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AMERICAN ACADEMY
OF ARTS & SCIENCES

Calendar of Events

Wednesday, February 9, 2005

1887th Stated Meeting – Cambridge

"Markets, Morals, and Civic Life"

Speaker: Michael J. Sandel, Harvard University

Location: House of the Academy

Tuesday, February 15, 2005

Meeting – Pasadena, California

Host: David Baltimore, President, California Institute of Technology

"Neuroeconomics"

Speaker: Colin Camerer, California Institute of Technology

Location: The Athenaeum, California Institute of Technology

Wednesday, February 16, 2005

Meeting – Los Angeles, California

Host: Albert Carnesale, Chancellor, University of California, Los Angeles

Presentations by newly elected Fellows

Speakers: Andrea Ghez and **Joel Handler**, both University of California, Los Angeles

Location: Faculty Club, University of California, Los Angeles

Thursday, February 17, 2005

Meeting – San Francisco, California

Host: David Kessler, Dean, University of California, San Francisco School of Medicine and Vice Chancellor for Medical Affairs

Presentation by newly elected Fellow

Speaker: Jay Levy, University of California, San Francisco

Location: Kalmanovitz Library, University of California, San Francisco

Monday, February 28, 2005

1888th Stated Meeting – New York City

Presiding: E. John Rosenwald, Jr., Vice Chairman and Senior Managing Director, Bear Stearns Companies, Inc.

"Universities as Urban Planners"

Speakers: Lee C. Bollinger, Columbia University, **James Polshek**, Polshek Partnership Architects LLP, and **Omar Blaik**, University of Pennsylvania

Moderator: Robert Campbell, Cambridge, MA

Location: 7 West 43rd Street, New York City

Wednesday, March 9, 2005

1889th Stated Meeting and S. T. Lee Lecture in the Humanities – Cambridge

"Images of Power in Shakespeare"

Speaker: Stephen Greenblatt, Harvard University

Location: House of the Academy

Wednesday, April 6, 2005

1890th Stated Meeting and Joint Meeting with the Boston Athenaeum – Cambridge

Speaker: Robert Pinsky, Boston University

Location: House of the Academy

Wednesday, May 11, 2005

1891st Stated Meeting and Annual Meeting – Cambridge

Speaker: Alan Brinkley, Columbia University

Location: House of the Academy

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

Induction 2004

New Fellows Gang Tian (MIT) and Rodolfo Dirzo (Stanford University)

Foreign Honorary Member Renata Mayntz (Max-Planck-Institut für Gesellschaftsforschung) with new Foreign Honorary Member Jürgen Kocka (Wissenschaftszentrum Berlin für Sozialforschung)

New Fellows A. Paul Alivisatos (University of California, Berkeley), R. Lawrence Edwards (University of Minnesota), and Harry N. Scheiber (University of California, Berkeley)

New Fellows Paul F. Berliner (Northwestern University) and Sharon Olds (New York University)

G. David Forney (MIT) with new Fellows John F. McDonnell (McDonnell Douglas Corporation) and Henry Samueli (Broadcom Corporation)

New Fellows Peter Rossky (University of Texas at Austin) and Mark E. Dean (International Business Machines Corporation)

Trust member E. John Rosenwald (Bear Stearns Companies) and new Fellow Leonore Annenberg (Annenberg Foundation)

New Fellows Rubie S. Watson (Harvard University) and Brice Marden (New York, New York)

Induction 2004

New Fellows Dedre Gentner (Northwestern University) and Graham C. Walker (MIT)

New Fellows Edward D. Lazowska (University of Washington) and Donald G. Saari (University of California, Irvine)

New Fellows William Galston (University of Maryland) and Rogers M. Smith (University of Pennsylvania)

Robert Post (Yale University), Jesse Choper (University of California, Berkeley), and new Fellow Jay A. Levy (University of California, San Francisco)

Induction Ceremony

Challenges Facing the Intellectual Community

On October 9, 2004, the American Academy of Arts and Sciences welcomed its 224th class of members at an Induction Ceremony in Cambridge, Massachusetts. The ceremony began with a reading by poet **Carl Phillips**. Astronomer **Steven Beckwith**, neurobiologist **Steven E. Hyman**, circuit court judge **Diane P. Wood**, literary scholar **Richard H. Brodhead**, and U.S. Senator **Paul S. Sarbanes** also addressed the audience. Their remarks appear below.

Carl Phillips

To paraphrase Samuel Johnson, the business of the poet is not so much to tell us how or what to think but rather to enlarge our sensibility. The poems I admire the most, from which I have learned the most, are those that without actually asking us to do so direct us toward an interior interrogation of ourselves as human beings. In the course of that interrogation, we give thought to nothing less than what it means to be alive, human, flawed, to have a body and to trust it, even as we acknowledge its instinctive nature and the ways in which that nature collides routinely with that strange and uniquely human creation – moral conduct, whatever that is. Sex and prayer, devotion, and the meaningful tension between the desire to risk abandon – without which devotion is nothing at all – and to resist it.

If the body is a ship, who is the harbormaster? That's but one of the questions hovering over this first poem by Frank O'Hara. It's called "To the Harbormaster."

"To the Harbormaster"

I wanted to be sure to reach you;
though my ship was on the way it got
caught
in some moorings. I am always tying up
and then deciding to depart. In storms and
at sunset, with the metallic coils of the tide
around my fathomless arms, I am unable
to understand the forms of my vanity
or I am hard alee with my Polish rudder
in my hand and the sun sinking. To
you I offer my hull and the tattered cordage
of my will. The terrible channels where
the wind drives me against the brown lips
of the reeds are not all behind me. Yet
I trust the sanity of my vessel; and
if it sinks, it may well be in answer
to the reasoning of the eternal voices,
the waves which have kept me from
reaching you.

The next poem is my own. It's called "Crew" – as in the sculling crews on the Charles River.

"Crew"
(St. John's)

Most wore shirts – oversized,
shabby-aquarium-green
singlets that the light

off the water at once
filled, making
the bodies inside

visible: their lack
of fullness, what
eventually they would come

into, briefly
the body seemed what it
never is

– ignorable,
a small concern.

But the boy at the bow was shirtless:

how bells at evensong,
though this was morning, leave
changed the air –

Facing the others, he watched them
pull in unison their
course across and

over again the water,
as if to the rowing there were now
no struggling,

or it was as if – about struggling –
the only difficult part left
lay in settling

finally on a pattern for it.
Three strokes; four –

And the boy at the bow sang out to them:

What is dread
but that from which the soul
will be delivered?

To which *O what*
is the soul? the rest of the boys
sang back.

Steven Beckwith

A few years ago, my wife and I were on vacation with friends from New York at their beach home on Long Island. We were sitting on the deck of their house admiring the moonrise over the ocean with the tide just starting to change, and – trying vainly to be erudite – I remarked on the lag between the time of the tides and the position of the Moon as it went around the Earth. The husband of the other couple looked at me and said in complete candor, "So the Moon goes around the Earth?" I was a bit startled, but I drew upon years of experience dealing with fellow academics and said, calmly, "Yes, the Moon orbits the Earth once a month. That's why it has different phases."

"I never knew that," he said.

I was not immediately sure if he was serious, but he looked genuinely pleased to learn something new, so I segued quickly to another subject before succumbing to the urge to deliver a lecture on basic astronomy while we were sitting on his deck overlooking his beach.

His failure to register the most basic knowledge about our nearest neighbor surprised me at the time, and this true story will be the basis for my future challenge. For we are in a truly remarkable time in human history, when our knowledge about the universe has already gone far beyond what most professional scientists would have imagined as recently as twenty years ago. Just picking a few examples from my own field of astronomy, the last ten years have seen the measurement of the age of the universe to a precision of better than 5 percent, measurement not only of its rate of expansion, the so-called Hubble constant, but the rate of change of the expansion over cosmic time, leading to the discovery that the universe is actually accelerating as it grows. This is one of the most important discoveries in the last hundred years.

We now have proof beyond any reasonable doubt not only for the existence of black holes but the presence of one in the center of our own galaxy, a discovery credited in part to one of our Class I inductees, Andrea Ghez. We have been able to see back to the time when the first stars and galaxies emerged from the soup after the Big Bang, a time we call cosmic dawn. We can now produce pictures of the young galaxies, demonstrating unequivocally that the universe really looked different thirteen billion years ago, a palpable verification that the universe has evolved and the Big Bang theory is better than the alternatives.

And we have not only discovered more than a hundred planets orbiting stars other than the Sun, in itself an almost unbelievable accomplishment, but we have also made the first measurements of elements in the *atmosphere* of one of them. Ten years ago, very few people thought we would discover any extrasolar planets in our lifetimes, let alone study their atmospheres.

We are the first generation since the rise of the human species to develop the means to answer some of the deepest questions of philosophy about our origins and place in the cosmos: where did we come from, what is the destiny of the universe, are we alone? Most people don't realize the enormous progress made by basic research into these questions. Many of us take for granted the technological innovations that improve and lengthen our lives, innovations won by remarkable perseverance and creativity applying one of the most powerful developments of human thought, the scientific method.

The intellectual achievements I cited here come from my own field of astronomy, yet they rely completely on developments in many other fields of science and technology and thus demonstrate the true renaissance of our current era. Here are just a few examples:

- The detectors needed to sense the faint light from distant galaxies, stars, and black holes were first developed for military reconnaissance by materials science, made affordable by their incorporation in hand-held video cameras, and refined for astronomy only after several billion dollars of military and commercial engineering investment. With our latest detectors on the Hubble Space Telescope, we have improved the sensitivity over the human eye by thirty billion times, enough to easily detect the light from a firefly at the distance of the Moon. Engineering drives science.

We need a more scientifically literate electorate if we are to make the right choices for the future of our society.

- Techniques from applied mathematics are used to process the data we collect, removing unwanted interference from the instruments and the Earth's atmosphere. Basic research in mathematics provides the underpinnings for all theories in cosmology, gravitational research, and elementary particle physics needed to understand the early universe.

- The development of chemical rockets made it possible to place our telescopes above the Earth's atmosphere, allowing us to approach the quantum limits of observation with our most advanced instruments.

- Advances in computer technology let us record, process, and analyze data from our experiments at a rate not dreamed of a couple of decades ago. The entire processed image of the Hubble Ultra Deep Field, our deepest image of the universe contained in a few hundred megabytes, fits easily on a data stick that I can carry in my pocket and is accessible for viewing by anyone in the world with a link to our website. Gutenberg could never have imagined the access to information we have today.

Just as our basic sciences depend so heavily on developments in technology, so basic research gives back to technology in turn: the transistor, the laser, and the World Wide Web all emerged from advances or inventions in basic research, in addition to the intellectual advances made possible by a deep understanding of space and physical theory.

Despite this overwhelming intellectual bounty, there is a large and perhaps even growing gap between those of us at the cutting edge and people in society who ultimately make these discoveries possible. My conversation at the beach house is a poignant example of this gap. Although a deep understanding of the universe or the Moon would probably

make little difference in the life of my friend, his worrisome lack of knowledge reminds us of how easily people can substitute superstition for understanding when looking at the world.

It is this tendency that is our most immediate societal challenge. It is troubling to see broad societal policies put in place by people with little understanding of and in some cases outright disdain for the scientific progress that has made our advance as a civilization possible. A surprisingly large number of our citizens consult horoscopes to help them make decisions. Stem cell research, genetic engineering, nuclear energy generation, and an understanding of global climate change, while not immune from uncertainties and ethical considerations, nevertheless hold a promise for our future as a species that we should not turn away from just because they conflict with age-old beliefs and, yes, superstitions that we must overcome to survive and prosper as a civilization. My challenge to the Academy is to find ways to counter the anti-intellectual trends that undermine the greatest accomplishments of science for society and in the worst case could allow a return to the dark ages after a period of enlightenment.

In last winter's *Bulletin* of the Academy, Robert Rubin wrote, "Our country would benefit enormously from a more economically literate electorate." I believe the same statement applies to scientific literacy in America: we need a more scientifically literate electorate if we are to make the right choices for the future of our society.

The opportunities are abundant. Many people are fascinated by even the most esoteric ideas. Stories about scientific discoveries regularly grace the front pages of the major newspapers in the world. The Air and Space Museum in Washington is the most visited museum in the world. Our website providing access to pictures from the Hubble Space Telescope has a million visitors per month, rivaling CNN's website for popularity. People can be interested in the intellectual progress of science and technology if we make it accessible to them.

We must seize these opportunities to infect our fellow citizens with the love of intellectual achievement that drew us to the calling in the first place. If we can do that, our impact on society will reach far beyond what we do as individual scholars and pave the way for a rich future of intelligent choices.

Steven E. Hyman

Brain science is a young field. The first department of neuroscience was founded in 1966 in recognition of the idea that only a sustained interdisciplinary effort would permit significant headway in addressing the complexity of the brain. And, of course, the brain is complex, as it would have to be in order to underlie all thought, emotion, and behavior. Driven by the human desire for self-understanding as well as for progress against dread diseases such as schizophrenia, autism, and Alzheimer's disease, and despite its youth and its difficult subject matter, neuroscience has advanced. All scientific advances bring with them ethical, social, and policy dilemmas – but progress in brain science brings special concerns.

Brain Privacy

One's mind would appear to be the last bastion of privacy. Within one's mind it is possible to safely harbor fear, hatred, prejudice, embarrassment, lust, or any train of thought, and no one else can be the wiser. And it would seem almost certain that no one could know more about what is going on within our heads than we do. These certainties are now being eroded. To be sure, neuroscience is not on the verge of creating mind-reading technology. But it is, however, now possible to peer into the human brain and to observe surrogates of thoughts and emotions with the aid of new imaging technologies.

The application of imaging technologies outside the laboratory has clear benefits when used to diagnose illness or observe the progress of treatment, but other potential uses raise many questions. For example, when white subjects are shown pictures of unfamiliar black faces they activate their amygdalae; this is a brain structure involved in processing emotions such as fear and anger, in a way that correlates with measures of implicit racial bias.[1] Amygdala activation in this circumstance does not signify that a person is bigoted; indeed, most of the subjects would sincerely deny any awareness of bias, let alone bigotry, thanks to the cognitive control exerted by their prefrontal cortices.[2] The potential deployment of imaging technology outside the laboratory to detect unconscious bias or other unconscious phenomena has many possible ramifications; here I want to highlight the issue of brain privacy. If the inferences of the authors of these papers are correct, they are seeing evidence (amygdala activation) for reactions to unfamiliar black faces that the subject might not be aware of, indeed might be distressed by. One can readily imagine poor uses of such technologies that could be quite harmful to individuals or groups. Moreover, in a world so dominated by security concerns, attempts to harness cognitive science and brain imaging to sift truthful answers from deception might prove irresistible in many societies, including our own, even if the technology turns out to be far from perfect.

Prediction

Families and societies might reasonably want information about the temperaments, talents, and vulnerabilities of their children. Early interventions to prevent depression or antisocial behavior or enrichments to enhance education are all potentially worthy goals. At the same time, predictions can be misused; even well-meant interventions can prove stigmatizing or limiting of educational opportunities, and later of work opportunities or even health insurance. There has long been concern about inappropriate use of genetic information to stigmatize individuals or groups. However, most behavioral phenotypes that we might care about result from complex

1 E. A. Phelps et al., "Performance on Indirect Measures of Race Evaluation Predicts Amygdala Activation," *Journal of Cognitive Neuroscience* 12 (5) (September 2000): 729 – 738.

2 J. A. Richeson et al., "An fMRI Investigation of the Impact of Interracial Contact on Executive Function," *Nature Neuroscience* 6 (12) (December 2003): 1323 – 1328.

interactions of many genetic and nongenetic factors, not simple determinative factors. In fact, it is our brains, not our genes, that have most to do with intelligence, talent, emotional style, and a diversity of behavioral outcomes. Potentially predictive brain-based studies are in early stages. Yet several investigations have found correlations between fluid intelligence and frontal lobe structure or function. Other investigators have made premature claims about identifying features of the brains of antisocial individuals.[3] Even with mature technologies brain-based predictions will likely remain probabilistic rather than certain, but we as a society should be prepared to manage the outcomes.

Enhancement of Normal Functioning

Several drugs, such as methylphenidate (Ritalin), selective serotonin reuptake inhibitors (SSRIs), and others, developed to treat mental disorders, and modafinil, developed to treat narcolepsy, exhibit beneficial effects on cognitive performance, alertness, and negative emotions[4] in people with milder symptoms who would not ordinarily be accounted ill; indeed they exhibit similar effects in healthy people. Some of these drugs are already in wide use among individuals without a diagnosable illness.[5] As more effective drugs are developed for existing indications as well as for new ones such as memory enhancement, and as their use spreads, as it will in a free society, ethical, social, and policy concerns will grow yet more pressing.

There is, of course, the important issue of safety since no drug can be absolutely free of side effects and the risk-benefit calculus changes when the user is not ill to begin with. This issue is best managed, at least in theory, by scientific advance, thorough testing in appropriate populations, regulation of advertising, and education of physicians and the public. Other social issues, fairness and coercion, have less obvious paths to a solution.

As we develop more complete and compelling understandings of the biology of thought, emotion, and behavior, there may follow a persistent erosion of the sense of personal responsibility in a variety of communities.

While fear has long been expressed that psychotropic drugs might be used to pacify a restive underclass, the data suggest that stimulant drugs and SSRIs are more widely accepted and used among educated and advantaged families.[6] Based on some individuals' financial means, access to information and prescribers, and a culture that creates incentives for a competitive advantage, there is a risk of widening the gulf between the most and least advantaged in Western societies by the existence of chemical "haves" and "have-nots." In short, the already advantaged may gain even greater competitive advantages at school and at work by being able to stay awake longer, attend better, and remember more. The pattern of stimulant use even to treat attention deficit hyperactivity disorder in the United States (greater among the affluent and educated, less among minorities) suggests that this is not an idle concern.

An allied issue is coercion. The explicitly required use of psychotropic drugs, as occasionally occurs in schools and more often in the criminal justice system, is a complex matter for law and regulation. The issue of implicit coercion has no such obvious forum for discussion. Competitive pressures have turned aspects of child rearing in some communities into something of an arms race. Many young people now approach SAT coaching as necessary, if only to ensure that they are not the only person in their cohort lacking prior exposure to the test and awareness of successful test-taking strategies. Similar logic could easily operate within certain school communities in which there is widespread use of stimulant drugs. Parents might feel that they put their child at a disadvantage in terms of behavioral control and ability to study if a large number of other children are receiving stimulants. In a competitive workplace, one can easily imagine scenarios in which caffeine, stimulants, and newer drugs become *de rigueur* to keep workers alert, energetic, and attentive for longer hours; or cases when SSRIs are informally suggested to banish irritability. Even the motives behind implicit coercion raise important ethical issues, for example, the point at which love and hope shades into the instrumentalization of children by narcissistic parents.[7]

Finally the use of psychotropic drugs for extended periods of time touches on the question of a person's identity. The human brain is highly malleable or, to use the technical term, "plastic." Insofar as any life experience leaves an impression on us, a memory, or a new set of reactions, it is because our brains are changed by the remodeling of synapses (the structures across which nerve cells communicate) and the resulting alteration in brain circuitry. The use of drugs changes the brain by two broad classes of effects. The first is indirect and is mediated by a person's experience of him- or herself. For a person who is suffering terribly, drugs may mean that life is not hopeless and that a future can be planned for. For a child who did not feel symptomatic and who receives drugs to control behavioral outbursts, the result might be a diminished sense of personal responsibility and self-efficacy. Of course, the reality is almost always far more complex and nu-

3 A. Raine et al., "Reduced Prefrontal Gray Matter Volume and Reduced Autonomic Activity in Antisocial Personality Disorder," *Archives of General Psychiatry* 57 (2) (February 2000): 119 – 127.

4 J. L. Rapoport and G. Inoff-Germain, "Responses to Methylphenidate in Attention-Deficit/Hyperactivity Disorder and Normal Children: Update 2002," *Journal of Attention Disorders* 6 (Suppl. 1) (2002): S57 – 6; D. C. Turner et al., "Cognitive Enhancing Effects of Modafinil in Healthy Volunteers," *Psychopharmacology* (Berl) 165 (3) (January 2003): 260 – 269; B. Knutson et al., "Selective Alteration of Personality and Social Behavior by Serotonergic Intervention," *American Journal of Psychiatry* 155 (3) (1998): 373 – 379.

5 A. Angold et al., "Stimulant Treatment for Children: A Community Perspective," *Journal of the American Academy of Child and Adolescent Psychiatry* 39 (2000): 975 – 984, 1004 – 1007.

6 *Health: A Report of the Surgeon General,* U.S. Department of Health and Human Services, 1999.

7 M. J. Sandel, "The Case Against Perfection," *Atlantic Monthly*, April 2004.

anced. The second class of effects comes from the direct actions of the drug on the brain to produce altered brain wiring. We certainly do not know that such changes would be harmful for existing drugs; indeed for those suffering a mental illness the goal of both drug treatment and psychotherapy is a beneficial long-term change in brain function. Nonetheless, it is an issue worthy of discussion; the brain of a person who has been treated with psychotropic drugs emerges as a slightly different brain than it was before.

Personal Responsibility

There is a large and growing literature on law, neuroscience, and psychology,[8] but even outside the courtroom there are important issues raised by advances in neuroscience. As we develop more complete and compelling understandings of the biology of thought, emotion, and behavior, there may follow a persistent erosion of the sense of personal responsibility in a variety of communities. Already more behavioral conditions ranging from learning styles to temperaments such as shyness or moodiness are coming under medical rubrics. This movement is welcomed by some and decried by others, but nonetheless will require thoughtful engagement.

In this short talk I've only been able to touch on a minority of the issues raised by the brain sciences, and in each case only to highlight areas deserving of substantial investigation and discussion. It is thus quite welcome to see a growing interest in the ethical, social, and policy issues raised by neuroscience.[9]

8 G. Garland, ed., *Neuroscience and the Law* (New York: Dana Press, 2004).

9 S. Marcus, ed., *Neuroethics: Mapping the Field* (New York: Dana Press, 2002); M. J. Farah, "Emerging Ethical Issues in Neuroscience," *Nature Neuroscience* 5 (11) (2002): 1123–1129; M. J. Farah et al., "Neurocognitive Enhancement: What Can We Do and What Should We Do?" *Nature Reviews Neuroscience* 5 (5) (2004): 421–425.

Diane P. Wood

In the brief time I have, I would like to reflect on one of the oldest, yet still a new problem for the legal system: namely, is there anything worthy of being called "law" at the international level? If so, what is it, and where can we find it? If not, is this a problem and (if it is) how might one remedy it? Most other countries in my experience do not share the ambivalence about international law that we find at home. The Constitution of the Federal Republic of Germany, for example, squarely states that: "The general rules of public international law constitute an integral part of federal law. They take precedence over statutes and directly create rights and duties for the inhabitants of the federal territory."[1]

To similar effect, the Constitution of Japan includes "the law of nations" in its supremacy clause, which reads as follows: "... This Constitution shall be the supreme law of the nation ... [and] [t]he treaties concluded by Japan and established law of nations shall be faithfully observed."[2]

The 1996 Constitution of the Republic of South Africa draws an interesting distinction between international law and foreign law when individual rights are concerned: "When interpreting the Bill of Rights, a court, tribunal or forum ... *must* consider international law, and *may* consider foreign law."[3] Many other countries similarly reflect respect for international law in their legal systems, whether or not they have singled it out for special attention in their constitutions.

Why are things so different here? The explanation certainly is not that Americans are skeptical about law in general. *Au contraire*. Americans believe deeply in written laws and in the court system at the domestic level. We can hardly keep up with the flood of legislation that comes forth from Congress and the state legislatures every year, and people are just as happy today to take their problems (legal or otherwise) to the courts as they were when Alexis de Tocqueville wrote *Democracy in America*. Indeed, they seem to like this solution more and more every year, somewhat to the dismay of hard-working judges. The National Center for State Courts reports that combined civil, criminal, domestic relations, and juvenile filings, which were a whopping 38.5 million in 2002, have grown 15 percent in the ten years since 1993; when you add traffic-related cases to the mix, the total filings in 2002 amounted to 96.2 million cases.[4] Next to this, the workload of the federal courts sounds like a drop in the bucket, but federal judges too are experiencing unprecedented demand for their services. In 2003, the Administrative Office of the U.S. Courts reported that criminal cases representing more than 92,300 defendants were filed in the district courts, and more than 250,000 civil cases were filed.[5] This represented on the criminal side a 44 percent increase over the 1994 case levels; on the civil side it was a 10.2 percent increase.[6] At the court of appeals level, some 60,600 cases were filed

1 Constitution of the Federal Republic of Germany, Chapter II, Article 25 (Public International Law), found at http://www.jurisprudentia.de/jurisprudentia.html.

2 Constitution of Japan, Chapter X, Article 98, found at http://www2.gol.com/users/michaelo/Jcon.ChX.html.

3 Constitution of South Africa, Article 39(1)(b), found at http://www.info.gov.za/constitution/1996/96cons2.htm#7.

4 National Center for State Courts, Court Statistics Project, Overview, available at http://www.ncsconline.org/D_Research/csp/2003_Files/2003_Overview.pdf.

5 Administrative Office of the U.S. Courts, Federal Judicial Caseload Statistic, March 31, 2004, available at http://www.uscourts.gov/caseload2003/front/Mar03Txt.pdf.

6 Ibid.

in 2003, which was a 21.8 percent increase since 1994.[7]

So the problem is definitely not that we are congenitally allergic to law. But, you might say, domestic law is somehow more reliable than whatever international law might be. It is made by people we elected; it is enforced by other people we elected or their appointees; and the courts (I hope) are sufficiently respected that their judgments are carried out. True, true, true, and, I would argue, irrelevant. Those same people whom we elect and to whom we delegate the responsibility to govern are the ones who are deciding, case by case and field by field, where rules of international scope exist and how we should respond to them. International conventions, in the sense of usages or customs rather than formal agreements, dictate an astonishing amount of actual behavior of nation-states. Let me offer a few examples from my own experience, which is largely in the area of international economic relations. After that, I'll turn to current events, which make the point just as well.

One of the more elaborate efforts at international rule-making in the last sixty years can be found in the network of agreements now enforced by the World Trade Organization. While at one time its predecessor, the somewhat clumsy General Agreement on Tariffs and Trade, confined itself to successive rounds of tariff reduction, prohibitions against obvious quantitative restrictions, and a consensus-based form of dispute resolution, over the years the organization became far more ambitious. Attention shifted to so-called non-tariff barriers to trade, and it quickly became apparent that practically any national policy (or lack of a policy) could affect international trade flows: subsidies for education; research and development support; government purchasing programs; the enforcement of environmental laws; child labor rules; norms against discrimination on the basis of sex, or religion, or race, or ethnicity; or the antitrust laws. Indeed, these developments were so notable that the American Society of International Law was prompted in the spring of 1993 to devote a substantial portion of its annual meeting to the topic "The Internationalization of Domestic Law: The Shrinking *Domaine Réservé*."[8] At a concluding panel, which I moderated, we discussed the ways in which international norms have *had* to be incorporated in domestic law in areas as diverse as economic issues, national security laws, land-use and environmental rules, and global regulations that affect disease prevention and control (especially HIV/AIDS). At the risk of oversimplifying, in the end the panel concluded that the *domaine réservé* has indeed shrunk, though not perhaps to as great a degree or at as great a pace as some might have thought. That still seems correct to me. Moreover, many groups around the world have also seen this, and some – the protesters in Seattle five years ago, for example – have not liked what they have observed. Thus, at the moment we appear to be in a period of retrenchment for the WTO: the procedures and rules adopted at the end of the Uruguay Round are quietly being put into place; the dispute resolution bodies are open for business and are slowly building credibility; yet the more ambitious initiatives for more international rules have been beaten back.

There is something worthy of being called international law, or rules that operate reasonably effectively to restrain nation-states. Such rules are becoming more, rather than less, important.

Other areas where international norms operate more strongly than is commonly supposed also exist. Take international criminal law enforcement cooperation. The U.S. authorities cooperate every day with their foreign counterparts in a huge network of other countries, investigating drug crimes, money laundering, terrorist acts, consumer fraud schemes, child pornography, and endless other topics. Most extraditions are not front-page news, precisely because they are success stories. One notable time that the United States was caught overstepping boundaries was described in the first round of the *Alvarez-Machain* litigation, when agents of the federal Drug Enforcement Agency slipped across the Mexican border and kidnapped a doctor who allegedly was assisting the drug lords in the ultimately fatal torture and interrogation of a DEA agent.[9] The U.S. agents spirited Dr. Alvarez-Machain back to the United States for trial. Mexico objected strongly to this violation of its territorial integrity. The U.S. Supreme Court held that nothing had happened that should prevent the doctor's criminal trial from going forward. In so doing, it read the extradition treaty between the United States and Mexico very narrowly, as something that provided a mechanism for extradition but that did not expressly forbid kidnapping. The decision received widespread criticism, because international law does not permit countries freely to exercise police powers outside their own borders. In fact, since then, and despite all the pressures of the war on terrorism, kidnapping is not a strategy that any country, including the United States, has employed publicly. It appears therefore that the international rule remains intact, even after an apparent setback.

What is happening today? Did international law get tossed into the wastebasket in the wake of the September 11 horrors? Has it become a luxury that we cannot afford (along with the Fourth Amendment and other quaint rules in the Bill of Rights)? I think not. One cannot answer these questions by looking at a few snapshots of current events: glimpses for instance of the U.S. decision to commence a war in Iraq without express authorization from the U.N. Security Council, or glimpses of the disregard of the Geneva Conventions at Abu Ghraib or at Guantanamo, or glimpses of inaction in the face of the growing genocide in Darfur. Instead, the system needs time to work. Although it seemed to many that the United States was disregarding the United Nations at the beginning of the Iraq war, and that remarks were being lobbed about to the effect that the institution had

7 Ibid.

8 ASIL *Proceedings* 553 (87) (1993).

9 *United States v. Alvarez-Machain,* 504 U.S. 655 (1992). A later phase of this case reached the Supreme Court in 2004, when it rendered a decision dealing with follow-on litigation brought by Dr. Alvarez-Machain against the kidnappers. See *Sosa v. Alvarez-Machain,* 124 S. Ct. 2739 (2004).

lost any possible effectiveness or utility, the picture is starting to look quite different. The reports of the U.N.'s death were, like those of Mark Twain's, greatly exaggerated.[10] Not only for the ongoing conflict in Iraq, but also in many other troubled areas of the world, the U.N. has proven once again that it is far better than the alternative. We are watching a similar drama unfold with respect to the applicability of the Geneva Conventions to the detainees at Guantanamo Bay: initial denials, followed by statements backing off from those denials, followed ultimately by a recognition that the substance of the Conventions had to be respected. These developments occurred against the backdrop of widespread criticism around the world of the position the United States had taken – that is to say, there was pressure on this country to adhere to these international rules, and the pressure has had an impact.

There is, then, something worthy of being called international law, or rules that operate reasonably effectively to restrain nation-states. Such rules are becoming more, rather than less, important, as we witness the development of the Internet as a mechanism of global communication and commerce, but also of global crime; as more and more businesses operate worldwide; and as threats to security become less and less tied to any particular piece of geography. If those rules are to work, they must bind everyone: the strong as well as the weak, the rich as well as the poor. Domestically, we have understood this since the beginning: even presidents and the rich and famous must obey the law, as we saw in the Nixon case, the Clinton case, and the Martha Stewart and Andrew Fastow cases. I am reminded of Voltaire's famous statement about God: "If God did not exist, it would be necessary to invent him."[11] So too with international law: if it has not existed up until now, it will be necessary to invent it. More than that, it will be up to those of us here to adapt and improve it to the formidable challenges that face us. I am confident that we will do so.

10 Mark Twain (aka Samuel Clemens), Cable from London to the Associated Press (1897).

11 Épitre à l'Auteur du Livre des Trois Imposteurs, November 10, 1770.

Richard H. Brodhead

It is an honor to speak as the representative of Class IV of new members of the Academy. As students of rapids know, Class IV events are massively energetic and thrilling but typically not life-endangering. That fits the humanities and the arts, and no doubt explains why we were assigned this number. I won't speak here as a professional humanist, still less as an administrator of the modern home of the humanities, the university. Instead I'll say a word about the founding need for this form of human practice, and with your permission I'll make it personal.

I knew poetry from the days of nursery rhymes, but the first time I "got" it was in my fourteenth year. I remember the moment fairly vividly. I was in high school not thirty miles from here and at the low watermark of self-esteem. Each day, changing classes, my fellows would parade past, every one of them an image of some adequacy I lacked: this one cooler, that one more handsome, this one more popular, that one more athletic. Doing my homework one day, I started into a Shakespeare sonnet where I was met by these lines:

When in disgrace with Fortune and men's eyes,
I all alone beweep my outcast state,
And trouble deaf heaven with my bootless cries,
And look upon myself and curse my fate,
Wishing me like to one more rich in hope,
Featured like him, like him with friends possessed,
Desiring this man's art, and that man's scope,
With what I most enjoy contented least . . .
(Shakespeare, Sonnet 29)

That's me! I could have cried. How did he guess?

This was my first recognition of the power of someone else's creation to give voice to my experience, an experience self-imprisoned and un-self-knowing until a stranger's words brought it to expression. But soon thereafter, I learned another primitive power of art. That same spring I read the first poem I ever really loved (I must have been going through a sort of literary puberty): Wordsworth's "Tintern Abbey," which flooded me with nostalgia for the more intense experience lost with my youth. It was some years before I realized that

Strange beasts, we humans, who need not just to live but also to understand our lives; stranger yet that we should know ourselves not directly but through borrowed understandings, through images composed by others' hands.

I had not in fact lost my youth at the time when its demise seemed so drenched in pathos. When I recognized this fact, I learned that this poem had not so much voiced my experience as induced a new experience, giving me access to a state of feeling that I knew through the poem that I did not yet know from life.

Sometime later I learned a further variant in which, art having given me a foretaste of certain forms of experience – let's call them virtual experiences, experiences imaginatively induced and entertained – I came to know them in reality. My sense was never of the gap between life and art. Rather, I had the sense of learning at last what art's images had been referring to, with art still providing words for what I now came to know. I knew King Lear's famous line over the dead Cordelia many years before I ever stood over the body of a loved one of my own. When I did, I felt I grasped at last what Lear (or Shakespeare) meant, but Lear's line gave me a way

to name the tormenting, gratuitous, inexplicable proximity of some things (for no good reason) living to others (for no good reason) dead: "Why should a dog, a horse, a rat have life/And thou no life at all?" I had long been struck by Whitman's empathic identifications with the sufferings of common men in *Leaves of Grass* – not just the runaway slave, but, less predictably, a fireman pinned in the rubble of a collapsed building:

I am the mashed fireman with breastbone broken . . . tumbling walls buried me in their debris,
Heat and smoke I inspired . . . I heard the yelling shouts of my comrades,
I heard the distant click of their picks and shovels . . .

September 11 supplied a real referent for what had heretofore been an imaginary experience. But in the wake of 9/11, while the rubble was still being sifted and the eventual toll of life not yet known, I felt I could enter into a plight made real by history through the medium of these 150-year-old words.

Strange beasts, we humans, who need not just to live but also to understand our lives; stranger yet that we should know ourselves not directly but through borrowed understandings, through images composed by others' hands. The officially designated divisions of the humanities will have their ups and downs, but as long as these needs stay in play, the core activity of the humanities will not go away. As Academy member Henry James once wrote: "Till the world is an unpeopled void there will be an image in the mirror."

Paul S. Sarbanes

It might be said that there was an American Academy of Arts and Sciences before there was an America. The American Academy received its charter from the Massachusetts legislature nearly 225 years ago, at a time when Massachusetts was a state – no longer a colony, but not yet part of the sovereign nation that would be established within the decade.

The "end and design" of the Academy, as the Act of Incorporation put it, was to "promote and encourage" knowledge and discovery, in order to "cultivate every art and science which may tend to advance the interest, honor, dignity, and happiness of a free, independent and virtuous people."

In that extraordinary period, the Academy was founded in the conviction that where there is education, knowledge, and open inquiry and debate, there will be freedom and prosperity. It has been borne out in the experience of this nation.

Full and timely access to information, free inquiry and debate, and reasoned discourse are indispensable to informed and responsible decision-making – in our personal lives, in our politics, in our economic and financial affairs.

In our capital markets in recent years, however, we have had to confront the disastrous consequences of departing from that principle. In October 2001, Enron was the nation's seventh-largest corporation. By the end of that year it was bankrupt. Enron was the canary in the mineshaft.

A number of major public companies, with the complicity of their auditors, were relying on convoluted and often fraudulent accounting devices to inflate earnings, hide losses and drive up stock prices. Facts were distorted and withheld. The result was a crisis in investor confidence. Over a period of months, market values of public companies fell by some trillions of dollars. Thousands of jobs were lost. Retirement savings dried up.

In the judgment of the *Wall Street Journal*, "The scope and scale of the corporate transgressions of the late 1990s . . . exceed anything the U.S. has witnessed since the years preceding the Great Depression."

That the crisis was not worse was due in large part to the statutory infrastructure established by the 1933 and 1934 Securities Acts. Together these Acts changed assumptions with respect to our capital markets. As President Roosevelt said of the 1933 Act, which was also known as Truth in Securities, "[it] adds to the ancient rule of caveat emptor, the further doctrine 'let the seller also beware.' It puts the burden of telling the whole truth on the seller."

The new laws, as Arthur Schlesinger, Jr. has explained them, "gave disillusioned investors new reasons for confidence. Even more, [they] removed the whole process of capital investment from the realm of guess and gamble and rested it – through the detailed and continuous disclosure required by the SEC – on the basis of reliable fact."

For the past seventy years our regulatory infrastructure has worked remarkably well, making the U.S. capital markets the most transparent and efficient in the world. But in recent years the markets have undergone rapid and fundamental changes, often beyond the reach of the existing infrastructure, and the commitment to serving the interests of the investing public gave way too often to short-term personal gain.

Upon analysis there was surprisingly little controversy about the nature of the problems:

- Inadequate oversight of accountants;
- Lack of auditor independence;
- Weak corporate governance procedures;
- Stock analysts' conflicts of interest;
- Inadequate disclosure provisions;
- Grossly inadequate funding of the Securities and Exchange Commission.

The Senate Banking Committee concluded that the systemic nature of the problems required a statutory remedy. As *Fortune* magazine put it, "This isn't just a few bad apples we're talking about. This, my friends, is a systemic breakdown." That statutory framework is carefully built upon, and reinforces, the framework established by the 1933 and 1934 Securities Acts.

Let me briefly outline the principal provisions of the new law.

- It establishes the Public Company Accounting Oversight Board (PCAOB), under the SEC, to assure effective accounting oversight. All accounting firms that audit public companies must register with the Board, which has broad discretion to establish standards, investigate conduct, and, when necessary, impose penalties.

- It establishes auditor independence by prohibiting accounting firms from offering a broad range of consulting services to the companies they audit.

- It sets standards for corporate governance. Public companies must have audit committees that are independent of management. Auditors now work for the audit committee. CEOs and CFOs are required to vouch directly for the accuracy of their companies' financial statements. Corporations are prohibited from making personal loans to their executives.

- It requires numerous disclosures, including prompt disclosure of trades in company stock by management and 10 percent shareholders, and disclosure of material off-balance-sheet transactions.

If our capital markets are to work efficiently, they cannot tolerate conflicts of interest. They must have effective checks and balances, and gatekeepers who faithfully carry out their responsibilities.

- It addresses analysts' conflicts of interest by requiring the SEC and the exchanges to adopt rules prohibiting conflicts of interest that undermine analysts' independence, and establishes safeguards to protect analysts against retaliation.

- It funds the SEC at a level that enables the Commission to hire additional accountants and attorneys and improve its technology infrastructure. These resources were urgently needed, and long overdue. In a four-year period we have succeeded in virtually doubling the SEC budget.

Changes in the law have had the salutary effect of prompting sober reassessment in boardrooms and classrooms across the country. This Academy undertook a project on "Corporate Responsibility: Beyond Regulation" that will shortly issue a report, including recommendations for rebuilding the trust that is the linchpin of our market system. I was privileged to participate in one of the project's sessions.

The issues are exceedingly complex, but the underlying principles are not. If our capital markets are to work efficiently, they cannot tolerate conflicts of interest. They must have effective checks and balances, and gatekeepers who faithfully carry out their responsibilities. They must ensure that investors have access to full, accurate, and timely information.

Bill Donaldson, the chairman of the Securities and Exchange Commission, emphasizes that compliance with the rules is not enough. "Successful corporate leaders must strive to do the right thing . . . and they must instill in their corporation this attitude of doing the right thing . . . They should make this approach . . . part of their companies' DNA."

The principle that Donaldson enunciated for our public companies extends far beyond the boardroom and the executive suite to every aspect of our personal and national life. It is a cardinal principle on which this Academy was founded more than two centuries ago.

Academy Officers: President Patricia Meyer Spacks (University of Virginia), Vice President Louis Cabot (Cabot-Wellington, LLC), Executive Officer Leslie Berlowitz, and Deputy Secretary Jerrold Meinwald (Cornell University)

Publications

Academy Study Challenges Corporate America To Think Beyond Regulation

Restoring Trust in American Business, a new book by the American Academy of Arts and Sciences, examines the recent wave of corporate scandals. It systematically assesses the role of six "gatekeepers" – auditors; lawyers; investment bankers; corporate directors; regulators; and business journalists – highlighting their failure to prevent corporate misconduct. The book recommends concrete steps for improving corporate conduct and restoring confidence in American business.

As the book points out – and as Americans who invest in stocks and read the business pages know – "the early years of the new century have been plagued by major scandals at Enron and WorldCom, by numerous instances of overly aggressive accounting and excessive executive compensation, by compromised auditors and securities analysts, by inattentive boards of directors, and by self-indulgent mutual fund managers. Public confidence in American business and finance has been shaken to a degree not seen since the Great Depression."

"The American Academy recognizes that public confidence in American business and financial institutions is critical to our national stability," said co-editor Leslie Berlowitz, Executive Officer of the Academy. "To restore that public trust, it is time to reimagine and rebuild gatekeeper roles to enable those holding such positions to shape corporate conduct more effectively."

Under the Academy's auspices, corporate lawyers Martin Lipton and Larry Sonsini and management scholar Jay Lorsch convened a series of roundtables that looked beyond regulation, to consider how to promote greater corporate responsibility. The sessions included experts from law, journalism, government, investment banking, corporate governance, management, and a variety of scholarly disciplines. Published by the MIT Press, the volume features essays by twenty-two distinguished contributors, including John Reed (New York Stock Exchange), Felix Rohatyn (formerly Lazard Freres), Gerald Rosenfeld (Rothschild North America), Damon Silvers (AFL-CIO), William Allen (New York University), and Rakesh Khurana (Harvard Business School).

"In order to function properly, our market system depends on a set of gatekeeper institutions," said co-editor Jay Lorsch, Professor at Harvard Business School. "When those gatekeepers either can't or won't meet their explicit or implied responsibility to the public trust, the system breaks down. Having strong gatekeepers is vital to the well-being of our market system."

According to the Academy report, the recent scandals illustrate that minimum compliance with the law isn't always enough. For that reason the solution cannot be simply a rush to regulation. In many instances, there was a broad and systemic failure of professionalism. Professionals, expected to use specialized knowledge for the public good and abide by explicit codes of conduct, instead succumbed to market pressures and financial self-interest.

"Acting with integrity can't be legislated, but it can be encouraged through stronger peer associations and improved professional checks and balances," said co-editor Andy Zelleke, project director of the American Academy's Corporate Responsibility study. The study concludes that gatekeepers must embrace higher professional standards to improve corporate conduct and limit the ability of "bad apple" managers to compromise accepted values and practices. To achieve that end, the report proposes remedies specific to individual professional roles:

- Lawyers must reformulate their public obligations and codes of conduct in order to balance their allegiance to clients with the greater public interest;
- Auditors must ensure that their primary duty is to the investing public rather than to the company they are auditing;
- Investment bankers and corporate directors must develop a consensus about their public obligations and foster a more professional identity and orientation;
- Regulators and business journalists need to articulate and adhere to explicit standards of professionalism that are tied to upholding the public trust.

To order copies of *Restoring Trust in American Business*, call the MIT Press at 1-800-405-1619 or visit http://mitpress.mit.edu. ■

Reviewer Comments

"This powerful collection of commentaries by the nation's most compelling thinkers makes it clear that the engine that drives the markets is not money but integrity, and that it takes a village of committed, principled, and vigilant participants to make it work. It is filled with indispensable insights and practical advice for executives, directors, investors, and policy-makers."

– Nell Minow, Editor, The Corporate Library; co-author, *Corporate Governance*

"These essays present clear, concise and cogent analyses of why America lost trust in American business and what must be done in order to restore that trust."

– Donald Keough, former President and CEO, Coca-Cola Company

"This book could be subtitled 'The Road Back From Enron.' It offers a moderate and readable approach to letting American business back into civilized society on a promise of good behavior – a promise that needs to be monitored."

– Daniel Schorr, Senior News Analyst, National Public Radio

Projects and Studies

At a morning orientation program for new members, held on October 9, 2004, leaders of current Academy studies presented updates on their work, with particular attention to the Academy's unique ability to convene representatives of diverse fields, professions, and organizations – both scholars and practitioners. Their remarks appear below.

Rules of Space

Neal Lane

University Professor, Senior Fellow, James A. Baker III Institute for Public Policy, Rice University

The Academy's Committee on International Security Studies has initiated a new project on the Rules of Space. To provide you with some context for the study, let me begin by making a few assertions. America's space program, I believe, is at a critical turning point in its history. America's preeminent role in space is being challenged, both internationally and here at home. And America's intentions for the future military use of space are, in some cases, drawing considerable criticism from other nations. Space policy has become a prominent and a very contentious public-policy issue. Policy decisions now being made will affect not only our national security but also our ability to successfully compete with other countries in the commercial use of space, and to collaborate with other parts of the world in the peaceful uses of space – for example, in such areas as space-based research and human exploration of space.

In an effort to focus attention on critical policy matters, and to suggest some policy alternatives that might improve the current situation, the Academy has convened a series of workshops and seminars; participants include representatives of the U.S. aerospace industry, satellite manufacturers, launchers, and operators; international military experts; and scientists. They are broad-based, highly informed groups of individuals that the Academy is very good at pulling together. John Steinbruner (University of Maryland), cochair of the Academy's Committee on International Security Studies, directs the overall project. The Academy has commissioned a series of papers and reports on topics ranging from Chinese and Russian perspectives on the U.S. space program to technical requirements for achieving U.S. military objectives in space to U.S. policies affecting space commerce as well as space-based research activities in universities and laboratories around the country.

George Abbey, former director of the Johnson Space Center, and I are collaborating on one of these reports. Under the working title, "International Competition and Cooperation in U.S. Space Policy," we are examining the three barriers currently facing the U.S. civilian space program. The first is a set of federal regulations called export controls that require a company or an organization to apply for an export license to sell, or even share collaboratively with any foreign country – ally or not – information or technologies that the U.S. government wishes to control. These rules apply to any information concerning space, satellites, rockets, technology, and instrumentation. Since all devices related to space are considered munitions, the license must be provided by the U.S. State Department. The problem is that the rules are ambiguous, the process is cumbersome and slow, and the outcome is highly uncertain. In many ways, it resembles the visa situation of recent months. As a result, the U.S. satellite industry has been severely damaged: we have lost 40 percent of the market share in a period of three years. These export

Leaders of current Academy projects

Front (left to right): President Patricia Meyer Spacks (University of Virginia), David Clark (MIT), and Michael Kremer (Harvard University)

Back (left to right): Robert C. Post (Yale University), Gerald Rosenfeld (Rothschild North America), Linda Greenhouse (*The New York Times*), Neal Lane (Rice University), and Tom Leighton (MIT and Akamai Technologies)

controls also apply to students, postdocs, and visiting collaborators from other nations, forcing the research establishment to continually ensure that it is following regulations, but with a great deal of ambiguity and uncertainty.

The second barrier – a huge one – concerns possible shortfalls in the science and engineering workforce. For a long time, boys and girls in the United States have chosen career directions other than science and engineering. We've made up for that with our ability to attract the brightest and the best young and not-so-young minds from all over the world. The strength of American science and technology has been dependent on these individuals. But in the post-9/11 era with visas so difficult to obtain, fewer talented people want to come to the United States, leaving us unsure about the source of our future science and engineering workforce.

Space policy has become a prominent and a very contentious public-policy issue. Policy decisions now being made will affect not only our national security but also our ability to successfully compete with other countries in the commercial use of space.

The third obstacle that George Abbey and I identify is what, in our opinion, is an unrealistic plan for the future of the U.S. civilian space program and for NASA in particular, where the focus has shifted to returning humans to the moon, and perhaps beyond, in future years. Shortly after this new plan was announced by President Bush, Senator McCain invited me to testify before the Senate Commerce Committee to express my thoughts from the perspective of my previous experience. Now I'm a space cadet; I've always wanted to go into space. What I said was that, indeed, NASA needs a vision. NASA needs a plan, and although this plan is bold, it's incomplete because it makes space science a lower priority than returning humans to the moon. It also does not suggest how we are going to obtain the funding for what would be a very expensive mission. Softly put, that was my view on the program.

I want to mention a fourth barrier – as a former government official I can only remember three barriers at a time. The fourth relates to America's future military plans in space. The missile defense system is an early indicator of what direction the United States might be taking, but nations around the world, individuals we've spoken with, both inside and outside of government, believe that the United States is on a trajectory to control space by arming satellites with weapons, which has never been done before, at least to my knowledge, and by using satellites as launching platforms, or as weapons themselves, perhaps to control Earth from space. It's a very real fear that has raised objections from China and other nations. Now, this may not be U.S. policy, but certainly such plans are on the drawing board, and they are based on serious, blue ribbon commissions reporting to the military establishment. The militarization of space is a critical issue, one that will be discussed in our report but will be examined intensely in the "Rules of Space" project as a whole.

Securing the Internet as Public Space

Tom Leighton

Professor of Applied Mathematics, MIT; co-founder and Chief Scientist, Akamai Technologies

As I'm sure you all know, the Internet has seen a stunning adoption rate in our society over the last decade. It has become a dominant communications medium for business, government, defense, and leisure. And this is just the beginning. I'm sure you have all read stories about Internet telephony, and it would not surprise me if over the next ten years the telephone becomes dependent on the Internet for communication. This is all good news. The Internet is an amazing and wonderful technology. But what many people don't understand is that a large portion of the current protocols and the technology that the Internet uses are based on the same protocols developed over thirty years ago by my colleague in this project, David Clark, and other experts in the field when only several hundred people were using the Internet. These individuals were from a few universities, industrial-research labs, and government groups; they were very intelligent, very sophisticated, and intended no harm to other users. At that time, there was a race to add functionality with little effort paid to securing that functionality as one went along.

Today we find ourselves in a situation where the Internet has gone rapidly from a novelty to mainstream; it is now a critical resource but we have no security. Everybody's been attacked by a virus or a worm, or been inundated by spam, but it goes a lot deeper than that. The public doesn't realize how easy it is for someone to steal your confidential information, your bank password, and not just by "phishing" attacks, where someone fraudulently poses as an institution requiring your bank or credit card information. It would be very easy for me to steal your online banking password. You wouldn't know. The bank wouldn't know.

Today we find ourselves in a situation where the Internet has gone rapidly from a novelty to mainstream; it is now a critical resource but we have no security.

And then I can do as I want with your bank account, and there's a lot of ways I can do that, and that's in part because there's no authentication today on the Internet. I can claim to Sprint or any other provider that I own the bank's IP address (its unique identifying number) and direct your traffic to me. Nobody checks. It's not authenticated. There's something called DNS (Domain Name System) on the Internet, which is the equivalent of 411, which you invoke every time you go to a website. That's not authenticated. I can slip in my IP address instead of the one where you're going, and you will come to me without knowing it. And there's no traceability. You can't catch the bad guy, and when you do catch somebody, usually it's the innocent bystander whose identity was stolen in some way.

Now, does this matter? This is actually a subject of debate today. To me, there's no question this is a serious problem. But there are people in positions of responsibility today that say, so what if my email's slow. So what if I couldn't get to eBay today. That really isn't important. And I agree in the big scheme of things.

There are issues more important than cybersecurity, but this security is also important, especially when you see today what's happening with international organized crime running extortion on the Internet through (denial-of-service) attacks, stealing of confidential information, the threat of a state-sponsored attack on critical portions of our infrastructure, and potential terrorist attacks timed to coincide with physical attacks. It is very scary, and a very serious problem for our country.

David Clark

Senior Research Scientist, MIT Laboratory for Computer Science

As Tom has pointed out, security is built out of technical building blocks, such as strong encryption, and bad security is often the fault of bad technology: flaws in software that leave your machine open to attack. But in order to frame my remarks, I want to offer you a different way of sorting the security problem into two buckets. I want to describe security problems as, A, stupid, or B, non-technical. Software-engineering failures exemplify a stupid problem. Many of the computer attacks today use a very simple form of exploitation that involves sending a message that is much longer than your software can handle. Your software doesn't bother to check how long it is; it simply takes the message, lays it out in memory, and stomps all over itself. This is a serious problem, but it is a self-contained one. We don't need to redesign the Internet to solve it.

Let me take an example of something that really annoys us: spam. Is spam a technical problem or, to ask the question more precisely, can spam be directly solved by a technical change? First we must recognize that spam exists because we don't insist that individuals have a well-known and verifiable identity before they can send mail. We also don't insist that email carry a stamp or a price in any form. If we had put a charge of a penny on an email, we might have reduced spam, although we would have created a collection and tracking nightmare. The current state of email (and spam) is defined by the current technology, but we can change technology. The fundamental question is what do we want? Decisions about the structure of email, if we think about them in a deliberative way, are social decisions. For example, we could create something just like email except that you can only talk to people you've been introduced to – gated communities in cyberspace, so to speak. The solution to spam, whatever it is, is going to change the nature of the shared social experience. We're going to have to ask and answer the question of under what circumstances can you intrude on somebody you don't know, and what range of responses is socially acceptable.

Consequently my question about spam, and about a lot of the other problems we have in the Internet, is not can we build a solution, but what is the right thing to build? To answer it, we must take into account a broad range of social and economic policy issues. Let me quickly pose some other questions I don't expect you to answer. If we alter our accessibility to the Internet, what forms of identity will be required in order to participate? Will we continue to have any rights of anonymous action? How can we be held accountable for misbehavior? Are we going to see an overall loss of confidence in the Internet resulting from activities such as phishing – this continuous flow of messages that appears to be coming from an institution like Citibank but in fact is coming from somewhere overseas in a country I can't identify? Who owns the knowledge about where we are? Your cell-phone service provider knows where you are. Is he permitted to sell that information or is it yours? Who owns the knowledge of who we are and what we like? How can that information be used? If you have a computer on the net running software from a particular vendor and a nasty virus takes over the machines, launching a denial-of-service attack against a major provider, are you liable? Is the software provider liable?

How can we shape the Internet so we can deal with disruptive and malicious participants without harming the shared experience of people who, like all of my friends in the old days, actually do want to cooperate?

How do we balance our rights as an individual, for example, our right to use encryption to protect private conversations, with the rights of the state to carry out lawful intercept? We're having a tussle today in Internet space as to how voice over IP (Internet telephony) should be reimplemented so that it is amenable to lawful intercept. The law of the United States, in this regard, is the Communication Assistance for Law Enforcement Act (CALEA) but the Internet standards are global protocols, not U.S. protocols. If we insert wiretaps into those protocols, they're going to be handled in every country according to that country's definition of lawful. How should we balance our design decisions in this global context?

All of these examples capture tensions that live in a space of personal rights, the interests of large private-sector players, the rights of the state, and the reality of the global nature of the Internet that spans jurisdictions and many societies with disparate social norms. This is the level at which we have to examine security issues and, more broadly, the problems of this shared experience we have in the Internet. Our new Academy study will focus on the security of the Internet as a public space. How can we shape the Internet so we can deal with disruptive and malicious participants without harming the shared experience of people who, like all of my friends in the old days, actually do want to cooperate? For this approach, we need more than a room of techies. We need social scientists, economists, political scientists, philosophers, and others who have views on the nature of society and the nature of human action – along with computer scientists.

As a computer scientist by training, I know that we cannot develop or implement an effective approach to security on the Internet without a broad range of perspectives.

Congress and the Court

Linda Greenhouse

Supreme Court Correspondent, The New York Times

The Academy is recognized for its ability to perceive emerging problems in our society even before the actual participants in them are aware that they exist. In addressing a group of federal judges several months ago, Justice Sandra Day O'Connor advised: "Try to make a friend out of the members of Congress. Try to help them understand the needs of judges. It's much harder

I have been an observer of the Congress-Court relationship for more than a quarter century and I have never seen such a sharp deterioration, coupled with a toxic atmosphere, in the interaction of these two branches of government.

to turn a cold shoulder on someone you know." One seldom hears this kind of discourse from a Supreme Court Justice, but today federal judges as a group, and the members of the Supreme Court in particular, are feeling rather besieged at the hands of Congress.

When the Academy began its study of the relationship of Congress and the Court in 2002, it appeared to those of us involved in the project that the shoe was on the other foot. Congress was feeling much besieged at the hands of the Supreme Court, which in the mid-1990s had started down a doctrinal road of reexamining some basic premises that had been extant since the New Deal, such as the role of Congress in regulating national affairs with a national scope. In a series of decisions, the Court placed limits on the ability of Congress to enforce basic guarantees of equal protection and due process through the Fourteenth Amendment, on premises that had not been questioned since the 1930s. The Academy felt there was a role to be played in convening the principals in this debate and providing neutral ground where they could meet face to face in the hope that they might better understand one another.

Since then, there has been a shift in the polarity of the problem. Congress has been on the warpath against the federal judiciary in a way that we haven't seen for quite some time – not so much in terms of more abstract doctrine but at the personal level of judicial pay and other issues. Criminal sentencing has been a major thorn in the side of the judiciary. Last year, Congress passed the Feeney Amendment that puts federal judges in the dock for handing down sentences that are lower than members of Congress think they should be. The House Judiciary Committee is conducting an internal investigation of a Court of Appeals decision on an affirmative-action case involving the University of Michigan. A resolution moving through the House of Representatives calls on federal judges to stop the very nascent, and some of us think very fruitful, practice of citing decisions from foreign courts to illuminate various problems facing American courts, including gay rights and capital punishment for juveniles.

I have been an observer of the Congress-Court relationship for more than a quarter century and I have never seen such a sharp deterioration, coupled with a toxic atmosphere, in the interaction of these two branches of government. It is appropriate for an organization such as the Academy to consider how we can examine the consequences of the current situation.

Robert C. Post

David Boies Professor of Law, Yale Law School

The Courts and Congress study illustrates how the Academy can use its good offices to examine questions that call for both scholarly and professional perspectives, and how the nature of an Academy study can evolve over time in response to changing circumstances.

A few years ago, several Academy members became concerned about Supreme Court decisions seeking to limit the power of the national Congress. We formed a committee, whose members were experts in law, political science, journalism, and public policy and service, to consider how we could identify and address the tensions between the federal legislature and the judiciary.

The premise of these decisions involves a basic concept of the American constitutional order. From the end of the eighteenth century, it was well understood that the federal government had only the powers granted to it by the Constitution. State governments, by contrast, retained all governmental powers except those denied to them by the Constitution. Until the 1930s, the Supreme Court would regularly articulate the constitutional limits of congressional power. In 1918, for example, the Court held that Congress had exceeded the bounds of its constitutional power when it sought to regulate child labor.

The Great Depression illustrated the utter interdependence of the national economy, which effectively undermined the notion that Congress could have only limited power. The New Deal response to the crisis of the 1930s required Congress to expand national authority in ways that were inconsistent with the idea that the national government had only specifically enumerated powers. The upshot was a dramatic confrontation between Franklin D. Roosevelt and the Supreme Court. FDR's proposed court-packing plan was averted only at the last minute when Justice Owen Roberts changed his vote, prompting the famous quip that "a switch in time saved nine." For half a century after the New Deal, American constitutional law effectively conceptualized the national government as possessing plenary power. Congress was effectively given constitutional authority to pass all laws that Congress believed were necessary to meet national needs.

Then in 1995 and subsequently in 2000, the Supreme Court revived the notion that the federal government had only limited powers, so that it could not pass legislation it deemed necessary for the good of the nation. For the first time since the New Deal, the Court began to strike down statutes on the ground that they were beyond the power of Congress. These statutes included the Violence Against Women Act and the Gun-Free School Zones Act. The Court's decisions were highly controversial and unclear. Congress was left with only a vague sense of the limits of its own legislative authority.

The evolving nature of this project exemplifies how Academy projects can maintain their value and relevance to the broader public by flexibly responding to changing circumstances.

In the belief that the Academy could act as an honest broker in this difficult situation, our committee of Fellows began to pursue a multipronged strategy. We designed Stated Meetings in Washington, D.C., among policymakers, in which the implications of these recent court decisions could be discussed and evaluated. In 2002 we sponsored a debate about the criteria for the confirmation of federal judges; participants included Senator Charles Schumer and the then Chief Judge of the United States Court of Appeals for the Fourth Circuit, James Harvie Wilkinson. In 2003, we sponsored a debate about the

independence of the federal judiciary; participants included Academy Fellow Judith Resnik (Yale University), Representative Howard Berman of California, and Danny Boggs, Chief Judge of the United States Court of Appeals for the Sixth Circuit.

We also organized private, off-the-record conversations among members of Congress and the Supreme Court. These candid discussions were useful to the participants. After 2003, however, it became clear that the relationship between the branches had deteriorated to the point where this strategy had become ineffective. We therefore began to plan scholarly studies of issues that these conversations had demonstrated were salient. Two Academy studies are now in the development stage. The first, led by Academy Fellow Philip Frickey (University of California, Berkeley), focuses on the question of how courts interpret federal statutes. Using a number of case studies, the study will examine how legislation was enacted by Congress and subsequently interpreted by the Court. The effort will be to find grounds that might improve the relationship between the Court and Congress in the quotidian but important matter of statutory interpretation.

The second study is being led by Judith Resnik. It focuses on the staffing of the federal judiciary. American judges are not professional in the sense of French and German judges. Instead they come to the judiciary from private practice or public service. Although they are not trained in the art of judging, they tend to possess the kind of political savvy that seems a prerequisite of the American practice of judicial review. In recent years, however, federal judges have increasingly spent their careers as magistrates or as some other kind of non-Article III judge. The Academy will study the causes of this shift, and whether this change in career path will affect the nature of American judging.

In the near future, the Court and Congress project will sponsor a Stated Meeting in Washington, D.C., on how the Constitution deals with the kind of stress exemplified by the events of 9/11. We are also considering a Stated Meeting comparing the American Constitution with other national constitutions.

The evolution of the Academy project on Congress and the Court illustrates the value of examining issues from the viewpoint of both scholars and practitioners. The evolving nature of this project exemplifies how Academy projects can maintain their value and relevance to the broader public by flexibly responding to changing circumstances.

Corporate Responsibility

Gerald Rosenfeld

Chief Executive Officer, Rothschild North America

Like the Congress and the Court study, the Academy's analysis of corporate responsibility has drawn on representatives of both scholarship and the professions to help us understand how we might address the breakdown in values in American business. The background to this study has played itself out on the pages of the newspapers and in the courts for the last three or four years, as public confidence in American business has seriously eroded.

I became involved in the project in May 2003 at a series of workshops in New York and subsequently took part in a very useful discussion with Senator Sarbanes, who, I am honored to say, is being inducted into the Academy today. On the basis of these and other discussions, a series of papers was commissioned and will be published early next year by the MIT Press. The volume, *Restoring Trust in American Business*, is edited by one of the cochairs of the study, Jay Lorsch of the Harvard Business School; the Executive Officer of the Academy, Leslie Berlowitz; and the Project Director, Andy Zelleke of the Wharton Business School.

The Academy's analysis of corporate responsibility has drawn on representatives of both scholarship and the professions to help us understand how we might address the breakdown in values in American business.

The study focuses on the significance of values in guiding corporate conduct and the role of various groups – whom we termed "gatekeepers" – in upholding ethical standards. They include regulators, auditors, journalists, lawyers, investment bankers, and corporate directors: the individuals that guide and oversee the institutions surrounding the business community. Serious issues concerning human behavior are evident in each of these professions.

In my own article for the book, I deal with ethical standards in the investment banking community. Since I am an investment banker and have been one for decades, I am particularly concerned about the question of whether investment banking is (or should be) recognized as a profession with obligations to the public, including responsibility as a "gatekeeper" helping to constrain corporate misconduct. Investment bankers have no specific set of behavioral rules to follow; they are simply expected to obey the law. Although a higher level of awareness on the part of regulators and senior managers in financial services may help to prevent future corporate scandals, it is clear that external forces will continue to pressure investment bankers toward higher standards of conduct. In my view, the investment community should act to adopt its own code of conduct.

In addition to my commentary, *Restoring Trust in American Business* includes a broader analysis of management as a profession. The book concludes with a set of recommendations designed to enhance gatekeeper professionalism and to underline the importance of continuing cooperative efforts on the part of this nation's intellectual, business, and public leaders to ensure higher standards of corporate conduct.

As we go forward, there will be meetings to follow up on the reaction to the book and the possibility of undertaking an in-depth study of one or two of the gatekeeper professions. In this process, the Academy will continue to provide a unique forum for the nonpartisan analysis of these difficult and controversial issues.

Universal Basic and Secondary Education

Michael Kremer

Gates Professor of Developing Societies, Harvard University

The Academy's study on Universal Basic and Secondary Education (UBASE) is a multidisciplinary effort to evaluate the benefits and obstacles involved in educating all of the children of the world, aged six to sixteen. Nearly 28 percent of the world's children in this age group – 400

million in total – are not enrolled in school and even for those attending school, educational quality often leaves much to be desired. Moreover, in the developing world, the number of young people aged six to sixteen is expected to grow by more than 100 million in the next quarter century.

With these facts in mind, Joel Cohen of Rockefeller University and David Bloom of the Harvard School of Public Health initiated the UBASE study and recruited scholars and representatives of international organizations to analyze the challenges involved in launching such a massive educational effort. There are several aspects to the project: how the goal of bringing quality education to the world's children can be defined; how progress toward this goal can be measured; what obstacles – technological, financial, political, and cultural – will be encountered; what the consequences of success might be, and how a set of options for the steps needed to advance the goal might be developed. The current phase of the project will produce research reports in eight areas, from the gathering of facts and data for measuring progress toward universal basic and secondary education to the intersection of health and education, and cost and finance issues.

My particular aspect of the study deals with the evaluation of educational initiatives and reforms. Most of the evidence on the impact of various educational strategies or interventions comes from comparing schools with different characteristics. For example, to learn about the impact of private education as opposed to public education, experts have compared private to public schools. The problem is that these comparisons can be confounded by other factors. Parents who send their children to private schools might differ from those who send

There are many ways to increase the number of children in school; the more difficult challenge is to provide them with a quality education. The availability of resources is a key issue, but their impact can be more complicated than one might think.

their children to public schools. One can try to control for observable socioeconomic differences such as income and education, but parents can also differ in unobservable ways such as their attitude toward education. Even if one found a way to establish a constant in the comparison of parents, children may require different educational experiences. Statistically, it is difficult to control for all the random variables.

In contrast, we can adopt another approach known as randomized evaluation that is used in the natural sciences and particularly in medicine. Having been involved in a number of educational evaluations using randomized data, let me illustrate how we can apply this method to a few of the questions being addressed in the study. For example, what is the most cost-effective way to educate more children in developing countries, given the limited resources available? The best approach – and it was not the first that came to mind – was the elimination of intestinal worms that affect one out of every three to four people in the world and are inexpensive to treat. We found that a program involving mass treatment of children in randomly selected schools led to a reduction in absenteeism of at least 25 percent. The cost of the program was only about $3.50 per additional year of schooling generated – much more cost-effective than many traditional interventions.

There are many ways to increase the number of children in school; the more difficult challenge is to provide them with a quality education. The availability of resources is a key issue, but their impact can be more complicated than one might think. I was involved in a study of textbook provision in a part of Kenya where primary-school students had very few textbooks. Why do you need a study? Isn't it obvious that more textbooks will lead to enhanced performance? In fact, the results showed that the children who tested well before they received the textbooks improved considerably, but those who did poorly in the pretest showed no improvement. Because I had taught in this area of Kenya before entering graduate school, the outcome was understandable. The entire Kenyan educational system is based on English, but for these children, English is their third language. Their home language is their first and Swahili is their second. Because they are often sick or have other responsibilities, many of these children attend school perhaps 70 – 80 percent of the time, and their teachers show up at about the same rate. Only those students with the best attendance can benefit from textbooks.

These findings raise questions about the need for more systematic educational reform. The educational system in Kenya is oriented toward students from Nairobi with more privileged backgrounds and with parents who can afford textbooks. The system isn't really serving the typical student in rural areas.

In another developing country – Colombia – students from poor neighborhoods were given vouchers to allow them to attend private schools. Given the lack of sufficient funds, a lottery was instituted to determine the voucher recipients. When we learned about this project, we decided to take advantage of the lottery to compare the students who won the vouchers with those who did not. We found that several years after receiving the vouchers, the lottery winners scored higher on tests. As the years passed, they were more likely to complete high school and to score well on college entrance exams. There is no doubt that the lottery was highly cost-effective for those who benefited, but there remain serious questions about the more general impact of vouchers.

Ultimately, what we need to advance educational development is greater knowledge about educational systems and the impact of specific interventions. Randomized evaluations are valuable because they can create greater certainty about how we should proceed, and the UBASE project is helping to develop a strong evidence base for action.

The Humanities Initiative

Patricia Meyer Spacks

Edgar F. Shannon Professor of English, University of Virginia

In 1998, the Academy established a two-pronged Humanities Initiative. I'll report first about the effort to develop humanities indicators, one of those key enterprises, and then about the histories of the humanities, the other central project. They're both at a very exciting stage of development.

Unlike scientists and engineers, humanists have never had available to them a single, dependable source of data about what's happening in their field. The *Science and Engineering Indicators*, issued biennially by the Nation-

al Science Foundation, provide information about education and employment over a considerable disciplinary range. In the humanities, various professional organizations have tried to assemble facts about developments within their disciplines, but data between fields are generally not compatible, since different organizations employ different means of gathering data and different ways of codifying them. The American Academy set out to facilitate the inauguration of a comprehensive system for accumulating and organizing basic information about education and employment in the humanistic disciplines. How many people major? How many take courses? How many get advanced degrees in these fields? What happens to those with Ph.D.s in the humanities? What do they do for a living? You can't assume nowadays that they get jobs in universities. How much teaching in the humanistic areas is done by part-time faculty? These are the sorts of questions we have in mind.

To accomplish our aim turned out to be unimaginably complex, as well as unimaginably expensive. The enterprise involves figuring out how best to make use of existing data as well as how to gather new information. It has required the collaboration of men and women from many disciplines – statisticians, social scientists, and humanists – and from many organizations, including the learned societies under the aegis of the American Council of Learned Societies.

But it is actually happening, thanks to foundation support and to the leadership of Norman Bradburn, who recently left the National Science Foundation to rejoin the National Opinion Research Center at the University of Chicago, along with medieval historian Francis Oakley and statistician Steven Raudenbush. I mention their professional identification to suggest how extensive the collaboration is. Thanks to the cooperation of individuals and organizations, a working committee has agreed upon a core set of questions of interest to all learned societies, and that wasn't an easy task. We are moving toward a national survey of humanities departments to generate basic information about faculty and staffing trends and about teaching loads.

These books, in conjunction with the effort to create comprehensive, accurate data for the humanities, will help to elucidate the specific functions, the specific condition, and the specific importance of humanistic knowledge in the United States.

The project to create histories of the humanities is closer to my heart, since I cochair it with Steven Marcus, and I'm editing one of the two volumes currently approaching publication. Both these books explore from different points of view changes that have shaped the humanities over the past century.

In the fall, the authors of the essays in my volume, *Mapping the Humanities*, met in New York to discuss drafts of their work. The meeting was exhilarating. The essays cover individually seven humanistic disciplines. They tell, as you would expect, seven different stories, but with provocative convergences. All record histories of immense vitality, with each discipline's governing assumptions in constant flux and with new consensus repeatedly generated out of controversy. Several disciplines – comparative literature, philosophy, and law, according to their historians – show unexpected convergences with science. I have to say it was something of a shock to me, as it will be perhaps to you, to learn that in its early days comparative literature aspired to the status of a science.

Reading the drafts and hearing their authors talk were invigorating experiences, reminding me, as the finished volume will remind its readers, how fundamentally the humanities participate in the life of this country, engaging in various terms the issues that perplex the nation, and reflecting in their internal conflicts wider dilemmas of meaning.

It was essential to the Humanities Initiative from the start that the Academy sponsor multiple histories to emphasize that every set of facts can generate different stories, and that the story told often depends on who is telling it. Academy Fellow David Hollinger, a historian from Berkeley, has edited another volume offering histories of the humanities disciplines from a specific point of view.

His book, *The Humanities and the Dynamics of Inclusion since World War II*, explores social and cultural determinants that have helped shape a distinctly American version of the humanities in the twentieth century. Its essays, also of multiple authorship, argue that the role played by the academic humanities in embracing the diversity of subject matters, ideas, and types of Americans has not been fully appreciated. They examine the rise of foreign-area studies, the emergence of American studies and other interdisciplinary programs, and the growth of American higher education as the opportunity to attend colleges and universities expanded in the postwar era. Hollinger and his authors show that the humanities have played a vital role in the engagement of the United States with the wider world, and that they continue to serve a crucial purpose as a means of incorporating America's ethnic and cultural diversity.

We hope to have both these volumes published in 2005 and 2006 to coincide with the observance of the Academy's 225th anniversary. Together, and in conjunction with the effort to create comprehensive, accurate data for the humanities, they will help to elucidate the specific functions, the specific condition, and the specific importance of humanistic knowledge in the United States. ■

New Members: Class of 2004

Class I: Mathematical and Physical Sciences

Section 1: Mathematics

David Aldous
University of California, Berkeley, CA
Professor of Statistics. Leading figure in discrete probability, the study of random processes on finite structures. Made contributions in several areas of probability theory: rates of convergence to equilibrium in finite-state Markov chains, Poisson approximations in diverse contexts, probabilistic analysis of algorithms, and the analysis of coalescent processes.

Leonard Gross
Cornell University, Ithaca, NY
Professor of Mathematics. Contributed to the interface between mathematics and physics. Devised the rigorous framework for white noise analysis that is used throughout probability and its applications. Created and explored logarithmic Sobolev inequalities and their relations to hypercontractivity, tools now applied far from their origins in constructive field theories.

Anatole Katok
Pennsylvania State University, University Park, PA
Raymond N. Shibley Professor of Mathematics. Leading researcher in ergodic theory and theory of dynamical systems. Shaped the subject through work on dynamics of billiards, construction of ergodic transformation, and geodesic flows. Provided the basis for this area of research with work on the rigidity of commuting flow actions.

Fang-Hua Lin
New York University, Courant Institute of Mathematical Sciences, New York, NY
Silver Professor of Mathematics. Solved many problems originating in physics or geometry and leading to nonlinear elliptic partial differential equations. Played a role in establishing a mathematical theory for liquid crystals, for both the static and dynamic cases. Made contributions to the study of topological defects. Established the dynamical laws for the Ginzburg-Landau vortices in superconductivity and the topological solitons in superfluids.

Yuri I. Manin
Northwestern University, Evanston, IL; Max Planck Institute for Mathematics, Bonn, Germany; Steklov Mathematical Institute, Moscow, Russia
Trustee Chair and Professor of Mathematics; Scientific Member; Professor. Solved many problems in number theory and algebraic geometry. Developed new techniques in the theory of differential equations and mathematical physics. Recent research focuses on quantum cohomology and noncommutative geometry.

Donald Anthony Martin
University of California, Los Angeles, CA
Professor of Mathematics and Philosophy. Leader in the development of axiomatic set theory. Derived, with others, a definability theory for the continuum from game-theoretic determinacy hypotheses. Wrote proofs for standard set theory of Borel determinacy and projective determinacy from large cardinals. Motivated and contributed to work on the associated philosophical problems.

Gang Tian
Massachusetts Institute of Technology, Cambridge, MA
Simons Professor of Mathematics. Authority in the field of differential geometry and complex analysis, with contributions to Kähler-Einstein metrics, geometric equations, and quantum cohomology. Recipient of the Alan Waterman Award (National Science Foundation) and the Veblen Prize (American Mathematical Society).

Nolan R. Wallach
University of California, San Diego, CA
Professor of Mathematics. Contributed to the harmonic analysis of semi-simple groups and the spectral theory and cohomology of their quotients. Work encompasses Lie theory, Riemannian geometry, differential equations, automorphic forms, algebraic geometry, mathematical physics, and quantum computing. Authored monographs on the cohomology of discrete groups, representation theory, and invariant theory.

Lai-Sang Young
New York University, Courant Institute of Mathematical Sciences, New York, NY
Professor of Mathematics. Expert in the theory of dynamical systems, particularly their ergodic behavior. Explores the geometric and statistical theories of chaotic dynamical systems, including measurements of dynamical complexity, and the cumulative effects of small random perturbations on the long-term behavior of dynamical systems.

Yves Colin de Verdiere (FHM)
Université Joseph Fourier, Grenoble, France
Professor of Mathematics. Advanced spectral theory, semiclassical analysis, and the combinatorics of graphs. Worked on the spectral theory of Laplace operators, providing the first rigorous proof that the length spectrum of a Riemannian manifold is a spectral invariant of the Laplace operator. Proved fundamental theorems in the spectral theory of graphs.

Section 2: Physics

Guenter Ahlers
University of California, Santa Barbara, CA
Professor of Physics. Experimentalist whose contributions include the elucidation of critical phenomena near the superfluid transition in liquid helium-4 and near magnetic phase transitions; the first experimental observation of chaotic behavior in a deterministic system; and the analysis of patterns in spatially extended nonequilibrium systems.

Moses H. W. Chan
Pennsylvania State University, University Park, PA
Evan Pugh Professor of Physics. Conducted experimental studies of phase transitions in quantum and classical fluids. Elucidated the effects of reduced dimensions, restricted geometries, and impurities on phase behavior. Discovered the supersolid phase in helium.

Paul A. Fleury
Yale University, New Haven, CT
Dean of Engineering and Frederick William Beinecke Professor of Engineering and Applied Physics. Condensed matter physicist. Advanced the optical spectroscopy of solids. Headed Sandia National Laboratory and major departments at Bell Laboratories.

Steven M. Girvin
Yale University, New Haven, CT
Professor of Physics and Applied Physics. Condensed matter theorist with interests in many-body problems, quantum phase transitions, low-dimensional systems, atomic physics, and quantum computation. Known for work on the quantum Hall effect, the superconductor-insulator transition, and the quantum mechanics of electrical circuits.

Jeffrey A. Harvey
University of Chicago, Chicago, IL
Enrico Fermi Distinguished Service Professor and Chair, Department of Physics. Codiscoverer of the heterotic string, a milestone in the quest for a unified theory of the laws of nature. Brought clarity to the nature of and interrelations among string theories through work on compactification, notably on orbifolds, and by elucidating the role of string solitons and instantons.

Alfred H. Mueller
Columbia University, New York, NY
Professor of Physics. Led the study of high-energy quantum chromodynamics (QCD). Developed concepts and techniques in QCD that permitted precise quantitative predictions and experimental tests, thereby helping to establish QCD

as the theory of the strong interactions. Recipient of the Sakurai Prize (American Physical Society).

Lisa Randall

Harvard University, Cambridge, MA

Professor of Physics. Particle theorist whose work on the effect of the geometry of extra dimensions on the hierarchy puzzle influenced thinking about particle physics, space, and gravity and brought phenomenology and string theory closer together. Contributed to supersymmetry breaking and the Standard Model.

Vladimir Borisovich Braginsky (FHM)

Moscow State University, Moscow, Russia

Professor of Physics. Formulated the concept of standard quantum limits on high-precision measurements that use conventional techniques, and invented quantum nondemolition methods to circumvent these limits. Developed technology for high-precision measurements including gravitational-wave detection and carried out experimental tests of the equivalence principle and other fundamental laws of physics.

Section 3 : Chemistry

A. Paul Alivisatos

Lawrence Berkeley National Laboratory ; University of California, Berkeley, CA

Chancellor's Professor of Chemistry and Materials Science. Pioneered the development of the physical chemistry of semiconductor nanocrystals. Elucidated their structural, thermodynamic, optical, and electrical characteristics as a function of particle size. Developed synthetic procedures to achieve size control and demonstrated the first practical applications of these new materials.

Moungi Gabriel Bawendi

Massachusetts Institute of Technology, Cambridge, MA

Professor of Chemistry. Pioneer in the organometallic synthesis and physical characterization of semiconductor materials in the nanometer size range (quantum dots). Elucidated the structure of electronic states in these quantum dots and established single quantum dot spectroscopy. Demonstrated applications of these quantum dots ranging from stimulated emission and lasing, electroluminescence, and biomedical imaging.

Peter Beak

University of Illinois at Urbana-Champaign, Urbana, IL

James R. Eiszner Endowed Chair in Chemistry. Made discoveries and provided unifying concepts in organic chemistry. Established thermodynamic differences for a number of isomeric systems. Has been influential in the design and execution of synthetic strategies.

Malcolm Harold Chisholm

Ohio State University, Columbus, OH

Distinguished Professor of Mathematical and Physical Sciences. Made contributions to the development of inorganic, organometallic, and materials chemistry. Pioneered the use of π-donor ligands such as amides and alkoxides and explored the use of metal-metal multiple bonds as reactive functional groups.

Eric N. Jacobsen

Harvard University, Cambridge, MA

Sheldon Emory Professor of Chemistry. Developed methods for the preparation of epoxides in enantiomerically pure form utilizing conceptually innovative approaches. Conceived the Mn (Salen) epoxidation method that is widely used in academia and industry. Subsequent work involving hydrolytic kinetic resolution led to myriad applications and mechanistic insights.

Peter Jacob Rossky

University of Texas at Austin, Austin, TX

Marvin K. Collie-Welch Regents Chair in Chemistry, Professor of Chemical Engineering, and Director, Institute for Theoretical Chemistry. Pioneered the theoretical atomistic description of chemical and biomolecular structure, reaction dynamics, and electronic processes in a liquid phase environment. Created new methods in classical and quantum statistical mechanics that elucidate the origin of experimental observations.

Henry Frederick (Fritz) Schaefer III

University of Georgia, Athens, GA

Graham Perdue Professor of Chemistry ; Director, Center for Computational Quantum Chemistry. Applied methods of quantum chemistry to solve problems of interest to general chemists. Predicted the structure of methylene. Current research focuses on the silicon-carbon double bond.

Richard Palmer Van Duyne

Northwestern University, Evanston, IL

Charles E. and Emma H. Morrison Professor of Chemistry. Accomplishments include the discovery, development, and application of surface-enhanced Raman spectroscopy (SERS) and the development of nanosphere lithography (NSL) and its use in nanoparticle optics. Advanced all areas of science involving molecules adsorbed on surfaces and nanoparticles.

Bernard Lucas Feringa (FHM)

University of Groningen, Groningen, The Netherlands

Professor of Chemistry. Devised the first chiroptical molecular switch and the first light-driven unidirectional rotary molecular motor in studies on functional nanosystems. Developed the first catalytic enantioselective 1,4-addition of organometallic reagents with absolute stereocontrol using a novel class of chiral monodentate phosphoramidite ligands.

Section 4 : Astronomy (including Astrophysics) and Earth Sciences

Steven V. W. Beckwith

Space Telescope Science Institute, Baltimore, MD

Director. Leading observational astronomer in the areas of star formation, circumstellar disks, molecular emission, and infrared detectors and techniques. Directs two international institutes and chairs strategic panels for the NRC, NASA, and ESA. Has advocated for the scientific productivity of the Hubble Space Telescope.

Charles L. Bennett

NASA Goddard Space Flight Center, Greenbelt, MD

Senior Scientist for Experimental Cosmology. As PI for NASA's Wilkinson Microwave Anisotropy Probe, led the team that mapped the cosmic microwave background sky, determined the age of the universe, the cosmological constant, the dark and baryonic matter, and the Hubble constant. On earlier NASA Cosmic Background Explorer, measured the cosmic spectrum and discovered temperature variations.

Claude R. Canizares

Massachusetts Institute of Technology, Cambridge, MA

Bruno Rossi Professor of Experimental Physics and Associate Provost. Directed the development of high-resolution spectrometers for the Einstein and Chandra X-ray observatories and devised the theoretical and practical basis for X-ray diagnostics of hot plasmas in celestial objects. Served as Director of the MIT Center for Space Research (1990 – 2002) and as Chairman of the Space Studies Board of the National Academy of Sciences (1994 – 2000).

R. Lawrence Edwards

University of Minnesota, Minneapolis, MN

Distinguished McKnight University Professor. Primarily responsible for the development and application of thermal ionization measurement of precise ^{230}Th ages to the timing and causes of Quaternary climatic and oceanographic changes. Pioneered Sr/Ca and U/Ca thermometry and uranium-thorium-protoactinium dating of carbonates, increasing understanding of past climate change and environmental problems.

Andrea Ghez

University of California, Los Angeles, CA

Professor of Astronomy. Developed high-spatial resolution im-

aging techniques to study star formation. Established the existence of a supermassive black hole at the center of our galaxy and determined its mass, position, and motion with unprecedented accuracy.

Donald A. Gurnett

University of Iowa, Iowa City, IA

Roy J. Carver/James A. Van Allen Professor of Physics. Expert in the observation and interpretation of electromagnetic and plasma wave phenomena of Earth, Jupiter, Saturn, Uranus, and Neptune and the heliospheric medium. Designed instruments to gather information on these phenomena during spacecraft missions, including the Cassini mission orbiting Saturn and the Mars Express mission.

Lyman Alexander Page, Jr.

Princeton University, Princeton, NJ

Professor of Physics. Developed new techniques to study the universe through the cosmic background radiation (CMB). Formulated experiments that measured the first peak in the CMB angular power spectrum, providing a determination of the total matter density in our universe. Founding member of NASA's Wilkinson Microwave Anisotropy Probe Project.

Maria T. Zuber

Massachusetts Institute of Technology, Cambridge, MA

E. A. Griswold Professor of Geophysics. Leader in the study of planetary interior structure and deformation. Led the determination of the first high-resolution structural models for the Moon, Mars, and the asteroid Eros, and developed a suite of quantitative models for the interpretation of planetary deformational features.

Section 5: Engineering Sciences and Technologies

Lilia A. Abron

Peer Consultants, Rockville, MD

President and CEO. Advanced environmental engineering and sustainable design through work in both academia and the private sector.

Arden L. Bement, Jr.

National Institute of Standards and Technology, Gaithersburg, MD

Director. Acting Director, National Science Foundation. Conducted research on radiation effects in materials, high-temperature semiconductors, and the processing-structure-property interrelationships in structural materials and thin-film devices. Promoted nuclear fuel management, reactor safeguards, and nuclear nonproliferation.

Mary Cunningham Boyce

Massachusetts Institute of Technology, Cambridge, MA

Kendall Family Professor of Mechanical Engineering. Authority on the mechanical behavior of polymeric materials. Developed physical models at the level of microstructure for large strain deformation and failure of polymers that define the state of the field. Leads an interdepartmental research group that is reshaping the role of elastomers, polymers, polymer blends, and nanocomposites as engineering materials.

Murray S. Daw

Clemson University, Clemson, SC

R. A. Bowen Professor of Physics. Developed three techniques in materials theory: the Embedded Atom Method, the Variational Density Matrix Method, and the Relevant Rate Extraction Theory. Work has especially benefited simulations of defects in metals.

Mark E. Dean

International Business Machines Corporation, Tucson, AZ

IBM Fellow and Vice President, Storage Technology. Contributions include research and application of systems technologies spanning circuits to operating environments. Research and development accomplishments include high-performance microprocessors, systems and software, cellular systems structure (Blue Gene), and digital visualization.

Sosale Shankara Sastry

University of California, Berkeley, CA

NEC Distinguished Professor of Electrical Engineering and Computer Sciences and Bioengineering; Chair, Department of Electrical Engineering and Computer Sciences. Contributions in research include designs for "intelligent highways," new algorithms for air traffic control, autonomous software for rotary aircraft, and computer-assisted surgery. Director of the Information Technology Office of DARPA (1999 – 2001).

Subra Suresh

Massachusetts Institute of Technology, Cambridge, MA

Ford Professor of Engineering and Head, Department of Materials Science and Engineering. Research has advanced materials science and engineering, in particular the study of mechanical response of structural and functional materials. Author of *Fatigue of Materials* and coauthor of *Thin Film Materials: Stress, Defect Formation, and Surface Evolution*.

Herbert Gleiter (FHM)

Institute of Nanotechnology, Karlsruhe, Germany

Director. Performed pioneering work on the synthesis of nanocrystalline materials. Contributions have led to major technological innovations, including the new field of nanostructured materials. In the 1980s introduced the idea of synthesizing materials with nanocrystalline ($\leq$ 100 nm) grain size to achieve superior and novel properties.

Anthony James Merrill Spencer (FHM)

University of Nottingham, Nottingham, United Kingdom

Emeritus Professor of Theoretical Mechanics. Devised continuum-mechanical theories for rigid-plastic and other fiber-reinforced materials and for the flow of granular materials and their implications. Contributed to the building of the theoretical mechanics school at the University of Nottingham.

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

Bernard Chazelle

Princeton University, Princeton, NJ

Professor of Computer Science. Helped establish the field of computational geometry in theoretical computer science. Solved many long-standing questions in computational geometry, including optimal-time algorithms for simple polygon triangulation, line segment intersection, and higher-dimensional convex hull.

James H. Clark

Shutterfly Corporation, Redwood City, CA

Chairman. Computer scientist and entrepreneur. Cofounded Silicon Graphics, Inc. (SGI) and Netscape. Developed the Geometry Engine Chip, a central element of SGI's technology.

Barbara J. Grosz

Harvard University, Cambridge, MA

Higgins Professor of Natural Sciences; Dean of Science, Radcliffe Institute for Advanced Studies. Known for contributions in the fields of natural language processing and multi-agent collaboration, and for addressing fundamental problems in modeling collaborative activity. Pioneered the rigorous study of the structure of discourse.

Takeo Kanade

Carnegie Mellon University, Pittsburgh, PA

U. A. and Helen Whitaker University Professor of Computer Science and Robotics. Director, the Robotics Institute at Carnegie Mellon University (1992 – 2001). Robotics researcher whose work spans many areas, including manipulators, sensors, computer vision, and multimedia. Advanced the development of direct-drive manipulators, automated face recognition, the most popular optical flow algorithm, and a 3-D construction method from multiple images.

Edward D. Lazowska

University of Washington, Seattle, WA

Bill & Melinda Gates Chair in Computer Science & Engineering. Known for the design, implementation, and analysis of high-performance computing and communication systems. Chaired NSF Advisory Committee for Computer and Information Science and Engineering and cochaired President's Information Technology Advisory Committee.

James L. Massey

Swiss Federal Institute of Technology (ETH), Zurich, Switzerland; Lund University, Lund, Sweden

Professor Emeritus of Digital Systems Engineering; Adjunct Professor of Information Technology. Contributed to information theory and to cryptography. Past president of the IEEE Information Theory Society and the International Association for Cryptologic Research.

Henry Samueli

Broadcom Corporation, Irvine, CA

Cofounder, Chairman, and Chief Technical Officer. Innovator in broadband communications. Responsible for all research and development activities of Broadcom, a leading manufacturer of semiconductor solutions for broadband applications.

Class II: Biological Sciences

Section 1: Biochemistry and Molecular Biology

Tania A. Baker

Massachusetts Institute of Technology, Cambridge, MA

Whitehead Professor of Biology; Investigator, Howard Hughes Medical Institute. Leader in biochemical studies of DNA transposition, the function of disassembly chaperones, and energy-dependent protein degradation. Advanced understanding of fundamental life processes ranging from viral replication to the proteolytic resculpting of the cellular proteome.

Donald Max Engelman

Yale University, New Haven, CT

Eugene Higgins Professor of Molecular Biophysics and Biochemistry. Contributed to two areas of physical biochemistry: the use of neutron scattering to establish the protein arrangement in the small ribosomal subunit; and the use of computational, NMR, X-ray scattering, and protein engineering methods to study the folding, assembly, and structure of membrane proteins.

Carl Frieden

Washington University School of Medicine, St. Louis, MO

Wittcoff Professor and Head, Department of Biochemistry and Molecular Biophysics. Contributed to the fields of enzyme kinetics and mechanisms, regulatory enzymes, actin polymerization, and protein folding. Developed the concept of hysteretic enzymes and the use of fluorine NMR for studying protein folding. Devised programs for analyzing complete time courses of enzymatic reactions.

Paul Lawrence Modrich

Duke University Medical Center, Durham, NC

James B. Duke Professor of Biochemistry; Investigator, Howard Hughes Medical Institute. Established the molecular mechanism by which the DNA mismatch repair system prevents mutations. Assigned activities to bacterial and human mismatch repair proteins and demonstrated that tumor cells derived from patients with hereditary nonpolyposis colon cancer are defective in this reaction.

Linda Lea Randall

University of Missouri-Columbia, Columbia, MO

Professor and Wurdack Chair of Biochemistry. Contributed to the understanding of protein export and molecular chaperones. Laid the foundations for biochemical study of bacterial protein export, discovered that modulation of protein folding was crucial for export, demonstrated the central role of molecular chaperones, and established the importance of kinetic partitioning.

Aziz Sancar

University of North Carolina, Chapel Hill, NC

Kenan Professor of Biochemistry and Biophysics. Authority in the field of DNA repair. Elucidated the properties and mechanisms of the enzymes responsible for three different repair systems. Isolated a protein that couples transcription and repair.

Graham C. Walker

Massachusetts Institute of Technology, Cambridge, MA

American Cancer Society Research Professor; Howard Hughes Medical Institute Professor. Elucidated how cells respond to DNA damage by inducing expression of repair pathway genes. Carried out pathbreaking work on the biochemistry of plant-microbe signaling.

Robert Hugh Waterston

University of Washington, Seattle, WA

Professor and William Gates III Endowed Chair of Genome Sciences. Brought whole-genome sequencing of metazoan organisms to reality through leadership of the project to sequence the genome of the nematode *Caenorhabditis elegans*. Played a central role in the determination, analysis, and public release of the sequences of the human, mouse, and other genomes.

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

Gary G. Borisy

Northwestern University Feinberg School of Medicine, Chicago, IL

Leslie B. Arey Professor of Cell and Molecular Biology. Advanced knowledge of how cells organize their cytoplasm. Participated in the discovery of tubulin, elucidated microtubule dynamics, introduced novel techniques to analyze cytoskeletal function in living cells, dissected the mechanism of chromosome movement, and furthered understanding of the supramolecular basis of the actin machinery in cell motility.

Marian B. Carlson

Columbia University College of Physicians and Surgeons, New York, NY

Professor of Genetics and Microbiology. Leader in the field of yeast gene regulation. Identified the roles of the SWI-SNF chromatin remodeling complex in transcriptional regulation. Made discoveries elucidating global regulatory roles of the Snf1 protein kinase and its human homologue, AMPK, in the metabolic response to glucose signals.

Scott David Emr

University of California School of Medicine, San Diego, CA

Professor of Cellular and Molecular Medicine; Investigator, Howard Hughes Medical Institute. First to establish a role for phosphoinositide lipids in the spatial and temporal control of membrane trafficking pathways, to identify numerous effector molecules (that contain FYVE and PX domains) that directly bind the lipid PtdIns(3) P, and to identify the molecular machinery (ESCRT complexes) required for receptor down-regulation and HIV viral binding.

Andrew Z. Fire

Stanford University, Stanford, CA

Professor of Pathology and Genetics. Participated in developing methods to reintroduce genes into *C. elegans* and to inactivate genes using double-stranded RNA. Uses these methods to address the roles of double-stranded RNA and other unique nucleic acid structures in animal development and immunity.

Donald Emil Ganem

University of California, San Francisco, CA

Professor of Microbiology and Immunology; Investigator, Howard Hughes Medical Institute. Made contributions to the understanding of the hepatitis B virus infection and to the study of epidemiology, replication, and pathogenesis of the virus that causes Kaposi's sarcoma, one of the leading tumors in patients with AIDS.

Leonard P. Guarente

Massachusetts Institute of Technology, Cambridge, MA

Novartis Professor of Biology. Made important discoveries in transcriptional regulation using yeast. Discovered that the gene SIR2 regulates the life span of yeast cells and roundworms. Work contributes to the molecular study of aging.

Erin K. O'Shea

University of California, San Francisco, CA

Professor of Biochemistry and Biophysics; Assistant Investigator, Howard Hughes Medical Institute. Made breakthroughs in the regulation of gene expression. First determined the mechanism of a coiled-coil transcription factor. Demonstrated how specific phosphorylation of a transcription factor determines its localization and regulatory activity and how inositol polyphosphates recruit chromatin remodeling factors.

Douglas C. Wallace

University of California, Irvine, CA

Donald Bren Professor of Biological Sciences and Molecular Medicine. Pioneer in the study of human mitochondrial DNA (mtDNA) genetics. Defined the principles of mtDNA inheritance, surveyed global mtDNA variation permitting reconstruction of ancient human origins and migration, discovered the first inherited mtDNA disease, and demonstrated the importance of mtDNA variation in aging and degenerative diseases.

Anthony James Pawson (FHM)

Samuel Lunenfeld Research Institute, Toronto, Canada

University Professor of Medical Genetics and Microbiology. Fundamentally changed the view of cellular regulation and signal transduction. Discovered the Src homology 2 domain and showed that tyrosine kinases exert effects through modular protein-protein interactions. Went on to establish that interaction domains provide a general paradigm through which cells are organized.

Masatoshi Takeichi (FHM)

RIKEN Center for Developmental Biology, Kobe, Japan

Professor and Director. Discovered that cell-cell adhesion is mediated by cadherins, transmembrane surface proteins that mediate homotypic binding between neighboring cells. Demonstrated that a code exists such that cells with like cadherins attach to each other.

Section 3: Neurosciences, Cognitive Sciences, and Behavioral Biology

Huda Akil

University of Michigan, Ann Arbor, MI

Gardner Quarton Distinguished University Professor of Neuroscience and Psychiatry and Co-Director and Senior Research Scientist, Mental Health Research Institute. Made discoveries in the neurobiology of behavior, especially in the molecular mechanisms underlying responsiveness to stress and pain. Demonstrated a role for endorphins in addiction and in related studies on the neuroendocrinology of anxiety and depression. Advanced understanding of emotionality and human behavioral dysfunction.

Mark F. Bear

Massachusetts Institute of Technology, Cambridge, MA

Picower Professor of Neuroscience; Investigator, Howard Hughes Medical Institute. Contributed to neuroscience by elucidating the synaptic and molecular mechanisms of plasticity in the cerebral cortex. Demonstrated that excitatory synapses throughout the mammalian cerebral cortex are bidirectionally modifiable, showed how these modifications can be reliably induced, and furthered understanding of the underlying molecular mechanisms.

Thomas James Carew

University of California, Irvine, CA

Bren Professor and Chair of Neurobiology and Behavior. Leading neuroscientist investigating the cellular neurobiology of learning and memory. Extensive research on neuroplasticity in *Aplysia* revealed synaptic mechanisms mediating several forms of memory, including habituation, sensitization, and associative learning, as well as time-dependent phases of synaptic facilitation and memory.

Catherine Dulac

Harvard University, Cambridge, MA

Professor of Molecular and Cellular Biology; Investigator, Howard Hughes Medical Institute. Identified essential signaling components of the murine vomeronasal organ, including novel multigene families encoding candidate pheromone receptors. Used molecular and genetic tools to analyze the coding of pheromone signals in the mammalian brain and the specificity of the pheromone response leading to gender discrimination and aggression.

Susan Hockfield

Massachusetts Institute of Technology, Cambridge, MA

President. Formerly William Edward Gilbert Professor of Neurobiology and Provost, Yale University. Introduced powerful methods for producing monoclonal antibodies. Used this methodology to discover some of the first cell-type molecular markers, which have enriched understanding of brain development and plasticity.

Steven E. Hyman

Harvard University, Cambridge, MA

Professor of Neurobiology and Provost. Scientist at the intersection of molecular neurobiology and psychiatry. Served as Director of Psychiatry Research at Massachusetts General Hospital and as the first faculty Director of Harvard's interfaculty initiative on Mind/Brain/Behavior. Previously Director of the National Institute of Mental Health.

Peter L. Strick

University of Pittsburgh, Pittsburgh, PA

VA Senior Research Career Scientist, Professor of Neurobiology, and Co-Director, Center for the Neural Basis of Cognition. Authority on brain circuitry and motor behavior. Unraveled the matrix of interconnections that forms the basis of the brain's motor systems and provided a framework for understanding the cognitive control of normal movement and movement disorders. Served as Editor in Chief of the *Journal of Neurophysiology*.

Sten Grillner (FHM)

Karolinska Institute, Stockholm, Sweden

Professor of Neurophysiology and Behavior. Made fundamental discoveries in the neurophysiology of the motor function of the spinal cord. Elucidated the locomotion-related spinal circuitry of the lamprey with respect to connectivity, neurophysiology, biophysics, pharmacology, and neural modeling.

Richard G. M. Morris (FHM)

University of Edinburgh, Edinburgh, United Kingdom

Professor of Neuroscience. Pioneered the study of spatial memory in rodents by devising a navigational water maze (the Morris maze). Used this and other methods to illuminate the role of the hippocampus in memory. Discovered the role of NMDA receptors in spatial learning.

Section 4: Evolutionary and Population Biology and Ecology

Ted J. Case

University of California, San Diego, CA

Professor of Biology. Ecologist known both for empirical and theoretical work, including studies of the mechanisms of species invasions. Developed theories of alternative stable states in communities. Defined concepts and methods for measuring higher-order (multispecies) interactions. Developed theories of spatial coevolution and continental biogeography.

Bernd Heinrich

University of Vermont, Burlington, VT

Emeritus Professor of Biology. Research biologist and nature writer. Pioneered studies of insect thermoregulation and pollination energetics. Author of *Bumblebee Economics*, *Ravens in Winter*, and *The Hot-blooded Insects*.

Bruce R. Levin

Emory University, Atlanta, GA

Samuel Candler Dobbs Professor of Biology. Pioneer in the study of the population biology and evolution of bacteria and their viruses and plasmid. Elucidated resource-based competition, host-parasite coevolution, genetic diversity, and the genetic structure of bacterial populations. Current research includes theoretical and experimental studies of the evolution of virulence in microparasites, and the epidemiology and within-host

population and evolutionary dynamics of bacterial infections, antibiotic treatment, antibiotic resistance and its control.

Michael John Novacek

American Museum of Natural History, New York, NY

Senior Vice President, Provost of Science, and Curator of Paleontology. Advanced understanding of mammalian evolution and relationships using diverse evidence ranging from fossils to genes. Made discoveries in the field that have fundamentally changed views of vertebrate evolution at key intervals. Noted author and spokesperson for the natural sciences.

Stuart L. Pimm

Duke University, Durham, NC

Doris Duke Chair of Conservation Ecology. Delineated structures of ecological food webs, the reasons why only certain invading species succeed and become pests. Elucidated factors determining expected extinction times for plant and animal populations. Applied these insights to problems of conservation biology.

Loren H. Rieseberg

Indiana University, Bloomington, IN

Class of '54 Professor of Biology. Merged modern tools of genome analysis with classic and innovative approaches in ecology to demonstrate the relevance of hybridization and chromosomal rearrangements in evolution. Pioneered the application of genetic map-based approaches to natural populations and developed wild sunflowers into a leading plant model for studies of speciation.

Gene E. Robinson

University of Illinois at Urbana-Champaign, Urbana, IL

G. William Arends Professor of Integrative Biology and Director of the Neuroscience Program. Entomologist. Elucidated the endocrine, neural, and genetic regulation of behavior in social insects at both the individual and colony levels. Advanced understanding of the role of genes, hormones, and neurochemicals in the evolution of social behavior.

Bess B. Ward

Princeton University, Princeton, NJ

Professor of Geosciences. Biological oceanographer whose work unites the fields of microbiology and geochemistry. Developed immunological and molecular probes for quantification of functionally related organisms and coupled these with autoradiographic and isotopic analyses to link the oceanic population to global reaction rates, forcing major revisions in understanding the marine nitrogen cycle.

Bryan C. Clarke (FHM)

University of Nottingham, Nottingham, United Kingdom

Professor Emeritus of Genetics. Demonstrated the widespread occurrence and importance of frequency-dependent selection in nature. Helped to explain such diverse phenomena as geographical variation in gene frequencies, evolutionary dynamics of host-parasite interactions, speciation mechanisms in snails, and the maintenance of genetic variation in human populations.

Rodolfo Dirzo (FHM)

Universidad Nacional Autónoma de México, Mexico City, Mexico

Professor of Ecology. Leading tropical forest ecologist and conservation biologist. Studied the dynamics of tropical forests and the evolution of plant-animal interactions. Conducted classical experimental studies on the significance to the ecosystem of the loss of large herbivores from tropical forests. Documented the causes and rates of tropical deforestation.

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

Edward J. Benz, Jr.

Dana-Farber Cancer Institute, Boston, MA

President and CEO. Academic hematologist whose demonstration that Cooley's Anemia is due to a deficiency of beta globin messenger RNA was the first verification that molecular biology could be applied to the study of human disease. Made contributions to the fields of cell disorders, gene regulation, and membrane biology.

Charles J. Epstein

University of California, San Francisco, CA

Professor of Pediatrics and Chief, Division of Medical Genetics. Conducted research on the development of animal models for studying the pathogenesis of Down's syndrome and the genetic control of oxygen-free radical metabolism. Played a leading role in guiding the development of medical genetics into a recognized and independent medical specialty and in shaping many of its research and clinical institutions. President-elect, American College of Medical Genetics.

Jeffrey Ivan Gordon

Washington University School of Medicine, St. Louis, MO

Dr. Robert J. Glaser Distinguished University Professor and Head of Molecular Biology and Pharmacology. Conducts research in gastrointestinal development. Devised mouse models that have provided insight into stem cell biology, epithelial cell renewal, and the molecular foundations of symbiotic host-bacterial relationships in the gut. Discovered and characterized the enzyme responsible for protein N-myristoylation and its biological significance.

James Larry Jameson

Northwestern University Feinberg School of Medicine, Chicago, IL

Irving S. Cutter Professor and Chair of Medicine. Unraveled steps in the complex genetic cascade that governs reproduction and thyroid hormone action through studies of naturally occurring mutations in human genes. Research links the functional effects of mutations with clinical and molecular pathophysiology, leading to a new understanding of human endocrine development and hormone action.

Jay A. Levy

University of California, San Francisco, CA

Professor of Medicine. Conducted retrovirus research, highlighted by the independent discovery of HIV and earlier xenotropic viruses, that yielded crucial information on virus-host cell interactions. Recognized novel CD8+ cell noncytotoxic anti-HIV responses and identified natural anti-HIV factors. Discoveries have far-reaching importance for treatment and vaccine development.

Joseph Roy Nevins

Duke University Medical Center, Durham, NC

James B. Duke Professor and Chairman of Molecular Genetics and Microbiology; Director, Duke Center for Genome Technology; Investigator, Howard Hughes Medical Institute. Elucidated mechanisms that regulate cell proliferation and that contribute to cancer development. Discovered the E2F transcription factor, discovered that E2F is a functional partner with the retinoblastoma tumor suppressor, and demonstrated the role of the Rb-E2F pathway in the control of cell-cycle progression.

Thalia Papayannopoulou

University of Washington, Seattle, WA

Professor of Hematology. Conducts research in hematology with an emphasis on stem cell biology. Improved understanding of the mechanisms of stem cell mobilization and stem cell homing. Showed (with George Stamatoyannopoulos) that fetal hemoglobin can be induced by perturbations of erythropoiesis by cytotoxic drugs, providing the basis for the introduction of cytotoxic drug treatment in hemoglobinopathies.

George Stamatoyannopoulos

University of Washington, Seattle, WA

Professor of Medicine (Medical Genetics) and Genome Sciences. Conducts research in molecular hematology, including the cellular control of hemoglobin switching. Showed (with Thalia Papayannopoulou) that fetal hemoglobin can be induced by perturbations of erythropoiesis by cytotoxic drugs, providing the basis for the introduction of cytotoxic drug treatment in hemoglobinopathies.

George D. Yancopoulos

Regeneron Pharmaceuticals, Inc., Tarrytown, NY

President, Research Laboratories, and Chief Scientific Officer. Elucidated and biologically characterized several families of cytokine and tyrosine kinase receptors and their ligands, and demonstrated their roles in regulating neural, muscular, and vascular development. Originated the technique of epitope tagging to define receptor complex composition and provided unifying concepts for the understanding of receptor mediated signaling.

Lucio Luzzatto (FHM)

Instituto Nazionale per la Ricerca sul Cancro (IST), Genova, Italy

Scientific Director. Made contributions to the understanding of glucose-6-phosphate dehydrogenase (G6PD) deficiency. Established its role in resistance to malaria, cloned the cDNA and the gene, and characterized several mutations causing the deficiency. Using G6PD as a marker, demonstrated the clonal origin of paroxysmal nocturnal hemoglobinuria (PNH) and pioneered studies of its genetic basis.

Class III: Social Sciences

Section 1: Social Relations (Anthropology, Archaeology, Sociology, Social and Developmental Psychology, Education, Demography, Geography)

Marilynn B. Brewer

Ohio State University, Columbus, OH

Professor of Psychology. Field work established that ethnocentrism yields negative judgments about particular characteristics of outgroups, while evaluation of ingroups tends to be uniformly positive. Conducted experiments that indicated that intergroup discrimination is driven primarily by ingroup favoritism rather than outgroup derogation.

Dedre Gentner

Northwestern University, Evanston, IL

Professor of Psychology, Education, and Social Policy, and Director of the Cognitive Science Program. Research has focused on analogy and similarity in learning and reasoning. Structure-mapping theory led to insights on the role of relations in conceptual processing and to a computational model of similarity. Contributions include work on mental models and on the development of cognition and language.

David C. Grove

University of Florida, Gainesville, FL

Professor of Anthropology. Authority on the period when Mexican cultures first displayed hereditary inequality and chiefly power. Directed excavations on the Mexican Altiplano, temperate Morelos, and the Veracruz Coast that furthered understanding of lowland-highland heterogeneity and interaction.

Michael Hechter

University of Washington, Seattle, WA

Professor of Sociology. Developed new theoretical approaches to questions in comparative social history and the origins of values and norms. Author of *Internal Colonialism: The Celtic Fringe in British National Development*, *Principles of Group Solidarity*, and *Containing Nationalism*.

Roger E. Kasperson

Stockholm Environment Institute, Stockholm, Sweden

Executive Director. Geographer. Extended the scientific assessment of risk into the social realm, compared its use in national cultures and multinational corporations, created a theory for the social amplification and attenuation of risk, analyzed the moral bases of technological choice, and assessed regional environmental degradation.

Mark R. Lepper

Stanford University, Stanford, CA

Professor and Chair of Psychology. Made contributions to the understanding of social-psychological aspects of motivation. Conducted theoretical and empirical studies of the distinction between intrinsic and extrinsic motivation and of their educational effects. Applies this research to identify the most effective motivational and instructional techniques of expert tutors.

Donald G. Saari

University of California, Irvine, CA

Distinguished Professor of Economics and Mathematics; Director, Institute for Mathematical Behavioral Sciences. Conducted analysis of dynamical systems of classical models of economic equilibrium, which showed nonconvergence, and of the Newtonian n-body systems, which showed collision orbits are improbable. Created geometric description to explain voting paradox.

Norbert Schwarz

University of Michigan, Ann Arbor, MI

Research Professor, Institute for Social Research; Professor of Psychology; Professor of Marketing. Conducted studies of judgment, revealing biases in information processing and decision-making. Research interests focus on the interplay of feeling and thinking, the role of conversational processes in reasoning, and the nature of mental construal processes in judgment.

Robert James Sharer

University of Pennsylvania, Philadelphia, PA

Shoemaker Professor of Anthropology. Contributor to new models of ancient Maya civilization, particularly in the area of secondary state formation. Leader in combining excavation data with hieroglyphic writing to illuminate the political and ritual behaviors of Maya rulers from A.D. 400 – 900. Author of *The Ancient Maya*.

Rubie S. Watson

Harvard University, Cambridge, MA

Curator of Comparative Ethnology. Specialist on Chinese marriage ceremonies. Published on Chinese women's patterns of culture and lineage organization among Cantonese villagers. At the Peabody Museum, reintroduced material culture into mainstream sociocultural anthropology.

Yu Xie

University of Michigan, Ann Arbor, MI

Otis Dudley Duncan Professor of Sociology and Statistics; Research Professor, Institute for Social Research. Developed statistical tools for comparative analysis of social mobility and human fertility. Deepened understanding of gender differences in science careers, socioeconomic outcomes of Asian Americans, and social and economic inequality in China.

Section 2: Economics

Abhijit Vinayak Banerjee

Massachusetts Institute of Technology, Cambridge, MA

Professor of Economics; Director, Poverty Action Lab. Applied economic theorist with broad interests. Made contributions to social learning in games, economic analysis of income and wealth distribution, and the application of contract theory to a range of issues involving developing economies. Recent work helped establish development economics as a subfield within applied economics.

Jeremy Israel Bulow

Stanford University, Stanford, CA

Richard Stepp Professor of Economics, Graduate School of Business. Developed the first formal model of durable goods and characterized firms' interactions through "strategic substitutes and complements" (with Geanakoplos and Klemperer). Made contributions to sovereign debt (with Rogoff), auction theory (with Roberts and Klemperer), tax and labor policy (with Summers), and pension theory.

Avner Greif

Stanford University, Stanford, CA

Bowman Family Professor in the Humanities and Sciences. Expert on European economic history, institutional economics and development. Applied game theory and historical analysis in the study of the development of economic institutions, their interrelations with political, social, and cultural factors, and their impact on economic growth.

Maurice Obstfeld

University of California, Berkeley, CA

Class of 1958 Professor of Economics. Contributed to the modern theory of the interactions of employment, output, interest rates, price levels, and exchange rates among countries in a global economy. Most recent work considers the role of capital flows in the major fluctuations experienced by a number of developing countries.

Christina Romer

University of California, Berkeley, CA

Class of 1957 Professor of Economics. Researcher in historical macroeconomics. Work showed that much of the apparent stabilization of the postwar American economy was an illusion caused by inconsistent measurement techniques. Used new data sources to understand the sources and effects of monetary policy actions and analyzed the causes of the Great Depression.

Mark Allen Satterthwaite

Northwestern University, Evanston, IL

Professor of Managerial Economics and A. C. Buehler Professor of Hospital and Health Services Management. Research focuses on economic institutions' ability to induce self-interested individuals to reveal their preferences accurately so that efficient allocations can be implemented. The Gibbard-Satterthwaite theorem in social choice and the Myerson-Satterthwaite theorem in microeconomics established fundamental limits on institutions' abilities to accomplish this.

Michael Woodford

Columbia University, New York, NY

John Bates Clark Professor of Political Economy. Monetary theorist and leader in the development of an integrated analysis of monetary and fiscal policy. Codeveloper of a general equilibrium model with Keynesian properties.

Guy Laroque (FHM)

INSEE-CREST (National Institute of Statistics and Economic Studies), Paris, France

Director, Macroeconomics Laboratory. Produced theoretical models, econometric techniques, and empirical work on a variety of problems. Work encompasses monetary theory, business-cycle models, inventory models, housing markets with fixed costs, theoretical and empirical analysis of commodities markets, and social security.

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

James E. Alt

Harvard University, Cambridge, MA

Frank G. Thomson Professor of Government. Made interdisciplinary contributions in political economy. Conducts research on parties, political institutions, and fiscal policy in industrial countries. Founding Director of the Center for Basic Research in the Social Sciences. Coedited the series "The Political Economy of Institutions and Decisions."

Jonathan Bendor

Stanford University, Stanford, CA

Walter and Elise Haas Professor of Political Economics and Organizations. Contributed to the study of bureaucracy (e.g., redundancy, delegation, and other ways of easing individual-level cognitive constraints ; causes and effects of political control), theory of collective action (e.g., how uncertainty affects cooperation ; the evolution of norms), and the theory of bounded rationality (e.g., satisficing ; incrementalism).

David Collier

University of California, Berkeley, CA

Professor of Political Science. Leading scholar in comparative and political methodology whose research has focused on Latin America. Work bridges quantitative and qualitative methods.

William Arthur Galston

University of Maryland, College Park, MD

Saul I. Stern Professor of Civic Engagement. Published five books and dozens of scholarly articles on political philosophy. Leader in efforts to revitalize civic learning and engagement. Former deputy assistant to President Clinton for domestic policy.

Nancy Lipton Rosenblum

Harvard University, Cambridge, MA

Senator Joseph Clark Professor of Ethics in Politics and Government. Leading scholar in political theory in both the historical and analytic mode. Author of *Bentham's Theory of the Modern State*, *Another Liberalism*, and *Membership and Morals*.

Stephen Skowronek

Yale University, New Haven, CT

Pelatiah Perit Professor of Political and Social Science. Authority on the development of American national institutions. Instrumental in building a field of American political development in contemporary political science and in fostering a historical-institutional approach to political scholarship. Research on presidential politics recasts the uses of political history for understanding leadership in contemporary America.

Rogers M. Smith

University of Pennsylvania, Philadelphia, PA

Christopher H. Browne Distinguished Professor of Political Science. Authority on U.S. constitutional law and advocate of historical-institutional approaches to public law studies. Devised an influential account of American citizenship and enriched debates over the roles of race, class, and gender in American politics.

Jean F. P. Blondel (FHM)

European University Institute, Florence, Italy

External Professor. Cofounder and first Executive Director of the European Consortium for Political Research. Worked to transform European political science from a fragmented, nationally confined, and professionally underdeveloped discipline by establishing an international enterprise that now has over two hundred fifty member departments and over four thousand affiliated scholars. Awarded the Johan Skytte Prize in Political Science.

Section 4 : Law (including the Practice of Law)

Philip Chase Bobbitt

University of Texas Law School, Austin, TX

A. W. Walker Centennial Chair in Law. Contributed to the conceptualization of American constitutional decision-making, to the understanding of the development of the modern state, and to the intricacies of national security policy. Author of *Constitutional Interpretation* and *The Shield of Achilles : War, Peace and the Course of History*.

George Philip Fletcher

Columbia Law School, New York, NY

Cardozo Professor of Jurisprudence. Has written and lectured in the fields of torts, criminal law, comparative law, and constitutional law. Published nine books and over a hundred articles. Received a Coif Award for *Rethinking Criminal Law*.

Michael J. Graetz

Yale Law School, New Haven, CT

Justus S. Hotchkiss Professor of Law. Recognized expert on public finance. Contributed to the understanding and improvement of federal tax policy and social insurance policy through academic scholarship and public service.

Joel F. Handler

University of California at Los Angeles School of Law, Los Angeles, CA

Professor of Law. Authority on social welfare law and poverty. Conducted empirical studies on poverty, political participation, and administration of justice. Author of *Social Movements and the Legal System*, *Down From Bureaucracy*, and *The Poverty of Welfare Reform*. President, Law and Society Association (1991 – 1993).

Daniel J. Meltzer

Harvard Law School, Cambridge, MA

Story Professor of Law. Authority on federal jurisdiction, American federalism, and criminal law and procedure. Coauthor of *Hart & Weschler's The Federal Courts and the Federal System*. Published on, inter alia, sovereign immunity,

constitutional remedies, and federal habeas corpus jurisdiction.

Thomas Wendell Merrill

Columbia University Law School, New York, NY

Charles Keller Beekman Professor. Legal scholar specializing in administrative law, property law, constitutional law, and the Supreme Court. Recent work focuses on understanding the concept of property in constitutional law and explaining standardization in property law. Served as Deputy Solicitor General (1987 – 1990).

Diane P. Wood

United States Court of Appeals for the Seventh Circuit, Chicago, IL

Circuit Court Judge. Leading scholar of comparative law. Expert in antitrust law, federal civil procedure, and international trade and business. Distinguished service in government (U.S. Department of Justice) and in the academic world (extensive publications on international comparative law).

Class IV: Humanities and Arts

Section 1: Philosophy and Religious Studies

Ned Block

New York University, New York, NY

Professor of Philosophy and Psychology. Leading philosopher of mind and psychology. Known for critical reactions to functionalism and for a long series of papers, spanning three decades, which maintains the irreducibility of qualia, sensations, imagery, and consciousness to either representationalist or functionalist viewpoints. Also known for work on the IQ controversy.

Alvin Ira Goldman

Rutgers University, New Brunswick, NJ

Board of Governors Professor of Philosophy and Cognitive Science. Contributed to epistemology, philosophy of mind, metaphysics, and political and legal theory. Championed the causal theory and reliabilism in epistemology and the simulation theory of mind reading in cognitive science. Author of *Epistemology and Cognition* and *Knowledge in a Social World*.

Wayne A. Meeks

Yale University, New Haven, CT

Woolsey Professor of Biblical Studies Emeritus. Influential scholar in New Testament studies. Helped shape the field with work on the social origins of early Christianity and early Christian literature. Author of *The Origins of Christian Morality* and *The First Urban Christians*.

Mark A. Noll

Wheaton College, Wheaton, IL

McManis Professor of Christian Thought. Author on and historian of American Christianity, especially the development of religious thought in America, and the rise and long cultural hegemony of Protestant Evangelicalism.

Peter Albert Railton

University of Michigan, Ann Arbor, MI

John Stephenson Perrin Professor of Philosophy. Made contributions to ethics and the philosophy of science. Known in ethics for a defense of moral realism. Advanced understanding of scientific explanation and probability. Author of *Facts, Values, and Norms: Essays Toward a Morality of Consequence*.

Samuel Scheffler

University of California, Berkeley, CA

Class of 1941 World War II Memorial Professor of Philosophy and Law. Leading moral and political philosopher. Books include *The Rejection of Consequentialism, Human Morality*, and *Boundaries and Allegiances*. Advisory Editor of *Philosophy and Public Affairs*.

Section 2: History

James L. Axtell

College of William & Mary, Williamsburg, VA

William R. Kenan, Jr. Professor of Humanities. Historian of American colonialism, ethnohistory, and education. Has written widely on Native American history and culture. Author of *The Invasion Within: The Contest of Cultures in Colonial North America*. Also known for studies of higher education in the United States.

Ira Berlin

University of Maryland, College Park, MD

Distinguished University Professor. Expert on slavery and emancipation in the Americas and author of *Generations of Captivity: A History of African American Slavery, Many Thousands Gone: The First Two Centuries of Slavery in North America*, and *Slaves Without Masters: The Free Negro in the Antebellum South*. Founder of the Freedman and Southern Society Project and past president of the Organization of American Historians.

Dipesh Chakrabarty

University of Chicago, Chicago, Illinois

Laurence A. Kimpton Distinguished Service Professor of History and South Asian Languages and Civilizations. Founding member of the journal *Subaltern Studies*. Combines social history of modern India with postcolonial historiography in works that influence the field at large. Recent books include *Provincializing Europe: Postcolonial Thought and Historical Difference* and *Habitations of Modernity*.

G. Robert A. Conquest

Stanford University, Stanford, CA

Fellow, Hoover Institution. Noted historian of the Soviet Union. Revealed Stalin's purges and forced collectivization of Soviet peasantry to the Western world. Books include *The Great Terror* and *Reflections on a Ravaged Century*. Has also written many works of poetry, criticism, verse translation, and fiction.

Michael A. Cook

Princeton University, Princeton, NJ

Cleveland E. Dodge Professor of Near Eastern Studies. Authority on Muslim history and thought. Published books on early Muslim dogma, Muhammad, and the Koran. Recently published *Commanding Right and Forbidding Wrong in Islamic Thought*.

Anne Firor Scott

Duke University, Durham, NC

W. K. Boyd Professor of History Emerita. Pioneer of women's history in the United States. Noted for her scholarly work and publications, including *The Southern Lady, Making the Invisible Woman Visible, Natural Allies*, and *Unheard Voices*. Past president of the Organization of American Historians.

William Sewell

University of Chicago, Chicago, IL

Max Palevsky Professor of Political Science and History. Works on the history of early modern and modern France, especially the Revolutions of 1789, 1830, and 1848; and on the relationship between history and social theory. Recipient of American Sociological Association awards for articles in historical sociology, cultural sociology, and sociological theory.

Jean Strouse

New York Public Library, New York, NY

Director, Dorothy and Lewis B. Cullman Center for Scholars and Writers. Writer, biographer, and historian. Wrote a biography of Alice James, which won the Bancroft Prize in American History and Diplomacy, and a biography of J. Pierpont Morgan. Recipient of MacArthur and Guggenheim fellowships. Past president of the Society of American Historians.

(Albert) Raymond (Maillard) Carr (FHM)

Oxford University, Oxford, United Kingdom

Honorary Fellow, Christ Church College and St. Antony's College. Historian of modern Spain. Helped to create St. Antony's College and served as Warden there for nearly twenty years. Editor of and contributor to *Spain: A History*.

Emilio Gabba (FHM)

University of Pavia, Pavia, Italy

Professor Emeritus. Historian of the classical world. Known for work on a variety of problems, including agrarian history, the Romanization of Italy, and classical historiography. Member of the Accademia Nazionale dei Lincei in Italy.

Jürgen Kocka (FHM)

Wissenschaftszentrum Berlin für Sozialforschung, Berlin, Germany

President. Historian. Author of numerous studies of modern, European, and comparative history. Advocate of social science approaches to history. Played a role as a member of the German Scientific Advisory Council in restructuring East German academic institutions after unification.

Section 3: Literary Criticism (including Philology)

Joan W. Bresnan

Stanford University, Stanford, CA

Sadie Dernham Patek Professor in Humanities. Leading figure in syntactic theory. Originated the theory of Lexical-Functional Grammar and its optimality-theoristic extensions. Conducted quantitative investigations revealing that grammar is inherently variable and stochastic in nature, a highly plastic cognitive system sensitively tuned to the frequencies of the environment.

Richard H. Brodhead

Duke University, Durham, NC

President. A. Bartlett Giamatti Professor of English at Yale University and Dean of Yale College (through June 30, 2004). Specialist on American literature. Published books on Hawthorne, Melville, Faulkner, Eudora Welty, and Richard Wright and edited the journals of Charles W. Chestnutt. Author of *The Good of this Place: Values and Challenges in College Education*.

Brian D. Joseph

Ohio State University, Columbus, OH

Distinguished University Professor of Linguistics and the Kenneth E. Naylor Professor of South Slavic Linguistics. Leading specialist in the linguistic structure and history of the Greek language. Authority on Balkan linguistics and on general historical linguistics. Known for his monograph on language change through contact in the Balkans. Research spans the Indic, Germanic, Italic, and Anatolian language groups.

Gustavo Pérez-Firmat

Columbia University, New York, NY

David Feinson Professor of Humanities. Poet, critic, and novelist. Has written books on Spanish, Latin American, and Latino literature and culture, among them *Idle Fictions*, *The Cuban Condition*, *Life on the Hyphen*, and *Tongue Ties*. Author of the memoir *Next Year in Cuba* and several volumes of poetry.

Janet Breckenridge Pierrehumbert

Northwestern University, Evanston, IL

Professor of Linguistics. Work combines computational and experimental methods to investigate language sound structure. Devised a model of intonation that has been influential in theoretical linguistics, phonetics, speech technology, and psycholinguistics. One of the founders of laboratory phonology. Current research explores how phonological categories and grammars are formed in individuals and populations.

William H. Pritchard

Amherst College, Amherst, MA

Henry Clay Folger Professor of English. Author of numerous books and essays, including *Updike: America's Man of Letters*, *Randall Jarrell: A Literary Life*, and *Frost: A Literary Life Reconsidered*.

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

Ann Beattie

University of Virginia, Charlottesville, VA

Novelist and short story writer. Edgar Allen Poe Professor of Creative Writing. Has written seven novels, including *Chilly Scenes of Winter* and *Picturing Will*, and seven collections of short stories. Recipient of an award for excellence from the American Academy and Institute of Arts and Letters.

Francine du Plessix Gray

Warren, CT

Novelist and biographer. Author of *Rage and Fire: A Life of Louise Colet, Lovers and Tyrants*, *Soviet Women: Walking the Tightrope*, a recent biography of Simone Weil, and *At Home with the Marquis de Sade*, which was a finalist for the Pulitzer Prize. Regular contributor to *The New Yorker*.

Sharon Olds

New York University, New York, NY

Poet and Professor of English. Author of numerous collections of poetry. Winner of the National Book Critic's Circle Award for *The Dead and the Living*. New York State Poet. Established the Writing Program at Goldwater Hospital, which brings young poets into the hospital to help severely disabled patients in their writing.

Carl Phillips

Washington University in St. Louis, St. Louis, MO

Poet. Professor of English and African and Afro-American Studies. Author of seven books of poetry. Recipient of the Kingsley Tufts Award, a Guggenheim Fellowship, and an Award in Literature from the American Academy of Arts and Letters. Translated Sophocles' *Philoctetes* and wrote a book of essays on the art of poetry.

Section 5: Visual and Performing Arts – Criticism and Practice

John Baldessari

University of California, Los Angeles, CA

Professor of Art. Conceptual artist who invented a new approach to photography. Uses the latest techniques to create collages juxtaposing photographs, words, and colors to spark new associations. Known for work with images taken from old Hollywood black-and-white movie stills.

Paul Franklin Berliner

Northwestern University, Evanston, IL

Professor of Ethnomusicology. Research revealed the rigors of improvisation within the oral traditions of Zimbabwean mbira music and American jazz. Interprets the impact of war on cultural legacies in Zimbabwe by contextualizing processes of music learning, transmission, and innovation in relation to religious and sociopolitical life in Zimbabwe.

John Corigliano

The Juilliard School, New York, NY

Composer and Professor of Composition. Known for his opera *The Ghosts of Versailles* and two symphonies: *New Grove's*, a "memorial to the victims of AIDS," and the *Symphony No. 2*. Winner of the 2001 Pulitzer Prize in Music.

Mario Davidovsky

Harvard University, Cambridge, MA

Composer and Fanny P. Mason Professor of Music Emeritus. Has been a central force in the development of electronic music in this country. Working with Milton Babbit at the Columbia-Princeton Electronic Music Center, developed many of the techniques later adopted by generations of younger composers. Has written extensively for conventional instruments.

Brice Marden

New York, NY

Visual Artist. Leading American minimal abstractionist creating monochromatic works of art. Investigates the subtle harmonies and optical effects obtained by juxtaposing broad areas of similar hues with different values of light and dark. In the late 1980s effected an abrupt change, incorporating Chinese cultural and artistic influences: calligraphy, taoism, scholars' rocks, and poetry. Continues to work in this complex painterly yet linear mode.

Ed Ruscha

Los Angeles, CA

Painter, printmaker, creator of books, and filmmaker. Associated with the Pop Art movement. Figure in contemporary American art. Has been exhibited internationally for three decades and is represented in major museum collections throughout the world.

Judith Tick

Northeastern University, Boston, MA

Matthews Distinguished University Professor. Musicologist, pioneer in the study of women and music, and innovator in the field of musical biography. Associate editor of the *Musical Quarterly*.

Work ranges across historical periods, theoretical frameworks, and artistic styles.

Joan Tower

Bard College, Annandale-on-Hudson, NY

Composer and Asher Edelman Professor of Music. Composed orchestral and chamber music. Founded the Da Capo Chamber Players (received the Naumburg Award for Chamber Music in 1973). Composer-in-residence with the Saint Louis Symphony (1985 – 1987).

James Turrell

Flagstaff, AZ

Visual artist. His created spaces isolate light, giving it form, depth, and mass. Work suggests a painterly sensibility in three dimensions, while commanding an investigation of the act of seeing. Recipient of Guggenheim and MacArthur Fellowships.

Mary Alice Zimmerman

Northwestern University, Evanston, IL

Professor of Performance Studies. Writer and director known for adapting classical texts to the stage. Winner of a MacArthur Fellowship and a 2002 Tony Award for Direction. Works include *Metamorphoses*, *The Odyssey*, *The Notebooks of Leonardo da Vinci*, *Journey to the West*, and *The Arabian Nights*.

Ellen Taaffe Zwilich

Florida State University, Tallahassee, FL

Composer and Francis Eppes Professor of Music. Won the Pulitzer Prize in 1983 for *Symphony No. 1*. Composed three other symphonies, concertos, and music for chamber ensembles. Held the first Composer's Chair awarded by Carnegie Hall.

Lucian Freud (FHM)

London, United Kingdom

Painter. Britain's best-known contemporary portrait painter. Specializes in portraits and nudes, often observed in arresting close-up.

Anselm Kiefer (FHM)

Barjac, France

Painter. Internationally celebrated for imposing operatic works dealing with the historical, mythological, and literary themes that animate postwar German culture. Work balances the dual purposes of visually powerful imagery and intellectually critical analysis.

Gerhard Richter (FHM)

Staatliche Kunstakademie Düsseldorf, Düsseldorf, Germany

Professor of Art. Conceptual painter who is considered a master of deconstruction of the formal conventions of painting. Has mastered a diversity of genres, including gestural abstraction, landscape, portraiture, and photo-based painting.

Class V: Public Affairs, Business, and Administration

Section 1: Public Affairs, Journalism, and Communications

Loren Frank Ghiglione

Northwestern University, Evanston, IL

Dean, Medill School of Journalism. Has directed two other journalism programs, owned and operated New England newspapers, and served as president of the American Society of Newspaper Editors and as a Pulitzer Prize juror. Wrote or edited six books on journalism.

Richard C. Holbrooke

Perseus, LLC, New York, NY

Vice Chairman. Served in the Kennedy, Johnson, Carter, and Clinton administrations in many roles, including U.S. Ambassador to Germany, Assistant Secretary of State for Europe, American negotiator for the Dayton Accords, U.S. Ambassador to the United Nations, and special envoy to Kosovo. Author of *To End a War*.

Norman Jay Ornstein

American Enterprise Institute, Washington, D.C.

Resident Scholar. Illuminated the complexities of policy making in Washington, through numerous books, research studies, and commentaries for national television. Regular commentator for PBS News. Senior Counselor to the Continuity of Government Commission. Convener of the Campaign Finance Reform Working Group. Coauthor of *Vital Statistics on Congress*.

Paul Spyros Sarbanes

United States Senate, Washington, D.C.

U.S. Senator. Democratic senior Senator from Maryland. Won re-election in 2000 to an unprecedented fifth term. Serves as the Ranking Member of the Senate Banking, Housing, and Urban Affairs Committee and as a senior member of the Foreign Relations, Budget, and Joint Economic Committees. Author of the Sarbanes-Oxley Act to set standards for accounting and corporate responsibility.

Timothy Endicott Wirth

United Nations Foundation, Washington, D.C.

President. As Congressman, Senator, Under Secretary of State, and President of the United Nations Foundation, played a role in the formulation and enactment of policies to address the problems posed by population growth, climate change, loss of wilderness, and resource mismanagement.

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

Leonore Annenberg

Annenberg Foundation, Radnor, PA

President, Chair, and Sole Director. Associated with a diverse group of charitable, cultural, and educational institutions, including the Annenberg Schools for Communication. Trustee emeritus, Acquisitions Committee, Metropolitan Museum of Art; Trustee, Philadelphia Museum of Art; Managing Director, Metropolitan Opera. Recipient of the Pat Nixon Ambassador of Goodwill Award. Awarded an honorary Commander of the Most Excellent Order of the British Empire by Queen Elizabeth II in recognition of her contribution to the preservation of important British cultural and educational institutions, and her work promoting British-American relations.

Henry H. Arnhold

Arnhold & S. Bleichroeder Holdings, Inc., New York, NY

Chairman. Serves as President of the Arnhold Foundation, which supports environmental and animal welfare organizations. Board member, New School University and Conservation International. Serves on the American Council on Germany, the Council on Foreign Relations, and the Foreign Policy Association.

John Bogle

Vanguard Group, Valley Forge, PA

Founder. Pioneered index funds, which implement the central findings of modern portfolio theory. Led the industry in eliminating sales loads and reducing fund expenses. Author of *John Bogle on Investing*, *Common Sense on Mutual Funds*, and *Bogle on Mutual Funds*.

Alexander W. Dreyfoos, Jr.

West Palm Beach, FL

Retired Chairman and Chief Researcher, Dreyfoos Group. Invented the Video Color Negative Analyzer, which received an Academy Award from the Academy of Motion Picture Arts and Sciences. Founding Chairman of the Raymond F. Kravis Center for the Performing Arts. Lifetime Member of the MIT Corporation and of the Board of the Scripps Research Institute. Founder of the Palm Beach County Council of the Arts.

John F. McDonnell

McDonnell Douglas Corporation, St. Louis, MO

Retired Chairman of the Board. Served as CEO from 1988 – 1994. Retired when McDonnell Douglas merged with Boeing in 1997. Director of Boeing. Chairman of the Board and longtime Trustee of Washington University in St. Louis.

Gerald Rosenfeld

Rothschild North America, New York, NY

CEO. Leading investment banker. Key investment banking advisory responsibilities in the industrial and technology sectors. Has shown a strong commitment to

corporate responsibility. Teaches finance at New York University. Member of the NYU Board of Overseers and of the Executive Committee of the Jewish Theological Seminary.

Robert Gregg Stone, Jr.

Kirby Corporation, New York, NY

Chairman Emeritus. Numerous directorships in business, including the chairmanship of West India Shipping Company, General Energy Company, and the Kirby Corporation. Served for twenty-seven years as a member of the Harvard Corporation (including Senior Fellow, 1995 – 2002).

Anne Tatlock

Fiduciary Trust International, New York, NY

Chairman and CEO of Fiduciary Trust and Vice Chairman and Board Director for Franklin Resources, Fiduciary Trust's parent company. Board member of Merck and Fortune Brands. Trusteeships include American Ballet Theater, Conference Board, Cultural Institutions Retirement System, Howard Hughes Medical Institute, Mayo Foundation, Andrew Mellon Foundation (Chairman, 2003 –), Teagle Foundation, and Vassar College.

Preston Robert Tisch

Loews Corporation, New York, NY

Chairman. Chairman and Co-CEO of a leading NFL football franchise. Distinguished record of public service. Served as U.S. Postmaster General and chaired the New York Convention and Visitors Bureau and the New York City Partnership. Founder and Chairman of Take the Field, an organization that rebuilds public high-school athletic fields in New York City.

Peter V. Ueberroth

Contrarian Group, Newport Beach, CA

Managing Director. Member of the board of directors of the Coca-Cola Company, the Hilton Hotels Corporation, and the Irvine Company. Served as Commissioner of Major League Baseball and as President of the Los Angeles Olympic Organizing Committee responsible for staging the 1984 Olympic Games.

Paul Zuckerman (FHM)

Zuckerman & Associates LLC, London, United Kingdom

Chairman. Also serves as Deputy Chairman of ICAP plc, and as Non-Executive Director of a number of other companies. Formerly an investment banker with Caspian Securities and S. G. Warburg. Treasurer of the International Women's Health Coalition (New York) and the National Art Collection Fund (United Kingdom), and Chairman of the William Walton Trust.

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

Leslie Cohen Berlowitz

American Academy of Arts and Sciences, Cambridge, Massachusetts

Executive Officer. Formerly Vice President for Academic Advancement at New York University. She serves on numerous educational and arts boards.

Carol T. Christ

Smith College, Northampton, Massachusetts

President. Previously Provost and Vice Chancellor at Berkeley. Credited with building top-rated departments. Scholar of nineteenth-century English literature.

Philippe L. de Montebello

Metropolitan Museum of Art, New York, New York

Director. Has led the Metropolitan Museum of Art for over twenty-four years. Presided over the expansion of the museum's permanent collection. Trustee of the New York University Institute of Fine Arts and the American Federation of the Arts. Honored with the Chevalier de la Legion d'Honneur in 1991 and the Spanish Institute Gold Medal Award.

Werner Leonard Gundersheimer

Folger Shakespeare Library, Washington, D.C.

Director Emeritus. Distinguished scholar and administrator. Authored publications in the field of Renaissance studies and served as professor of history (and department chair) at the University of Pennsylvania before assuming the directorship of the Folger Shakespeare Library, a post he held for eighteen years.

Frances Degen Horowitz

City University of New York, New York, NY

President of the Graduate School and University Center. Developed a new campus as a significant urban hub of scholarship, research, and public discourse. Recognized educational leader and developmental psychologist who serves in numerous scientific, educational, and civic capacities. Has worked to bridge academic and public interests locally and nationally.

Curtis W. Meadows, Jr.

University of Texas at Austin, Austin, Texas

Founding Director, RGK Center for Philanthropy and Community Service, and faculty member of the Lyndon B. Johnson School of Public Affairs. Served for eighteen years as President, CEO, and Director of the Meadows Foundation of Texas. Held leadership positions with more than sixty charitable and community organizations. Counsel to the law firm of Thompson and Knight, LLP.

C. D. Mote, Jr.

University of Maryland, College Park, MD

President and Glenn L. Martin Institute Professor of Engineering. Advocate for students and mentorship and for university partnerships with federal laboratories and industry. Former Vice Chancellor and FANUC Chair in Mechanical Systems, University of California, Berkeley. Specialties include dynamics and stability of gyroscopic systems and biomechanics.

William B. Quandt

University of Virginia, Charlottesville, VA

Edward R. Stettinius Professor of Politics. Former Vice Provost for International Affairs. Leading scholar of the Arab-Israeli peace process. Active participant, as a member of the National Security Council staff, in negotiations leading to the Egyptian-Israeli peace treaty. Senior Fellow at the Brookings Institution.

Gerald Schoenfeld

The Shubert Organization and The Shubert Foundation, New York, NY

Chairman. Played a pivotal role in revitalizing the operation and productions of live-performance theaters in many U.S. cities. Advanced community development and civic affairs in New York City and helped lead the effort to renew and improve Times Square and the surrounding area.

Patty Stonesifer

Bill & Melinda Gates Foundation, Seattle, Washington

President and Co-Chair. Leads the foundation in its efforts to improve health and learning around the world. Chairs the executive committee of the Vaccine Fund and sits on the boards of Amazon.com and Viacom.

Guillermo Jaim Etcheverry (FHM)

University of Buenos Aires, Buenos Aires, Argentina

President. Heads one of the largest institutions of higher learning in Latin America. Neurobiologist, educator, and academic leader. Proposals for educational reform are reinvigorating the Argentine educational system.

Ho-Wang Lee (FHM)

National Academy of Sciences, Seoul, Republic of Korea

President. Discovered the Hantaan and Seoul viruses, the etiologic agents of Hemorrhagic fever with renal syndrome (HFRS), in 1976 – 1981. Identified reservoir hosts, the mode of virus transmission, and developed an effective vaccine against HFRS. Contributed to the prevention of hantaviral diseases.

Manuel Martínez-Maldonado (FHM)

Ponce School of Medicine, Ponce, Puerto Rico

President and Dean. Noted scientist, physician, scholar, and public servant. Developed student and residency training programs and curricula, fostered a more equitable policy of organ sharing in the United States, and promoted public-health initiatives, medical education, and research in Latin America.

Visiting Scholars Program

The Visiting Scholars Program (VSP) stimulates and supports research conducted by scholars and practitioners who show promise of becoming leaders in their field, especially those who work on multidisciplinary topics. The program, now in its third year, offers opportunities for Visiting Scholars to carry out their individual research as well as to collaborate with Academy Fellows on shared scholarly or policy-related interests. It also contributes to making the House of the Academy an active research center for intensive scholarship by individuals from diverse disciplinary, institutional, and geographic backgrounds.

Visiting Scholars have the opportunity to join in seminars sponsored by the Academy's program areas as well as to participate in social gatherings and other regularly scheduled Academy activities. Neighboring institutions, including Harvard University, the Boston Public Library, and the Boston Athenaeum, partner with the Academy in the work of the program.

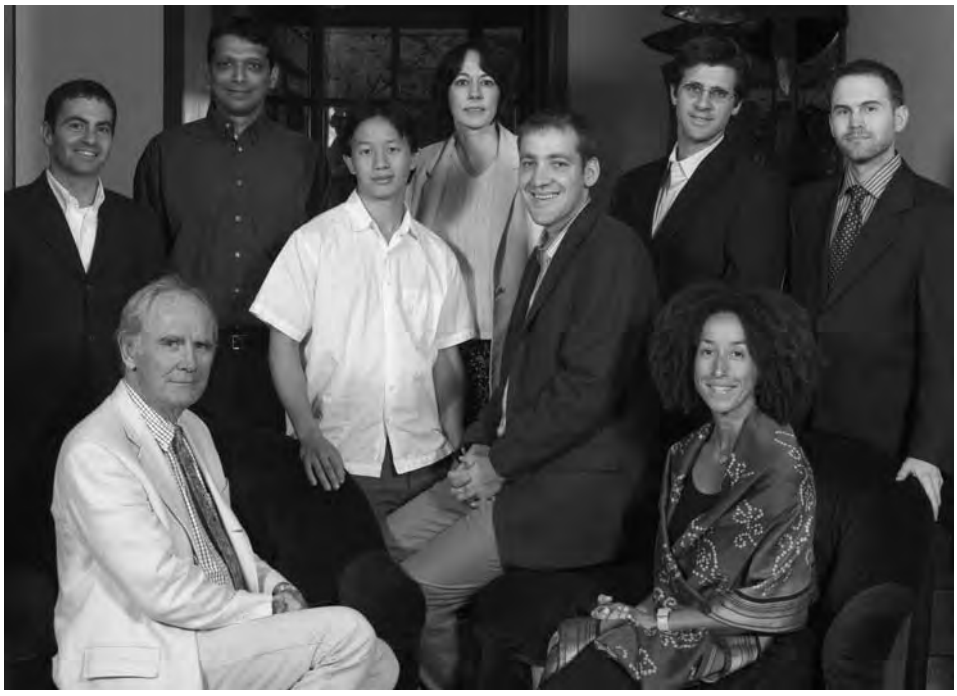
The Visiting Scholars Program is undertaken in collaboration with the Harvard Humanities Center, which provides access to the university's research facilities and works with the Academy to plan joint lectures, seminars, and informal discussions.

Scholars are chosen by means of a national competition. Fellows expert in the candidates' fields review applications, and the resulting recommendations are passed on to a final advisory committee.

A group of more than 40 academic institutions from across the country have become "University Affiliates" of the Academy, with a special interest in developing and supporting the VSP.

Visiting Scholars, 2004 – 2005

Christopher Capozzola – Assistant Professor of History, Massachusetts Institute of Technology. Ph.D., Columbia University. A.B., Harvard College. *Uncle Sam Wants You: Citizenship and Obligations in World War I America*. A study of military conscription; voluntary associations and their dual roles in war mobilization and home front repression; and the rise of legal understandings of civil liberties and citizenship rights, demonstrating how political obligations were tied to coercive practices of citizenship in early twentieth-century American political life.



Front (left to right): Chair of the VSP James Carroll, Hsuan L. Hsu, Robert MacDougall, Cheryl Finley; back (left to right): Christopher Capozzola, Asif Siddiqi, Lisa Szefel, Matthew Lindsay, Christopher Klemek

Cheryl Finley – Assistant Professor of the History of Art, Cornell University. Ph.D., Yale University. B.A., Wellesley College. *Committed to Memory: The Slave Ship Icon in the Black Atlantic Imagination*. An examination of the history, meaning, and use of the leading visual image associated with slavery, the engraving *Description of A Slave Ship*, from its emergence in 1789 as a propaganda tool of the abolitionist movement to the present day, when it remains an icon of remembrance and identity in twentieth-century black Atlantic literary, political, and artistic spheres.

Hsuan L. Hsu – Assistant Professor of English, Yale University. Ph.D., University of California, Berkeley. A.B., Harvard College. *Scales of Identification: Geography, Affect, and Nineteenth-Century U.S. Literature*. An analysis of two sets of writings – texts that deal with the colonization of Africa by freed American slaves and Japanese and American writings on the opening of Japan to Western commerce – that exemplify how nineteenth-century literature reflected changes in the geographical scale by which events are influenced and interpreted.

Christopher Klemek – Assistant Professor of History, Florida International University. Ph.D., University of Pennsylvania. B.A., Ohio State University. *Urbanism as Reform: Modernist Planning and the Crisis of Urban Liberalism in Europe and North America, 1945 – 1975*. A survey of the development of the interdisciplinary field of urban studies, focusing on institutions, such as the Harvard-MIT Joint Center for Urban Studies; public policies, including the Federal Model Cities Program; and individuals, such as neighborhood activist and author, Jane Jacobs.

Matthew Lindsay – J.D. Yale Law School, Ph.D. candidate, University of Chicago. B.A., University of California, Irvine. *In Defense of "Racial Balancing": Accounting for Inequality in the Post-Civil-Rights Era*. The study analyzes the Supreme Court's retreat from the ideal of racially proportionate representation in several areas of American antidiscrimination law, including employment discrimination, government contracting, and affirmative action in higher education. It maintains that central to that retreat has been an intellectual sea change in the meaning that several of the Justices, in dialogue with a host

of influential political and social scientific thinkers, have ascribed to conspicuous racial underrepresentation.

Robert MacDougall – Postdoctoral Scholar, Harvard University. B.A., Queens University. *The People's Phone: Rewiring the History of the Gilded Age and the Progressive Era*. A history of the telephone and telephone networks in the United States and Canada from the 1880s to the 1920s, demonstrating how the political struggles of the Gilded Age and the Progressive Era were inextricably intertwined with technological changes.

Asif Siddiqi – Postdoctoral Scholar, Carnegie Mellon University. M.B.A., University of Massachusetts, Amherst. M.S., Texas A&M University. *Science and Repression in the Twentieth Century: Revisiting Soviet Science and Technology*. An historical study of the dialectic relationship between repression and the practice of science and technology in the Soviet Union, focusing particularly on the costs and benefits of state-sponsored repression to scientific and engineering communities during the Great Terror.

Lisa Szefel – Postdoctoral Scholar, University of Rochester. M.A., University of Virginia. A.B., Mount Holyoke College. *The American Poetic Community, 1890 – 1920*. An analysis of the transformation of American poetry in the early twentieth century brought about by the interaction of organizations and publications that linked poets, readers, and editors in new ways, resulting in fresh creative possibilities for poets and new expectations in readers.

Chair of the VSP

James Carroll – Historian and columnist for *The Boston Globe*. Books include *An American Requiem*, *Constantine's Sword: The Church and the Jews: A History*, and, most recently, *Crusade: Chronicles of an Unjust War*, a collection of his *Boston Globe* columns since 9/11. During his tenure at the program, he is working on a history of the Pentagon. ■

Cheryl Finley, A. Hunter Dupree (Cambridge, MA), and Donald Hornig (Harvard School of Public Health)

Lisa Szefel and Krister Stendahl (Harvard University)

Eugene Skolnikoff (MIT) and Robert MacDougall

Science on the Café Scene *by Roald Hoffmann*

One day in spring 2001, when I was in New York City for a few months, my friend K.C. Cole, who writes inspiringly about physics, came to me and said, "I want to set up a reading at the Cornelia Street Café in Greenwich Village to publicize my new book *The Hole in the Universe*. But when I went to the owner of the café, Robin Hirsch, he said, 'You're not famous enough.' Roald, would you like to read with me?" I agreed. So K.C. returned to Robin with a plan to have both of us read. This time Robin said, "You're both not famous enough!" We thought again, and came up with the idea of adding Oliver Sacks, whose work K.C. often cited, and whom I knew well. Oliver agreed, and, of course, now we were famous enough.

Thanks to a friend then at *The New Yorker*, Ren Weschler, and to the wonderful imagination of Angelo Verga, the poet who organizes readings at the Café, this item appeared in *The New Yorker*:

> The author Oliver Sacks joins Roald Hoffmann, a Nobel-laureate chemist, and K.C. Cole, a science writer whose latest book is "The Hole in the Universe," for an evening of readings and talks about "the concept of nothing, the void, the Buddhist idea of emptiness, in art, science, physics," according to the evening's organizer, the poet Angelo Verga. "It's a difficult thing to explain," he says. "It's such an intriguing idea that I'm just going to get out of their way and give them their space."

It was a magical evening. The theme "Nothing" (everyone has lots to say about nothing), and Oliver's name, had three hundred people clamoring to get into a small cave-like café in which Robin has been hosting music and the spoken word for twenty-five years.

K.C. read of the vacuum and its significance to physicists; Oliver spoke of the lack of sensation, a nothing of another order; and I found to my surprise that I had written some poems on the theme. Or something. The atmosphere of the evening was wonderful. When it was over, I asked Robin if he'd let me organize a monthly series. He agreed,

Robin Hirsch, one of the owners of the Cornelia Street Café, and Roald Hoffmann in front of the Café.

and so "Entertaining Science" began in January 2002.

The setting is a dark, narrow room. Not quite a Sacromonte cave, it certainly looks like you'd imagine a Bohemian café. There's a stage about eight feet square.

The audience at a Cornelia Street Café cabaret. Can you recognize the Academy member in the crowd?

We have less than two hours. Inspired by our only model, that spring 2001 evening, I've tried to have a theme for each show and two to four people. Sometimes I let one lead person pick a theme, and together we talk about other participants and performers. For instance, Diane Ackerman wanted to talk about art and the brain, what eventually became her *Alchemy of Mind*. So she and I discussed neuroscientists in New York. The performers get paid nothing, *nada*, *ni odnoi kopeiki* – "so what's new," my young friends in music and the theatre say. We have to depend on local talent, or people traveling through New York. Diane mentioned that she had loved a book by Joseph LeDoux, of New York University, who studies emotions, especially fear. "Let's ask him," I said, and sure enough, he agreed. I then suggested adding an actor/storyteller friend of mine, Jack Klaff, who did a won-

Oliver Sacks in his element.

derful monologue on what goes on in an actor's mind.

I try to get in music because it works so well in the café setting. So when the theme was "Blind Will and Selfish DNA," and tumor biologist and writer George Klein read his masterly essay on that theme, I thought of asking the electronic percussion player and composer Lukas Ligeti to join us. I wasn't sure if George would like Ligeti's music, but there was a Hungarian connection. And I detected an interest in science, a scientific thread in Ligeti's composition. It worked.

Another time the theme was "Heavy Metal." Now the music part was obvious – it was provided, on a steel guitar, by a wonderful instrumentalist and electronic composer, Elliott Sharp. Oliver Sacks read from his *Uncle Tungsten* and could not resist demonstrating the properties of metals. I talked about packing polyhedra, and gamma brass. In a café! And Daniel Brush showed his sculptures in steel and gold.

Koji Nakanishi doing his magic.

Among Academy members who have performed have been Jerry Meinwald (in a program with the theme of "Metamorphoses"), Koji Nakanishi (in "Now You See It, Now You Don't"), Benoit Mandelbrot (in "The Smooth and the Wildly Rough"), Lynn Margulis (in "Thermodynamics and the Purpose of Life"), Joel Cohen (in "How Many People, Past and Future?"), and Paul Greengard (in "Right Brain, Left Brain").

My initial problem in organizing the evenings was that when I thought of interesting people (scientists and artists), I always came up with people my own age. This would not do. Fortunately I have pretty broad musical tastes, and New York City is brimming with young dancers, actors, and musicians eager to perform. I took and take risks, and now have a group of young people who will recommend talent. Or jump in themselves. I also love the hazard of connections. And mother-son teams.

After the two-hour set, the performers and friends move to the restaurant upstairs and enjoy their only pay – a good free meal. The discussion flows; it is a natural continuation, among friends, of what started in the cave.

What is my purpose in this series? To bring science to the café scene? Yes, perhaps to teach a little science. But ultimately we are not serious, except in the way that life is (and is not). The performers in the series juxtapose science with music, the written and spoken word, art and performance. The Cornelia Street Café audience is fantastic. The people who come – a smattering of scientists, some friends of the performers, Village denizens, artists, people off the street – are primed to make every connection the performers want. And then some. When it works, science emerges as human, lively, and fun.

Perhaps the themes tell the story – aside from those I've mentioned, here's a selection: "What's So Funny About Science" (with Steve Mirsky, Marc Abrahams, Lynda Williams, and Jim Lyttle), "The Two-Fisted Singing Universe" (with Joel Primack, Nancy Abrams, and Richard Brandt), "Vox Humana" (with mezzo-soprano Stephanie McGuire and Johan Sundberg, expert on the acoustics of the human voice), "Coltrane, Einstein, and Cosmology" (with Stephon Alexander, Papa Smurf, and Sharon Glassman).

"Entertaining Science" is the name of the Cornelia Street Café cabaret, the first Sunday of every month. We've become the hottest cheap ticket in New York City, and have filled the house *mano a mano* on Superbowl Sunday and the Sunday preceding the 4th of July. It is fun. ■

Roald Hoffmann, Frank H. T. Rhodes Professor of Humane Letters at Cornell University, shared the Nobel Prize in Chemistry in 1981 for his theoretical work on the course of chemical reactions. A Fellow of the American Academy since 1971, Hoffmann is a playwright, poet, and essayist as well as a chemist.

Some of the Academy members who have performed at the Café:

Joel Cohen
Paul Greengard
Roald Hoffmann
Benoit Mandelbrot
Lynn Margulis
Jerrold Meinwald
Koji Nakanishi
Oliver Sacks

In Response: The Ticking Bomb Contention

by Michael Traynor

The Perspectives section of the Summer 2004 issue of the *Bulletin* reported on an Academy meeting on "Contemplating Torture and Lesser Forms of Highly Coercive Interrogation." At a November 16, 2004, press conference in Washington, D.C., Michael Traynor dissented from some of the recommendations on highly coercive interrogations discussed in the article. Following are excerpts from his remarks:

> I agree with the strong statements that the United States shall abide by its statutory and treaty obligations that prohibit torture and cruel, inhuman or degrading treatment. I dissent, however, from the exception permitting cruel, inhuman or degrading treatment in some circumstances and from the recommendations that permit highly coercive interrogations that would violate the Constitution of the United States if applied to a prisoner accused of a crime.
>
> In exceptional circumstances, the recommendations permit highly coercive interrogation techniques that are cruel, inhuman or degrading. In nonexceptional circumstances, they permit highly coercive interrogation techniques that fall into the vague and troubling zone between prohibited techniques that courts find "shock the conscience" and proposed techniques that exceed the reasonable standards set for "seeking a voluntary confession under the due process clauses of the U.S. Constitution." The recommendations do not define the various techniques but leave them to be recommended secretly by the Attorney General, promulgated secretly by the President, and provided only to selected congressional committees. This culture of secrecy in itself should set off alarm bells. The recommendations provide for briefing by the Attorney General to congressional committees and oversight by them but only as "to which HCI's are presently being utilized" and for making "probable cause" determinations available to congressional intelligence committees, the Attorney General, and inspectors general of pertinent departments. They do not call for briefing or oversight about such important questions as whether any lives were saved or any act of terrorism was prevented, whether any deaths or serious injuries occurred as a result of the interrogations, and whether the guidelines were breached. They do not require monitoring or oversight by inspectors general to guard against abuse. Moreover, the guidelines are only that; they are not enforceable rules.
>
> The so-called "ticking bomb" scenario involving interrogation of a captured terrorist is a difficult theoretical one. In the real world, the scenario posed is both artificial and unlikely – a straw man, invented to create fear and a panicked public endorsement of the shameful erosion of due process. More likely, large numbers of captured people will be swept up by troops. Such people will include individuals who are innocent and have no useful information, neighbors, relatives, or others who are innocent but might have marginally useful information, and a few terrorists. This is not the example the United States should set for its own citizens or for our allies or even for our enemies. Moreover, highly coercive interrogation techniques are not demonstrably effective to elicit truthful information . . . Techniques that by definition exceed constitutional limits on the interrogation of persons accused of crime are likely to be repugnant to people who cherish human rights as well as violate due process. They are likely to be ineffective against true terrorists and fanatics trained to withstand them and prepared to die and injurious to innocent people subjected to them. Moreover, they are likely to provoke retaliation against our own troops and civilians who are captured, foster disrespect and resentment around the world, and corrode discipline in our own forces. ■

Michael Traynor, a Fellow of the American Academy since 2002, is a partner at Cooley Godward LLP. He served as an advisor to a project on a long-term legal strategy concerning terrorism sponsored by the National Memorial Institute for the Prevention of Terrorism. For the full text of his dissenting statement, please see http://cooley.admin.hubbardone.com/files/tbl_s5SiteRepository/FileUpload21/392/Heymann_.pdf. For the final report of the Long-Term Legal Strategy Project for Preserving Security and Democratic Freedoms in the War on Terrorism, please see http://www.mipt.org/Long-Term-Legal-Strategy.asp.

Noteworthy

Select Prizes and Awards

Nobel Prizes, 2004

Economic Sciences
Finn E. Kydland (Carnegie Mellon University) and Edward C. Prescott (Arizona State University; Federal Reserve Bank of Minneapolis)

Physics
David J. Gross (University of California, Santa Barbara), H. David Politzer (California Institute of Technology), and Frank Wilczek (MIT).

Physiology or Medicine
Richard Axel (Columbia University) and Linda B. Buck (Fred Hutchinson Cancer Research Center)

Wolf Prizes, 2005

Mathematics
Gregori Margulis (Yale University) and Sergei Novikov (University of Maryland and Landau Institute for Theoretical Physics, Moscow)

Medicine
Tony Hunter (Salk Institute for Biological Studies), Anthony James Pawson (Samuel Lunenfeld Research Institute at Mount Sinai Hospital, Toronto), and Alexander Levitzki (Hebrew University of Jerusalem)

Physics
Daniel Kleppner (MIT)

Joyce Appleby (University of California, Los Angeles) and Peter D. L. Stansky (Stanford University) have been named Couper Scholars by the Phi Beta Kappa Society.

Pierre Chambon (Institute of Genetics and Molecular and Cellular Biology, France), Ronald M. Evans (Salk Institute for Biological Studies), Elwood Jensen (University of Cincinnati), and Matthew Meselson (Harvard University) are among the recipients of the 2004 Lasker Medical Research Awards.

Peter Dallos (Northwestern University) has been elected an Honorary Fellow of the Hungarian Academy of Sciences.

Antonio Damasio and Hanna Damasio (both, University of Iowa) were awarded the Jean-Louis Signoret Prize in Cognitive Neuroscience given by La Fondation Ipsen.

Robert F. Drinan, S.J. (Georgetown University) received the 2004 ABA Medal from the American Bar Association.

Sir John Elliott (University of Oxford) has been elected to the Accademia Nazionale dei Lincei, Italy.

Herbert Gleiter (Institute of Nanotechnology, Germany) received the Hsun Lee Lecture Award from the Chinese Academy of Science.

Gertrude Himmelfarb (Washington, D.C.) and John Searle (University of California, Berkeley) are among the recipients of the 2004 National Humanities Medal, given by the National Endowment for the Humanities.

Stephen P. Hubbell (University of Georgia) has been awarded the Marsh Award for Ecology by the British Ecological Society.

Nikki Keddie (University of California, Los Angeles) has been awarded the Balzan Foundation Prize.

Elizabeth F. Loftus (University of California, Irvine) received the 2005 Grawemeyer Award for Psychology, given by the Grawemeyer Foundation at the University of Louisville.

Claire Ellen Max (University of California, Santa Cruz) and Richard J. Saykally (University of California, Berkeley) are among the recipients of the 2004 E. O. Lawrence Awards in Physics, given by the U.S. Department of Energy.

Jerrold Meinwald (Cornell University) received the 2005 Roger Adams Award in Organic Chemistry, given by the American Chemical Society.

Cherry A. Murray (Lawrence Livermore National Laboratory) has been awarded the 2005 George Pake Prize by the American Physical Society.

Jaroslav Pelikan (Yale University) and Paul Ricoeur (Chatenay, France) were awarded the John W. Kluge Prize for Lifetime Achievement in the Human Sciences by the John W. Kluge Center at the Library of Congress.

Steven Pinker (Harvard University) received the Henry Dale Prize from the Royal Institution of Great Britain, the William James Book Prize and the Eleanor Maccoby Book Prize from the American Psychological Association, and the Kistler Book Prize from the Foundation for the Future.

Mark Ratner (Northwestern University) is among the recipients of the Chicago Innovation Awards and received the 2004 Visionary Pioneer Award.

Erkki Ruoslahti (Burnham Institute) and Masatoshi Takeichi (RIKEN Center for Developmental Biology, Japan) are recipients of the 2005 Japan Prize, awarded by the Science and Technology Foundation of Japan.

Kay Lehman Schlozman (Boston College) has been awarded the 2004 Rowman & Littlefield Award for Innovative Teaching in Political Science.

Jack L. Strominger (Harvard University) is the recipient of the 2004 American Society for Biochemistry and Molecular Biology-Merck Award.

Oliver Williamson (University of California, Berkeley) is the 2004 recipient of the H.C. Recktenwald Prize in Economics.

Stanford E. Woosley (University of California, Santa Cruz) has been awarded the 2005 Hans A. Bethe Prize by the American Physical Society.

New Appointments

Arden L. Bement (National Institute of Standards and Technology) has been appointed director of the National Science Foundation.

Samuel Bodman has been confirmed as the new U.S. Secretary of Energy.

Frances D. Fergusson (Vassar College) has been elected to the Board of Directors of Wyeth.

Richard W. Fisher (Kissinger McLarty Associates) has been appointed president of the Federal Reserve Bank of Dallas, effective April 2005.

Robert Gagosian (Woods Hole Oceanographic Institution) has been appointed to the U.S. National Commission for the United Nations Educational, Scientific, and Cultural Organization.

Susan Hockfield (MIT) has been elected president of MIT.

Bill Joy (Aspen Smallworks) has been named a partner at Kleiner Perkins Caufield & Byers.

Linda K. Kerber (University of Iowa) has been named president of the American Historical Association.

Steven Levitt (University of Chicago) has been appointed director of the Initiative on Chicago Price Theory at the University of Chicago Graduate School of Business.

Julio Ottino (Northwestern University) has been appointed dean of the McCormick School of Engineering at Northwestern University.

Condoleezza Rice has been confirmed as the new U.S. Secretary of State.

Judith Rodin (Rockefeller Foundation) has been named president of the Rockefeller Foundation.

Ronald Rogowski (University of California, Los Angeles) has been named associate dean of the UCLA International Institute.

Aaron J. Shatkin (Center for Advanced Biotechnology and Medicine) has been appointed to the Board of Directors of Serologicals Corporation.

Select Publications

Poetry

Richard Howard (New York, New York). *Inner Voices: Selected Poems, 1963 – 2003*. Farrar, Straus & Giroux, October 2004

Sharon Olds (New York University). *Strike Sparks: Selected Poems, 1980 – 2002*. Alfred A. Knopf, September 2004

Gary Snyder (University of California, Davis). *Danger on Peaks*. Shoemaker & Hoard, September 2004

Richard Wilbur (Smith College). *Collected Poems: 1943 – 2004*. Harcourt, December 2004

Fiction

Louis Auchincloss (New York, New York). *East Side Story*. Houghton Mifflin, December 2004

Bharati Mukherjee (University of California, Berkeley). *The Tree Bride: A Novel*. Theia/Hyperion, September 2004

V. S. Naipaul (London, United Kingdom). *Magic Seeds: A Novel*. Alfred A. Knopf, November 2004

Richard Stern (University of Chicago). *Almonds to Zhoof: Collected Stories of Richard Stern*. Triquarterly Books, February 2005

John Updike (Boston, Massachusetts). *Villages*. Alfred A Knopf, October 2004

John Edgar Wideman (University of Massachusetts, Amherst). *God's Gym: Stories*. Houghton Mifflin, February 2005

Non-Fiction

Aharon Appelfeld (Wylie, Aitken & Stone). *The Story of a Life: A Memoir*. Schocken Books, October 2004

Kwame Anthony Appiah (Princeton University). *The Ethics of Identity*. Princeton University Press, January 2005

Lucian A. Bebchuk (Harvard University), ed. *Shareholder Access to the Corporate Ballot*. Harvard University Press, January 2005

Alfred Chandler (Harvard University) and **Bruce Mazlish** (MIT), eds. *Leviathan. Multinational Corporations and the New Global History*. Cambridge University Press, January 2005

Jared Diamond (University of California, Los Angeles). *Collapse: How Societies Choose to Fail or Succeed*. Viking, December 2004

Wendy Doniger (University of Chicago). *The Woman Who Pretended To Be Who She Was*. Oxford University Press, November 2004

John E. Dowling (Harvard University). *The Great Brain Debate: Nature or Nurture?* Joseph Henry Press, November 2004

Robert F. Drinan, S.J. (Georgetown University). *Can God and Caesar Coexist? Balancing Religious Freedom and International Law*. Yale University Press, September 2004

Solomon Feferman (Stanford University) and Anita Burdman Feferman. *Alfred Tarski: Life and Logic*. Cambridge University Press, October 2004

David Hackett Fischer (Brandeis University). *Liberty and Freedom: A Visual History of America's Founding Ideas*. Oxford University Press, October 2004

Lawrence M. Friedman (Stanford University). *Private Lives: Families, Individuals, and the Law*. Harvard University Press, February 2005

William Galston (University of Maryland). *The Practice of Liberal Pluralism*. Cambridge University Press, January 2005

Ian Glynn (University of Cambridge) and Jenifer Glynn. *The Life and Death of Smallpox*. Cambridge University Press, August 2004

Barbara Goldsmith (Barbara Goldsmith Productions). *Obsessive Genius: The Inner World of Marie Curie*. W. W. Norton & Company, November 2004

Stephen R. Graubard (London, U.K.). *Command of Office: How War, Secrecy and Deception Transformed the Presidency, from Theodore Roosevelt to George W. Bush*. Basic Books, September 2004

Richard Howard (New York, New York). *Paper Trail: Selected Prose, 1965 – 2003*. Farrar, Straus & Giroux, October 2004

Alan Lightman (MIT). *A Sense of the Mysterious: Science and the Human Spirit*. Pantheon, January 2005

Jean M. Mandler (University of California, San Diego). *The Foundations of Mind: Origins of Conceptual Thought*. Oxford University Press, April 2004

Bruce Mazlish (MIT). *Civilization and Its Contents*. Stanford University Press, January 2005

Bruce Mazlish (MIT) and **Akira Iriye** (Harvard University), eds. *The Global History Reader*. Routledge, March 2005

Richard A. Posner (U.S. Court of Appeals, Seventh Circuit). *Catastrophe: Risk and Response*. Oxford University Press, October 2004

Allan R. Robinson (Harvard University) and Kenneth Brink (Woods Hole Oceanographic Institute), eds. *The Global Coastal Ocean: Interdisciplinary Regional Studies and Syntheses*. Harvard University Press, December 2004

Ingrid D. Rowland (American Academy in Rome). *The Scarith of Scornello: A Tale of Renaissance Forgery*. University of Chicago Press, December 2004

Geoffrey R. Stone (University of Chicago). *Perilous Times: Free Speech in Wartime from the Sedition Act of 1798 to the War on Terrorism*. W.W. Norton & Company, October 2004

Cornel West (Princeton University). *Democracy Matters: Winning the Fight Against Imperialism*. Penguin Press, September 2004

Neal Zaslaw (Cornell University) and John Spitzer (San Francisco Conservatory of Music). *The Birth of the Orchestra: History of an Institution, 1650 – 1815*. Oxford University Press, June 2004

Exhibitions

Louise Bourgeois: *Likeness: Portraits of Artists by Other Artists*, Institute of Contemporary Art, Boston, through May 2005; *Celebrating Sculpture: Modern and Contemporary Works from Dallas Collections*, Dallas Museum of Art, through April 25, 2005.

Ellsworth Kelly: *Tablet*, The Menil Collection, Houston, through May 8, 2005; *Drawn from Nature: The Plant Lithographs of Ellsworth Kelly* and *Kelly in Color*, Grand Rapids Art Museum, Michigan, March 4 – May 15, 2005.

Lee Friedlander: *Lee Friedlander: At Work and Sticks and Stones*, Columbus Museum of Art, March 11 – April 28, 2005.

Performances

Pierre Boulez: *Boulez: Conductor and Composer* (conducting), Chicago Symphony Orchestra, March 17 – 18, 2005.

Alfred Brendel: *Alfred Brendel in Recital*, Benaroya Hall, Seattle, March 13, 2005; Irvine Barclay Theatre, Irvine, Calif., March 18, 2005.

Placido Domingo: *In Concert with Ana Maria Martinez*, RTE Orchestra, The Point, Dublin, Ireland, March 9, 2005; *In Concert with Ana Maria Martinez*, Iceland Symphonic Orchestra, Egilshöll, Reykjavik, Iceland, March 13, 2005; *Die Walküre*, Lyric Opera, Chicago, March 29, April 5, April 12, 2005.

Robert Levin: *Mendelssohn the Performer: Orchestra of the Age of Enlightenment*, Queen Elizabeth Hall, London, March 25, 2005.

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. ■

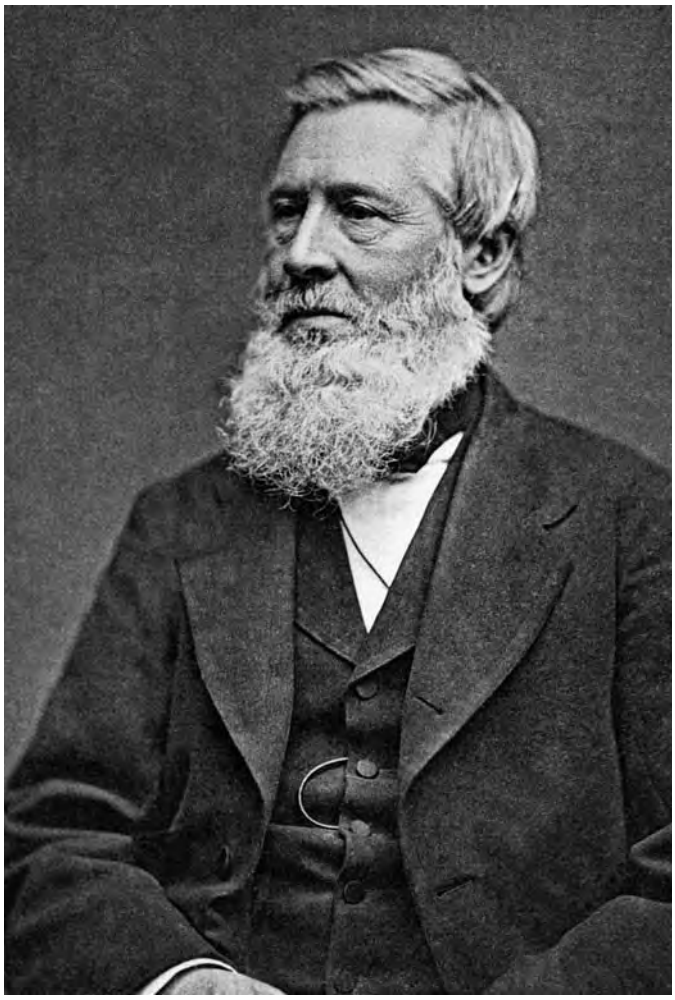
From the Archives

In 1860, zoologist-geologist Louis Agassiz and botanist Asa Gray, both members of the Harvard faculty, took part in a debate held at the American Academy of Arts and Sciences on the recently published *Origin of Species*. While Agassiz staunchly maintained his belief in the divine creation of individual species, Gray defended Darwin's hypothesis on their variability. Among Agassiz's allies in the exchange was Harvard philosopher Francis Bowen, emphasizing the importance of interdisciplinary analysis even at this stage in the Academy's history. In response to remarks by Bowen, Gray presented the following rebuttal, as recorded by the Academy Secretary on April 10, 1860:

> As to the charge that the hypothesis in question repudiated design or purpose in nature and the whole doctrine of final causes, Professor Gray urged: – 1. That to maintain that a theory of the derivation of one species or sort of animal from another through secondary causes and natural agencies negatived design, seemed to concede that whatever in nature is accomplished through secondary causes is so much removed from the sphere of design, or that only that which is supernatural can be regarded or shown to be design; – which no theist can admit. 2. That the establishment of this particular theory by scientific evidence would leave the doctrines of final cause, utility, special design, or whatever other teleological view, just where they were before its promulgation, in all fundamental respects; that no new kind of difficulty comes in with this theory, i.e. none with which the philosophical naturalist is not already familiar. It is merely the old problem as to how persistence of type and morphological conformity are to be reconciled with special design, (with the advantage of offering the only scientific, though hypothetical, solution of the question,) along with the wider philosophical questions, as to what is the relation between orderly natural events and intelligent efficient cause, or Divine agency. In respect to which, we have only to adopt Professor Bowen's own philosophy of causation, – viz. "that the natural no less than the supernatural, the continuance no less than the creation of existence, the origin of an individual as well as the origin of a species or a genus, can be explained only by the direct action of an intelligent cause," – and all special difficulty in harmonizing a theory of the derivation of species with the doctrine of final causes will vanish.

(Reprinted from the *Proceedings of the American Academy of Arts and Sciences*, volume 4, 1857 – 1860)

For more information on these debates, see *Asa Gray: American Botanist, Friend of Darwin* (Johns Hopkins University Press, 1988) by Academy Fellow A. Hunter Dupree. ■



Asa Gray

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