest years, the Academy has sent letters to new members informing them of their election. In the early nineteenth century, the Corresponding Secretary would use a printed form that could be filled in by hand.

James Savage (1784 – 1873), a Boston antiquary, attorney, and public official, served the City of Boston and the Commonwealth in several official roles. He was also the founder of Provident Institution for Savings, the first savings bank in Boston, and served as treasurer and president of the Massachusetts Historical Society.



James Savage Esq.

Salem, Feby. 23d. 1824

Sir,

At a Meeting of the American Academy of Arts and Sciences, holden the 18th day of Feby. instant you were elected to be a Fellow of the Academy.

Such Regulations, as, it is supposed, you may wish to be acquainted with, are herewith transmitted. Your determination is requested within six months from the date hereof. Upon your acceptance you will be furnished with a Certificate executed in the usual form.

I am, Sir,

Your most humble Servant,

Jno. Pickering } Corresponding Secretary.

REGULATIONS.

AT a Meeting of the *American Academy of Arts and Sciences*, March 14, and May 29, 1787.

VOTED, That the ſum of Two Dollars be paid annually to the Treaſurer, by each Member of the Academy within this Commonwealth, for the uſe of the Academy, to be appropriated in ſuch manner, as the Academy ſhall, from time to time, direct: That the firſt payment of the aforeſaid ſum be made at the Statute-Meeting, in May next, and from year to year afterwards; the Members ſhall be at liberty to make payments quarterly, ſemi-annually or annually, ſo that the aforeſaid ſum of Two Dollars be completed at the time of the Statute-Meeting in May, each year.

VOTED, That whenever a Volume of the Memoirs ſhall be printed, each Member of the Academy, belonging to the Commonwealth, ſhall be obliged to take one copy, for which he ſhall immediately pay to the Treaſurer, according to the ſum, at which the volumes ſhall be rated by the Academy.

VOTED, That every one, who ſhall hereafter be elected a Member, if belonging to the State of Maſſachuſetts, ſhall, upon his acceptance, pay the ſum of Five Dollars, for which the Treaſurer ſhall give him his receipt; and no one ſhall be conſidered a Member, till he has made ſuch payment, unleſs the Academy ſhould think proper for ſpecial reaſons to remit it; and that the ſame exceptions apply to the payment of the annual aſſeſſment and the purchaſe of the volume.

The Public Good:

Knowledge as the Foundation for a Democratic Society

American Academy of Arts & Sciences — American Philosophical Society

This spring, the American Academy of Arts & Sciences and the American Philosophical Society will hold their first-ever joint meeting. This special event, *The Public Good: Knowledge as the Foundation for a Democratic Society*, will take place April 27 – 29, 2007, in Washington, D.C., in collaboration with the National Academy of Sciences.

The program, which begins on Friday evening, will feature some of our nation's leading thinkers speaking on critical issues confronting American society in the twenty-first century. Formal invitations and registration forms were mailed in mid January to all members of the American Academy and the American Philosophical Society. Please register early since we have limited space, especially for some of the social events.

We are grateful to the Annenberg Foundation Trust at Sunnylands for its generous support of *The Public Good: Knowledge as the Foundation for a Democratic Society*. For questions regarding the meeting, please contact the conference office: telephone (617-576-5018); facsimile (617-576-5050); email (publicgood@amacad.org).

Preliminary Program

Friday, April 27, 2007

Convocation of the Academies: Program and Dinner at the National Portrait Gallery

- Don Michael Randel, President, Andrew W. Mellon Foundation, *Keynote*
- John Wilmerding, Christopher Binyon Sarofim Professor of American Art, Princeton University

Saturday, April 28, 2007

Panel Discussions at the Mayflower Hotel

- **Religion and the Enlightenment**
  Chair: Martin Marty, Fairfax M. Cone Distinguished Service Professor Emeritus, University of Chicago
- **The Independence of the Courts**
  Chair: Linda Greenhouse, Supreme Court correspondent, *The New York Times*
- **Prospects for the United States in the Global Economy**
  Chair: Robert Solow, Nobel Laureate and Professor of Economics Emeritus, Massachusetts Institute of Technology
- **The Media and Society**
  Chair: Kathleen Hall Jamieson, Director, Annenberg School of Communications, University of Pennsylvania

Reflections on Democracy: Program and Dinner at the Library of Congress

- E. L. Doctorow, Lewis and Loretta Glucksman Professor in American Letters, New York University
- Rosanna Warren, University Professor, Emma Ann MacLachlan Metcalf Professor of the Humanities, Boston University
- *Honorees:* Leonore Annenberg, James Billington, John Hope Franklin

Sunday, April 29, 2007

Panel Discussions at the National Academy of Sciences

- **Science, Health, and an Aging Society**
  Chair: Harvey Fineberg, President, Institute of Medicine
- **Energy Choices and Global Warming**
  Cochairs: Ralph Cicerone, President, National Academy of Sciences
  Richard Meserve, President, Carnegie Institution of Washington

Confirmed participants include:

Pedro Aspe, former Secretary of the Treasury of Mexico
Lisa Berkman, Thomas D. Cabot Professor of Public Policy, Harvard School of Public Health
Tom Brokaw, Special Correspondent, NBC
James Carroll, writer, Boston, MA
Charles Geyh, John F. Kimberling Chair in Law, Indiana University School of Law
Charles O. Holliday, Jr., Chairman and CEO, DuPont
Gwen Ifill, Moderator and Managing Editor, *Washington Week*
Judith Kaye, Chief Judge of the State of New York
Edward P. Lazear, Chairman, President's Council of Economic Advisors
Jane Lubchenco, Wayne and Gladys Valley Professor of Marine Biology, Oregon State University
Mark Noll, Francis A. McAnaney Professor of History, University of Notre Dame
Sandra Day O'Connor, former Supreme Court Justice
John Reed, former CEO, Citigroup
Jack Rowe, former President and CEO, Aetna
Janet Yellen, President and CEO, Federal Reserve Bank of San Francisco

AMERICAN ACADEMY
OF ARTS & SCIENCES

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