

IAS

Institute for Advanced Study



Report for the Academic Year 2007–2008

It is fundamental in our purpose, and our express desire, that in the appointments to the staff and faculty, as well as in the admission of workers and students, no account shall be taken, directly or indirectly, of race, religion, or sex. We feel strongly that the spirit characteristic of America at its noblest, above all the pursuit of higher learning, cannot admit of any conditions as to personnel other than those designed to promote the objects for which this institution is established, and particularly with no regard whatever to accidents of race, creed, or sex.



*Extract from the letter addressed by the
Institute's Founders, Louis Bamberger and
Caroline Bamberger Fuld, to the first
Board of Trustees, dated June 4, 1930.*

Newark, New Jersey

The Institute for Advanced Study exists to encourage and support fundamental research in the sciences and humanities—the original, often speculative, thinking that produces advances in knowledge that change the way we understand the world.



THE SCHOOL OF HISTORICAL STUDIES, established in 1949 with the merging of the School of Economics and Politics and the School of Humanistic Studies, is concerned principally with the history of Western European, Near Eastern, and East Asian civilizations. The School actively promotes interdisciplinary research and cross-fertilization of ideas.



THE SCHOOL OF MATHEMATICS, established in 1933, was the first School at the Institute for Advanced Study. Several central themes in mathematics of the twentieth and twenty-first centuries owe their major impetus to discoveries that have taken place at the Institute. Today, the School is an international center for research on mathematics and computer science. The School sponsors, jointly with Princeton University, the Program for Women and Mathematics.



THE SCHOOL OF NATURAL SCIENCES, established in 1966, supports research in broad areas of theoretical physics, astronomy, and systems biology. Areas of current interest include elementary particle physics, string theory, quantum theory, and quantum gravity; investigating the origin and composition of the universe; and conducting research at the interface of molecular biology and the physical sciences. The School sponsors Prospects in Theoretical Physics, a program for graduate students and postdoctoral scholars.



THE SCHOOL OF SOCIAL SCIENCE, founded in 1973, takes as its mission the analysis of societies and social change and is devoted to a multidisciplinary, comparative, and international approach to social research and the examination of historical and contemporary problems.



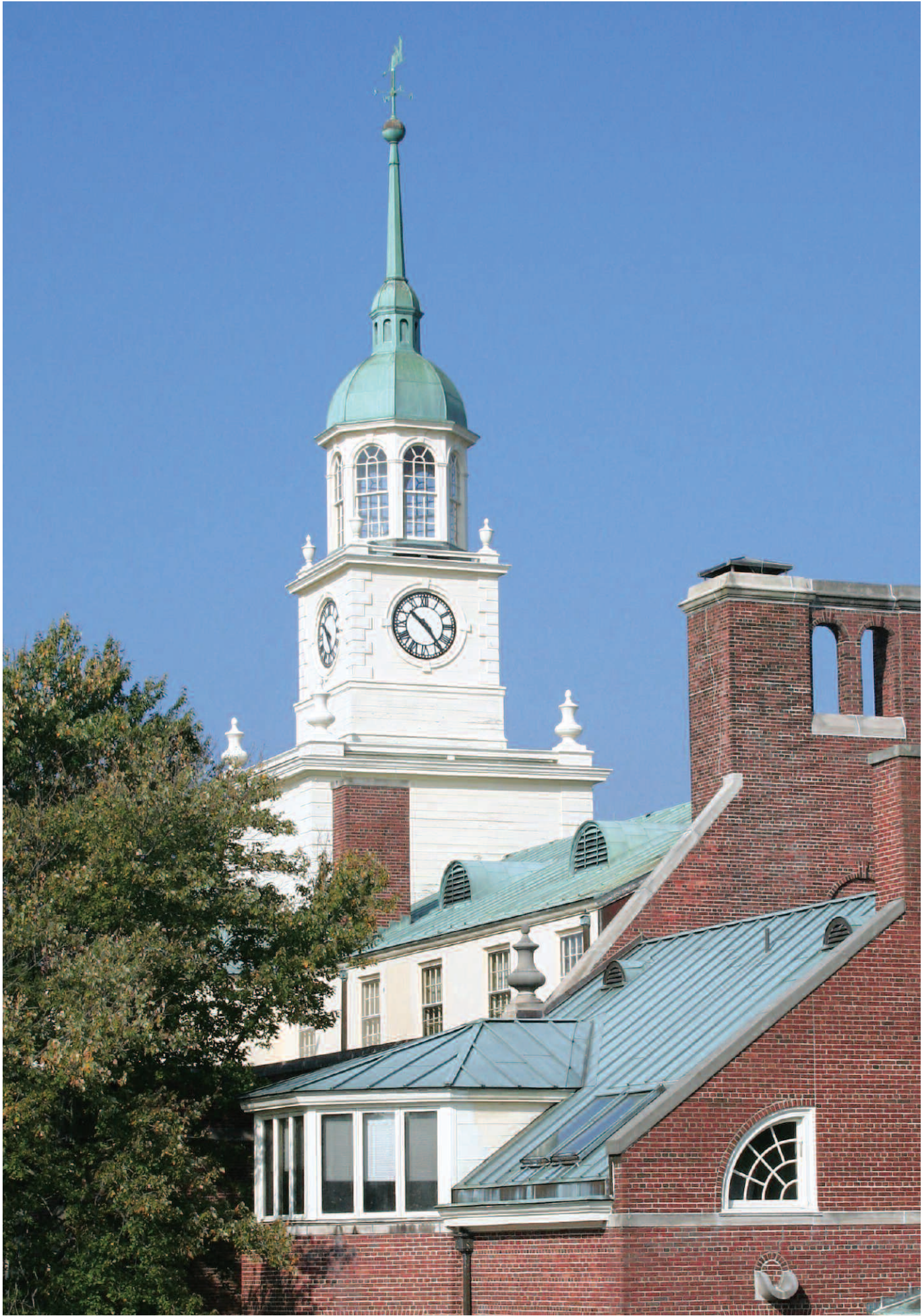
SPECIAL PROGRAMS include the Program in Interdisciplinary Studies, which explores different ways of viewing the world; the Artist-in-Residence Program; Director's Visitors; the IAS/Park City Mathematics Institute, which aims to increase awareness of the roles of professionals in all mathematics-based occupations; and the Science Initiative Group, dedicated to building science capacity in the developing world.



Institute for Advanced Study

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Background and Purpose

The Institute for Advanced Study was founded in 1930 with a major gift from New Jersey businessman and philanthropist Louis Bamberger and his sister, Caroline Bamberger Fuld, who wished to use their fortunes to make a significant and lasting contribution to society. They sought the advice of educator Abraham Flexner, who developed the concept of the Institute as a community of scholars whose primary purpose would be the pursuit of advanced learning and scholarly exploration. The Institute for Advanced Study has remained committed to its founding principles for more than seventy-five years, and its record of definitive scholarship and scientific achievement is unsurpassed.

The Institute fills a unique role in postgraduate education and scientific and scholarly research. As “the university to universities,” in the words of Trustee Vartan Gregorian, the Institute serves all colleges and universities by providing a place where scholars can hone their skills and do their best work, thereby adding substantially to their ability to contribute as both teachers and scholars to the academic institutions where they base their careers. For young scholars just entering the academic world, an opportunity to work at the Institute can set the direction for lifelong research interests and thereby determine professional careers. The Institute provides more mature scholars with the opportunity to take new directions in their research or to complete a major piece of work away from the many obligations of working life at a university. At a time when pure research and scholarly activities are undervalued, the opportunities that the Institute provides have never been more necessary. The Institute’s foremost objective is the advancement of knowledge and the deepening of understanding across a broad range of the humanities, sciences, and social sciences.

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One of the Institute’s unique strengths is its permanent Faculty of twenty-seven eminent scholars, whose broad interests and extensive ties to the larger academic world are reflected in their own work and also in the guidance and direction they provide to the Institute’s visiting Members.

The Faculty defines the major themes and questions that become the focus of each School’s seminars and other activities, and the Faculty selects and works closely with visiting Members. Small in number and organized into four Schools (Historical Studies, Mathematics, Natural Sciences, and Social Science), the Faculty and Members can interact with one another without any departmental or disciplinary barriers.

Each year the Institute awards fellowships to some 190 visiting Members from about one hundred universities and research institutions throughout the world. The Institute’s more than 5,000 former Members hold positions of intellectual and scientific leadership in the United States and abroad. Some twenty-two Nobel Laureates and thirty-four out of forty-eight Fields Medalists, as well as many winners of the Wolf and MacArthur prizes, have been affiliated with the Institute. The Institute does not receive income from tuition or fees; resources for operations come from endowment income, grants from private foundations and government agencies, and gifts from corporations and individuals.

Report of the Chairman

Never in my wildest aspirations, as a youth who was introduced to the Institute for Advanced Study through my sister, Lucille, a physicist who worked in the health physics division of the Oak Ridge National Laboratory, did I expect that I would have the opportunity to serve as Chairman of the Institute's Board of Trustees. It has been an immense honor to serve the institution that I have always thought of as an intellectual Camelot, in what I believe is a modest role in moving things forward during a period of significant transition and tremendous achievement.

This past year, I had the pleasure of assuming the reins from James D. Wolfensohn, our Chairman for twenty-one years, whose retirement we celebrated last October. Jim's Chairmanship from 1986 to 2007 was characterized by an invaluable and enduring commitment to the Institute's unique mission and to furthering the ability of the Faculty to focus on their scholarly work. He maintained this commitment for more than two decades during a period when his other duties were crucially important and extraordinarily demanding by any standard. As Chairman, he brought a rare grace and humor to our many meetings and events. All who care about the Institute owe Jim an enormous debt of gratitude for his many contributions, and we are honored that he continues to serve on the Board as Chairman Emeritus.

I am especially thrilled that during the past year, Trustees and Faculty as well as Jim's colleagues and friends raised more than \$5 million to create the James D. Wolfensohn Professorship in the School of Social Science in honor of his distinguished service. The intent is for the Professorship to be filled by a scholar who analyzes the cultures of non-Western countries ethnographically, and whose research is aimed at studying these local and national cultures to gain an understanding of how they work in terms of their histories and their place in international and global contexts. With its devotion to issues relating to non-Western cultures, the Professorship will link Jim's work as President (1995–2005) of the World Bank with his commitment to the Institute, where he has served as a Trustee since 1979. In the spirit of giving for which they are well known, a new Membership in the School, to be associated with the Wolfensohn Professorship, has been created by a generous donation from the Wolfensohn family.

During his Chairmanship, Jim oversaw the Institute's successful endowment of six Professorships, across the Institute's four Schools, including the Albert O. Hirschman Professorship in the School of Social Science, currently held by economist Eric S. Maskin, who was awarded the 2007 Nobel Prize in Economics last October, and the George F. Kennan Professorship in the School of Historical Studies, currently held by political philosopher Avishai Margalit.

Fittingly, Jim's retirement last October coincided with the opening of an extension to Bloomberg Hall, made possible through the generosity of an anonymous benefactor, that now houses The Simons Center for Systems Biology and marks a milestone in the Institute's history in terms of its commitment to biology. The Simons Center has been supported by generous donors, including especially Trustee James H. Simons, a former Member in the School of Mathematics, and his wife Marilyn Hawrys Simons, who endorsed the Institute's work in systems biology with a \$10 million challenge grant from their foundation, The Simons Foundation.

Since its founding seventy-eight years ago, the Institute has maintained its influence and standing through a commitment to undertaking a comprehensive review, approximately every ten years since the mid-1950s, of its structure and its current course with the goal of recommending any adjustments that should be considered for the future. We are grateful for the astute leadership shown by Vice Chairman Richard B. Black, chairman of the Decadal Review Implementation Committee, along with Trustees Victoria Bjorklund and Brian Wruble, who are overseeing a Decadal Review that is currently in progress with the aim of producing a final report by October 2009.

In other Board transitions, we saw the retirement of Academic Trustee Andrew Strominger, who served a five-year term with distinction on behalf of the School of Natural Sciences. A former long-term Member (1982–87) of the School and a leading string theorist, Andy is Professor of Physics at Harvard University and a senior fellow of its Society of Fellows. His research, which concerns unsolved problems relating to the incompatibility of quantum mechanics and Einstein’s theory of gravity, the origin of the universe, and the origin of the masses of the elementary particles, has led the way in merging the study of quantum-mechanical black holes with that of string theory. The Board of Trustees benefited greatly from his lucid explanations of the intricacies of string theory as well as his deep appreciation of and commitment to the Institute as a scholar.

Andy will be succeeded by Curtis Callan, the J. S. McDonnell Distinguished University Professor of Physics at Princeton University, who will join the Board as of July 1, 2008. Curt, a winner of the Dirac Medal in 2004, was a Member in the School of Natural Sciences at the Institute on three occasions, in 1969–72, 1983, and 1993–94, and has been a frequent Visitor in recent years. Well known for the Callan-Symanzik equation, he was recently elected Vice President of the American Physical Society.

Also joining the Board as of July will be Eric E. Schmidt, Chairman and Chief Executive Officer of Google Inc. An internationally recognized technologist and business leader, Eric serves on the Board of Directors of Apple Inc. and is Chairman of the Board of Directors of the New America Foundation. He was elected to the National Academy of Engineering in 2006 and the American Academy of Arts and Sciences in 2007.

As the Institute seeks to further endow The Simons Center for Systems Biology, Eric has provided crucial support with a gift to endow the Eric and Wendy Schmidt Membership in Biology. We are also grateful to Ann Lee Saunders Brown for her generous funding of the Charles L. Brown Membership in Biology, which is named for her late husband, a former Institute Trustee and Chairman of AT&T. In addition, Trustee James J. Schiro, Chief Executive Officer of Zurich Financial Services, has facilitated a generous gift from Zurich Financial Services to create an endowment for the Zurich Financial Services Membership, which will be offered to Chinese candidates conducting research in the fields of mathematics, economics, and the sciences.

Finally, Charles Simonyi, President and Chief Executive Officer of Intentional Software Corporation, will take over as Chairman of the Board on October 25, 2008. As his friends and colleagues at the Institute are well aware—as are all those who heard his highly engaging public talk at the Institute last October about his travel into space aboard a Russian-built Soyuz spacecraft—Charles is certain to provide passionate and discerning leadership for this remarkable place where scholars at the frontiers of their fields are provided an environment unfettered by distractions. I know firsthand that Charles and I share a deep and unwavering appreciation for the Institute, its Director, Faculty, and staff, and the many benefactors who make the work of the Institute possible and enable it to embark on extraordinary and influential adventures of intellectual curiosity.

Martin L. Leibowitz
Chairman, Board of Trustees

It has been an immense honor to serve the institution that I have always thought of as an intellectual Camelot, in what I believe is a modest role in moving things forward during a period of significant transition and tremendous achievement.

Report of the Director

At the end of October, James Wolfensohn retired as the Chairman of our Board of Trustees after twenty-one years' service. His vision has guided our evolution as an institution, ensuring the maintenance of the highest standards of excellence and the relevance of the Institute's work. Despite his many other formidable responsibilities, Jim's loyalty and commitment to the Institute have never wavered. Under his leadership, nobody was in any doubt that the role of the Institute's staff is to provide the best facilities for theoretical research in the world, and that the responsibility of the Faculty and Members is to take full advantage of the exceptional opportunities afforded by this privileged environment.

Just before Jim stepped down as Chairman, he presided at the opening of an extension to Bloomberg Hall to house The Simons Center for Systems Biology, which has been established under the leadership of Professor Arnold Levine. Designed by Pelli Clarke Pelli Architects, the extension incorporates systems biology within the School of Natural Sciences, providing an interactive environment that connects seamlessly with the rest of the School and facilitates multidisciplinary interaction, which has been a prominent feature of the Center's development.

As construction neared completion, Richard Long spent three days at the Institute creating a sculpture in the small courtyard that had been formed to the southwest of the new extension on the southeast side of the building. The work, *Slate Oasis*, comprises more than ten tons of standing slate, which form organic patterns and interlock on a flat ground of gray limestone chippings.

During the past year, the Institute has benefited greatly from the leadership of Martin Leibowitz, former Vice Chairman and Chief Investment Officer of TIAA-CREF, who agreed to succeed Jim Wolfensohn as Chairman last October. Now a Managing Director at Morgan Stanley, Marty has been a Trustee since 1995 and Vice Chairman of the Board since 2001. He is deeply committed to the Institute's mission and unstinting and generous in support of its work. The Institute is greatly indebted to his wisdom and understanding. In October 2008, Charles Simonyi, currently President of the Corporation, will succeed Marty as Chairman.

As the year began, we were saddened by the death on August 6 of Atle Selberg, Professor Emeritus in the School of Mathematics and one of the great mathematicians of the twentieth century. Atle first came to the Institute in 1947, joining the Faculty in 1951. At a meeting in Wolfensohn Hall in January, colleagues, friends, and family came together to celebrate his life and work and its profound impact on analytic number theory.

Following the retirement of Robert Langlands, Peter Sarnak, whose work like that of Atle Selberg's centers on analytic number theory, joined the Faculty of the School of Mathematics in July. Peter will hold his appointment in conjunction with his Professorship at Princeton University. At the same time, political theorist Danielle Allen of The University of Chicago succeeded Michael Walzer as UPS Foundation Professor in the School of Social Science. In January, particle physics phenomenologist Nima Arkani-Hamed of Harvard University joined the School of Natural Sciences as a Professor.

Pierre Deligne, Professor in the School of Mathematics since 1984, retired in January, and Helmut Hofer, Silver Professor in the Courant Institute of Mathematical Sciences of New York University, has been appointed to succeed him from July 2009. One of the founders of the area of symplectic topology, Helmut's work focuses on symplectic geometry, dynamical systems, and partial differential equations.

The Institute has also announced the appointment of ancient historian Angelos Chaniotis as a Professor in the School of Historical Studies effective July 2010. Angelos, currently a Senior Research Fellow in Classics at All Souls College, Oxford, succeeds Glen Bowersock, who retired in 2006. Angelos is known for his original and wide-ranging research in the social, cultural, religious, legal, and economic history of the Hellenistic world and the Roman East.

Each year the work of our Faculty and Members is recognized by the award of major international prizes, and this academic year was certainly no exception. Phillip Griffiths and Pierre Deligne received the 2008 Wolf

Prize in Mathematics, together with David Mumford (former Member, 1962–63, 1981–82) of Brown University. King Albert II made Pierre a Vicomte in Belgium and the Belgian post office issued a postage stamp in honor of his achievements.

Edward Witten, Charles Simonyi Professor in the School of Natural Sciences, was awarded the 2008 Crafoord Prize in Astronomy and Mathematics, and Nima Arkani-Hamed was awarded the 2008 Raymond and Beverly Sackler International Prize in Physics for his “novel, deep, and highly influential contributions to new paradigms for physics beyond the Standard Model.” The Royal Netherlands Academy awarded its Heineken Prize in history for 2008 to Jonathan Israel, Professor in the School of Historical Studies, for his vitally new perspective on the history of the Enlightenment.

In October 2007, Eric Maskin, Albert O. Hirschman Professor in the School of Social Science, was awarded the 2007 Nobel Prize in Economics. Eric shared the award with Leonid Hurwicz of the University of Minnesota and Roger B. Myerson of The University of Chicago, for having laid the foundations of mechanism design theory.

The Institute is in the midst of a Decadal Review, analyzing how well it has been fulfilling its mission of fostering research into fundamental questions in the sciences and humanities, and seeking to formulate strategic objectives for the coming years. Such reviews have taken place at ten-year intervals since the 1950s. In the last academic year, Visiting Committees reviewed the work of each of our four Schools. Surveys have been conducted of the views and experiences of current Members and former Members from the last five years. Nearly all members of the Institute’s staff have taken part in meetings to provide their unique perspective on how we might work more effectively. Reports have been commissioned on the Institute’s building and energy efficiency and data have been collected on all aspects of its operation. The Board of Trustees expects to complete the Review during 2009.

As conceived by Abraham Flexner, the Institute has always been organized in Schools, now four in number, each flexible and broader in scope than a typical university department. As our recent survey attests, collaborations across School boundaries exist, but more opportunities are sought to facilitate interactions between different Schools. After Hours Conversations, a program conceived and organized by Caroline Walker Bynum of the School of Historical Studies and Piet Hut of the Program in Interdisciplinary Studies, was launched in February to encourage such conversations in an informal and relaxed environment. Each Monday, Tuesday, and Thursday evening in February and March, an Institute Professor, Member, or Visitor gave a ten-minute talk on an academic topic, followed by twenty minutes of group discussion. Each of the talks took place in Harry’s Bar on the upper level of the Dining Hall and was attended by between fifteen and fifty members of the Institute community, who actively participated in sharing their views on the topics presented. The program will continue in the coming academic year.

The core work of the Institute is the research performed by our Professors, including those now emeritus, and our Members, who are drawn each year from many different countries. It is the commitment of the Institute’s staff and our growing community of Friends and benefactors that enables the Institute’s continuing and wide influence through the research performed here and the impact that time spent at the Institute has on our Members. They ensure the independence that is essential if the Institute is to be able to continue to fulfill its mission of facilitating disinterested research into fundamental questions in the sciences and humanities.

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Peter Goddard
Director



ANDREA KANE

The School of Historical Studies

Faculty

Yve-Alain Bois

Caroline Walker Bynum

Patricia Crone, Andrew W. Mellon Professor

Nicola Di Cosmo, Luce Foundation Professor in East Asian Studies

Jonathan Israel

Avishai Margalit, George F. Kennan Professor

Heinrich von Staden

Professors Emeriti

Glen W. Bowersock

Giles Constable

Oleg Grabar

Christian Habicht

Irving Lavin

Peter Paret

Morton White

The School of Historical Studies is concerned principally with the history of Western European, Near Eastern, and East Asian civilizations. Both inside and outside these broad areas of study, Faculty and Members have pursued a wide range of topics. The emphasis has traditionally been on Greek and Roman civilization; medieval, early modern, and modern European history; the history of art; and the history of science, but over time the School's interests have enlarged to include Islamic culture, the history of China and Japan, modern international relations, and more recently, music studies. Over two thousand scholars have come to the School since its founding, and their work here in these and other areas of research has regularly been enriched by the fruitful interaction of disciplines in a small and collegial community.

The School's broad interpretation of the meaning of "Historical Studies" continued to be reflected in the research projects pursued by the forty-three Members and eleven Visitors who joined the School for the academic year 2007–08. Their research spanned a diverse range of historical subjects including the history of art, philosophy, music, religion, international relations, literature, science, and medicine, as well as ancient history and the classics. The periods studied ranged from as far back as 300 BC to the late twentieth century. Research carried out in the School also extended over a wide geographic range, from Europe to the Byzantine Empire, the Middle East, Central Asia, the Indian subcontinent, China, Tibet, and Japan. The group of scholars who joined the School in 2007–08 was itself an internationally diverse group, including citizens of Belgium, Canada, Germany, France, India, Ireland, Israel, Italy, Russia, Spain, Sweden, the Ukraine, the United Kingdom, and the United States. Members received support both from the Institute's own funds and from a variety of external sources, including the National Endowment for the Humanities, The Andrew W. Mellon Foundation, Fritz Thyssen Stiftung, Gerda Henkel Stiftung, and The Gladys Krieble Delmas Foundation.

DINAH KAZAKOFF



Beyond the individual research projects pursued, groups of scholars were drawn together for lectures and discussions that facilitated the exchange of ideas across fields and regions.

present and discuss topics of mutual interest. (See the list of events at the end of this section.)

ACADEMIC ACTIVITIES

In 2007–08, Professor **Yve-Alain Bois** edited and wrote the preface to a collection of writings by artist Mel Bochner, which were published by MIT Press, and wrote an essay, “When Artworks Resist,” in the catalogue *Glenstone: The Inaugural Exhibition*, which dealt with the discrepancy between Clement Greenberg’s aesthetic dogma and the works it purported to champion. He translated into English and published his 1993 monograph on the French artist Martin Barré. He also wrote an essay on the work of British artist Mark Wallinger on the occasion of his retrospective in Aarau, Switzerland, and Braunschweig, Germany; another on the relationship between the work of Fernand Léger, Ellsworth Kelly, and Robert Rauschenberg on the occasion of a Léger retrospective at the Beyeler Foundation in Basel; and yet another on Ad Reinhardt’s so-called “black paintings” in conjunction with an exhibition at the Guggenheim Museum. He continued to work on the catalogue raisonné of Ellsworth Kelly’s paintings and sculptures, and he is finishing his work on the Barnes Foundation’s holdings of Matisse. At the Institute, he organized an informal art history seminar and dinner where Members as well as scholars from the area presented their current work.

In July, he participated in the symposium on Héli Oiticica held at the Tate Gallery in London. In October, he gave lectures on “Barnett Newman’s Jewishness” at the Lavy Colloquium at Johns Hopkins University and on Ellsworth Kelly’s French years at the Philadelphia Museum of Art. In November, he lectured again on Kelly at the Hirshhorn Museum of Art in Washington, and on Barnett Newman at the Oikones conference in Basel. He also gave three lectures at the School of Architecture of the University of California, Los Angeles, on the relationship between art and architecture and a lecture at The University of Chicago on formalism. In January, he participated in a symposium held at the Getty Museum on the relationship between art history and conservation. In March, he gave two lectures at Emory University on formalism and on pseudomorphism, the latter of which he gave again at Harvard in April. In May, he had a public conversation with Richard Serra in the Louvre, in conjunction with the artist’s installation of several monumental works in Paris.

Beyond the individual research projects, many events drew groups of scholars together for lectures and discussions that facilitated the exchange of ideas across fields and regions. These included a regular series of presentations by individual Members to the School as a whole at the Monday Lunch-time Colloquia, as well as invited lectures, seminars, and a number of smaller groups that met on a regular basis to

In 2007–08, Professor **Caroline Walker Bynum** worked at turning “Christian Materiality,” her Jerusalem lectures from last June, into a book. She wrote an article on devotion to Christ’s side wound in the fifteenth century, another on the reception in Christian theology of biblical passages concerning sacrifice down to the twentieth century, and two pieces for a general audience on the state of the historical profession. *Crown and Veil*, for which she wrote the preface and an article on women’s spirituality, was published by Columbia University Press. Her short essay, “The P Word,” which appeared in the American Historical Association’s *Perspectives* in October, drew a surprisingly large amount of attention. *Wonderful Blood* (University of Pennsylvania Press, 2007) won the American Academy of Religion’s Award for Excellence in historical studies in November. In December, she received an honorary Doctor of Humane Letters from the University of Michigan.

During the year, Bynum lectured at Lafayette College in Easton, Pennsylvania; Academia Sinica and National Taiwan University in Taiwan; Princeton Theological Seminary; Columbia University; the Delaware Valley Medieval Association; the University of Oxford; Tel Aviv University; and the American Academy in Rome. She led workshops for graduate students at National Taiwan University and National Tsinghua University, at the University of Oxford, at Brown University, and at the Israeli Historical Society in Jerusalem. She continued to work with Columbia University graduate students, served on the selection committee of the Yad-Hanadiv Foundation, and joined the Board of the American Academy in Berlin. At the Institute, she led a Medieval Table that met every Wednesday at lunchtime for presentation of individual research and discussion of general methodological issues. She also organized, with Professor Piet Hut of the Program in Interdisciplinary Studies, an early evening series called “After Hours Conversations,” designed to increase intellectual exchange across the four Schools at the Institute.

The most exciting event of the year for her was a conference, organized by her graduate students from the past thirty-five years and held at Princeton University on September 28, at which she was presented with a Festschrift, *History in the Comic Mode* (Columbia University Press, 2007), the title of which was taken from one of her own methodological essays. A close second was a session at a Radcliffe Institute for Advanced Study conference on “Gender and Religion” (April 3) devoted to “The Work of Caroline Walker Bynum in Twenty-first Century Perspective.”

Andrew W. Mellon Professor **Patricia Crone** spent the year working on the Iranian rebels of the eighth and ninth centuries, and in particular on the nature of their religious beliefs, some of which reappear time and again in the religious history of Iran down to modern times. She completed an article analyzing a tenth-century Ismaili report on such beliefs and drafted much of a book, which she envisages as the end result of this

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Professors Patricia Crone and Jonathan Israel organized a conference on the connections between Islamic ideas and the Radical Enlightenment.



CLIFF MOORE

research, but the subject has many ramifications and the end is not yet in sight. She also wrote the entries on “atheism” and “Barahima” for the third *Encyclopaedia of Islam*, reflecting another long-term interest of hers, namely the history of the Dahris, adherents of oddly modern-sounding beliefs in early Muslim Iraq whose views played a role in the formation of early Muslim theology and had a long afterlife. She also drafted an article on the subject.

Her second *Variorum* volume of collected articles, on political, social, and military history, appeared in print. So too did the Turkish translation of her *Medieval Islamic Political Thought*, which was so long in the making that she thought the project had been abandoned. On the editorial front, her series *Makers of the Muslim World* now boasts twenty-seven volumes. She has also become involved in the creation of a new encyclopedia of Islamic political thought.

As regards public appearances, she delivered lectures and seminars on subjects such as the Quranic declaration “there is no compulsion in religion,” Iranian heresy (Khurramism), and the cultural aftermath of great imperial expansions in Freiburg, Oxford, Los Angeles, and Vienna and attended diverse conferences in between. In addition, she organized jointly with Professor Jonathan Israel and Professor Martin Mulsow of Rutgers, The State University of New Jersey, an event that gathered medievalists and early modernists, both Islamic and European, for intensive work on the links between Islamic ideas and the Radical European Enlightenment. The conference, held at the Institute in April, cut across many fields and was an experiment in the difficult art of establishing sufficient common ground for experts to consider one another’s problems. It is an activity for which the Institute is ideally suited, and she hopes it will become a tradition.

The Quran readings and Persian text readings continued as before, and the Islamicist seminar met occasionally.

During the academic year 2007–08, Luce Foundation Professor in East Asian Studies **Nicola Di Cosmo** concentrated on research in two main ambits. The first concerns the Chinese historiography on nomadic empires, with special attention to the way in which Chinese early sources constructed a history of foreign peoples. His working hypothesis is that early Chinese histories fixed a model of nomadic history that in later times was adopted by the nomads for building their empires. The gist of this study concerns an analysis of the traditional Chinese historiography of the Xiongnu empire (third to first centuries BC), Türk empire (sixth to eighth centuries), Mongol empire (thirteenth to fourteenth centuries), and the Manchu regime that conquered China in the seventeenth century, through which it may be possible to understand one of the critical issues in the history of Eurasian nomads, namely, the transmission over time of a consciousness of nomadic empires and of the imperial political culture and institutions associated with it.

The second ambit concerns a new interpretation of the

Professor Nicola Di Cosmo gave a Faculty lecture at the Institute on “The History of Others: Foreign Peoples in Early Chinese Historiography,” in which he discussed his working hypothesis that early Chinese histories fixed a model of nomadic history that in later times was adopted by the nomads for building their empires.



ANDREA KANE

Manchu conquest of China, according to which the global connections created by the expansion of Europe in the sixteenth century and a greater commercialization of China during the same period were responsible for the rapid development of Manchuria and the rise of a new political power. This hypothesis places the history of Manchuria in a context of global economic trends in sharp contrast with traditional theses that focus on the failure of the Ming state or on Manchu traditional culture.

His activities at the Institute involved the organization of ten talks (the East Asian Seminar series) and a workshop on Eurasian archeology with papers by Russian and Ukrainian archeologists.

Di Cosmo lectured at Princeton, Berkeley, Columbia, and Stanford, and he delivered a Faculty lecture at the Institute. Abroad he lectured in Italy (Universities of Padova, Venice, and Piemonte Orientale) and Korea (Seoul National University). Especially noteworthy were the Mote Memorial Lectures at Princeton University, established in 2005 in memory of Professor Frederick Mote. The themes of these lectures ranged from Chinese historiography to Medieval Eurasian trade, Mongol history, and the frontiers of ancient China.

Among his other activities, he was nominated coeditor of an Oxford University Press series dedicated to ancient empires. He evaluated a number of academic promotions, manuscripts for publications (both monographs and essays), and doctoral dissertations. In April 2008, he was elected to the Executive Board of the Italian Scientists and Scholars in North America Foundation.

During the academic year 2007–08, Professor **Jonathan Israel** continued drafting chapters for the third part of his outline history of the Western Enlightenment, covering the period 1750–89, and also continued his research into rare books, manuscripts, and historical background necessary to the project. His research during this year took him to libraries in Oxford, London, Berlin, Greifswald, Helsinki, and Paris.

As he was in his sabbatical year during this academic session, he was able to spend two and a half months in Oxford working in several College libraries as well as the Bodleian Library from January to late March. During this period, he delivered the Sir Isaiah Berlin Memorial Lectures, a series of six lectures hosted jointly by the Oxford Philosophy and History faculties. He also gave two separate additional talks in Oxford. In addition to these, he delivered public lectures or conference papers in Princeton; The Hague; Helsinki; Le Mans; Rouen; Greifswald; Bergen, Norway; and Catania, Sicily, and he made two historical television programs, one in New York and the other for a Dutch company, in Oxford.

In April, with Professor Patricia Crone and Professor Martin Mulsow of Rutgers, Israel convened a conference at the Institute on textual and other links between medieval Islam and the Radical Enlightenment. Together they plan to edit the proceedings.

In May, it was announced that Israel had been awarded the 2008 Heineken Prize for History, which he was scheduled to receive in Amsterdam in October 2008.

His publications this year, along with several book reviews, were:

Professor Israel continued drafting chapters for the third part of his outline history of the Western Enlightenment, covering the period 1750–89. His research into rare books, manuscripts, and historical background necessary to the project took him to libraries in Oxford, London, Berlin, Greifswald, Helsinki, and Paris.

A major new concern of Professor Margalit's has to do with the notion of sectarianism and the sectarian mindset as an attitude toward politics and religion. During the second term, he held a seminar on sectarianism and esotericism for Members.

"Admiration of China and Classical Chinese Thought in the Radical Enlightenment (1685–1740)," *Taiwan Journal of East Asian Studies* IV (2007); "Enlightenment, Radical Enlightenment, and the 'Medical Revolution' of the Late Seventeenth and Eighteenth Centuries" in *Medicine and Religion in Enlightenment Europe* (Ashgate, 2007), edited by Ole Peter Grell and Andrew Cunningham; "John Locke and the Intellectual Legacy of the Early Enlightenment" in *Eighteenth-Century Thought* III (2007); "Gerrit Paape, 'Wijsbegeerte,' en de 'Algemene Revolutie' van de mensheid" in *Parmentier* XVI (2007); "Replying to Hanco Jurgens" in *De Achttiende Eeuw* XXXIX (2007); and "Radical Enlightenment and its Relevance to Today's Problems" in *The Secular State and Islam in Europe*, edited by Kurt Almquist (Riga, 2007).

Having spent much of the academic year working on the completion of his book *Compromise and Rotten Compromise*, George F. Kennan Professor **Avishai Margalit** submitted the manuscript to the publisher, Princeton University Press. In the winter, he presented two chapters from this book as lectures at Stanford University.

A major new concern of Margalit's has to do with the notion of sectarianism and the sectarian mindset as an attitude toward politics and religion. Margalit gave the Irving Howe Memorial Lecture on this topic, as well as an opening lecture at the Exzellenzcluster conference at the University of Konstanz, Germany. During the second term, Margalit held a seminar on sectarianism and esotericism for Members.

In the past year, Margalit served as a member of the academic committee charged with organizing an international conference in honor of Michael Walzer, which took place in June. Within this framework, he delivered a lecture on "Fraternity and Solidarity," which will be part of a book he is currently writing on *Loyalty and Betrayal* to be published by Harvard University Press.

Margalit is in the exploratory stages of creating a center for Shared Contested History for countries that were once at war with each other and whose painful pasts threaten to undermine the stability of peaceful relations between them. Margalit is starting with Poland as the testing ground for his idea.

Professor Heinrich von Staden (left), pictured with Professor Yve-Alain Bois (center), has been mainly focused on drafting several chapters for a long-term project on the relation between collectivities and individuals in the development of Greek and Roman science and medicine.



A frequent writer for *The New York Review of Books*, Margalit contributed a major article, "A Moral Witness to the Intricate Machine" (December 2007), in which he addressed some of the moral issues of the conflict between Israel and the Palestinians.

Early in the academic year 2007–08, Professor **Heinrich von Staden** gave two lectures on the relations between science and religion at the Collegiate Peaks Forum in Colorado and a keynote lecture, "How Greek was the Roman Body?," at a colloquium at the University of Manchester.

Subsequently, he gave two keynote lectures, one in October on “Words, Actions, and Visualization in Greek Incubation Narratives,” the other in December on “The Plasticity of the ‘Scientific’” at conferences at Humboldt University in Berlin. A further keynote lecture, “Science and Medicine in Alexandria from the First Century BC to the Second Century AD,” followed at a conference on “Alexandrian Personae” at the University of North Carolina. In addition, he gave a lecture on “The Physician as Historian” at the Istituto Italiano per la Storia Antica in Rome, and another on “The Elasticity of Forms: Transformations in the Written Organization of Medical Knowledge” at a workshop on “Condensation, Organization, and Transmission” at the Fondation Hardt in Vandœuvres, Switzerland. He also contributed a paper on “Authority, Agon, and Exegesis: Creating Hippocrates” to a symposium in honor of Sir Geoffrey Lloyd at the University of Cambridge. In August 2007, von Staden presided at a meeting of the delegates to the Fédération Internationale des Études Classiques in Barcelona. He also participated in colloquia and workshops in Paris and Mainz in April and June 2008, and he continues to serve on the editorial boards of several journals in the United States and Europe.

Aside from a number of book reviews, he published several articles, including “Physis and Techne in Greek Medicine” in *The Artificial and the Natural: An Evolving Polarity*, edited by Bernadette Bensaude-Vincent and William R. Newman (MIT Press, 2007); “Purity, Purification, and *Katharsis* in Hippocratic Medicine” in *Katharsiskonzeptionen vor Aristoteles*, edited by Martin Vöhler and Bernd Seidensticker (Walter de Gruyter, 2007); “Aulus Cornelius Celsus on *Ars* and *Natura*” in *Tradición Griega y Textos Médicos Latinos en el Período Presalernitano*, edited by Arsenio Ferráces Rodríguez (La Coruña, 2007); and “The Oath, the Oaths, and the Hippocratic Corpus” in *La Science Médicale Antique. Nouveaux Regards*, edited by Véronique Boudon-Millot, Alessia Guardasole, and Caroline Magdelaine (Beauchesne, 2008). During the academic year, he mainly concentrated on drafting several chapters for a long-term project on the relation between collectivities and individuals in the development of Greek and Roman science and medicine.

Professor Emeritus **Glen W. Bowersock** has been working in the last year on late antique Ethiopic epigraphy, the *Kebra Nagast*, and Syriac apocalyptic. He delivered a paper on these topics at the international Patristics conference in Oxford in August 2007. In September 2007, he was a visiting scholar at the American Academy in Rome and also presented a paper on Aelius Aristides’ *Panathenaicus* at a colloquium in Florence. In February 2008, he traveled to Florida State University in Tallahassee to deliver a paper on *iatrosophists* at the Langford Conference, organized by former Member and Langford Eminent Scholar at Florida State University Miriam Griffin. For a week in early April, he served as John H. Biggs Resident in Classics at Washington University in St. Louis, where he gave three lectures and met with students and faculty. In May, he celebrated the retirement of former Member François Paschoud at



ANDREA KANE

Professor Avishai Margalit spoke on “Fraternity and Solidarity” at an international conference that was held at the Institute in June, celebrating the work of School of Social Science Professor Emeritus Michael Walzer.

a colloquium on late antique historiography at the University of Geneva.

Bowersock has written a new preface for a French translation of his *Julian the Apostate*. It will incorporate an excerpt from a hitherto unpublished letter

he received from Marguerite Yourcenar about the book when it first appeared in 1978. A French translation of his *Fiction as History* and an Arabic translation of his *Roman Arabia* both appeared toward the end of 2007. He is preparing for Oxford University Press a collection of essays on the classical tradition under the title *From Gibbon to Auden*.

Meanwhile, Bowersock continued to supervise the Fonds Louis Robert at the Académie des Inscriptions et Belles-Lettres in Paris, and on the tenth anniversary of Mme Robert's gift, he has agreed to speak about Louis Robert and his achievement at the annual *rentrée* of the Académie under the coupola of the Institut de France in

November 2008. Bowersock went twice to Florence to chair the *consiglio scientifico* of the Istituto Italiano di Studi Umanistici, and he went twice to Brussels to chair a panel for awarding the European Research Council's new grants for senior scholars. He went to Helsinki in May 2008 to serve on the Advisory Committee of the Academy of Finland for the university's Center of Excellence, which sponsors, among many important projects, work on the Petra Papyri, the Jabal Harun excavation, and the patriarchal library of Alexandria. He continued as a member of the Advisory Committee for New York University's new Institute for the Study of the Ancient World.

During the academic year 2007–08, Professor Emeritus **Giles Constable** published one article, a foreword (to *From Martyr to Monument*, by Janet T. Marquardt), a conclusion (to *Mittelalterliche Orden*, by Gert Melville and Anne Müller), a memoir (of Herbert Bloch), and three reviews. He spoke at conferences in Lorient, Brioude, Washington, Schloss Dhaun, Avignon, Rutgers, and Drew Universities and attended meetings in Paderborn, New York, and Princeton. He has three books in press and two others nearing completion.

Professor Emeritus **Oleg Grabar** lectured at the University of Georgia in Athens, Georgia; Case-Western Reserve in Cleveland; Gennadion Library and Benaki Museum in Athens, Greece; and the American Philosophical Society in Philadelphia. He chaired a panel of the Middle Eastern Studies Association in Montreal and participated in a panel at the Louvre in Paris to discuss the reopening of the Islamic collections in the Musée des Arts Décoratifs. Publications include "The Qur'an as a Source of Art" in *Word of God, Art of Man*, edited by Fahmida Suleman (Oxford University Press, 2008); "What does Arab Painting mean?" in *Arab Painting*, edited by Anna Contadini (Brill, 2007); and "Half a Century in the Study of Islamic Art" in *Exploring the Built Environment*, edited by Mohammad al-Asad (CSBE, 2007).

Professor Emeritus **Christian Habicht** accepted a proposal from Harvard University Press to contribute to a new bilingual edition of the work of the



CLIFF MOORE

Professor Emeritus Oleg Grabar queried Professor Jonathan Israel from the audience during the question-and-answer period that followed Israel's lecture on "The Islamic World and the Radical Enlightenment: Toleration, Freethinking, and Personal Liberty."

historian Polybius, published in six volumes of the Loeb Classical Library by W. R. Paton, 1922–27, and often reprinted. Frank Walbank, the doyen of Polybian studies, had revised both the Greek text and the English translation and had put his extensive handwritten notes on the printed pages. They needed to be checked and transformed into a manuscript. Moreover, for the first time, the Press wanted short explanatory notes to be added to the entire work. Walbank's *Historical Commentary on Polybius*, in three massive volumes, published in 1957, 1967, and 1979, helps enormously, but new finds and recent bibliography must constantly be added. Habicht has devoted nearly all his time since summer 2007 to this large project.

His publications during the year were as follows: “Lolling in Thessalien (1882)” and “Aus Lollings thessalischen Tagebüchern” in *Historische Landeskunde und Epigraphik in Griechenland. Akten des Symposiums veranstaltet aus Anlass des 100. Todestages von H. G. Lolling (1848–1894) in Athen vom 28. bis 30. 9. 1994* (2007) and “Neues zur hellenistischen Geschichte von Kos” in *Chiron* 37 (2007). Three other papers were accepted by various journals for publication.

This year saw the publication of the first volume of Professor Emeritus **Irving Lavin**'s collected works: *Visible Spirit. The Art of Gianlorenzo Bernini*, vol. I (Pindar, 2007). It is the first of a projected five-volume edition. Two other papers dealing with art in Rome in the seventeenth century have also been published: “Urbanitas urbana. The Pope, the Artist, and the Genius of the Place” in *I Barberini e la Cultura Europea del Seicento*, edited by Lorenza Mochi Onori, et al. (De Luca Editori d'Arte, 2007), and “The Baldacchino. Borromini vs Bernini: Did Borromini Forget Himself?” in *St. Peter in Rom 1506–2006, Akten der Internationalen Tagung 22.–25.02.2006 in Bonn*, edited by Georg Satzinger and Sebastian Schütze (Hirmer Verlag, 2008). Lavin was appointed an Honorary Member of the Comitato Nazionale per le Celebrazioni del Centenario della Nascita di Giulio Carlo Argan (1909–92).

Two of the lectures Professor Emeritus **Peter Paret** gave this academic year have been published: his talk before the Militärisch-Politische Gesellschaft in Berlin on modern social-science interpretations of Clausewitz, “Gedanken über Clausewitz,” appeared in *Denkwürdigkeiten der Politisch-Militärischen Gesellschaft* no. 43 (2008); and his talk, “Beyond Music: Paul Hindemith's Opera *Mathis der Maler* as Political Document,” in the Princeton University Art Museum series, “The Inspiration of Art,” has come out in an expanded version in *Historically Speaking* IX, no. 5 (2008). A third lecture at Humboldt University in Berlin, “Kunst und Zeitgeschichte: Barlach's Zeichnungen zum Nibelungenlied,” is included in the catalogue of the coming exhibition on Barlach's graphics by the Ernst Barlach Stiftung in Güstrow. An earlier talk at Princeton University, “Triumph and Disaster of Assimilation: The Painter Max Liebermann,” appeared in *The Jewish Studies Quarterly* XV, no. 2, 2008. Paret also published “Images as Documents in the History of War,” in *Central European History* XXXVIII, no. 2 (2007), and a “featured review” in *The American Historical Review* CXII, No. 5 (2007), “David A. Bell, *The First Total War*.”

During the academic year, Paret prepared the Lees Knowles Lectures on the History of War, which he will give at the University of Cambridge in fall 2008. The lectures address four varieties of history of the same episode: nar-

Professor Paret is continuing to prepare the Lees Knowles Lectures on the History of War, which he will give at the University of Cambridge in fall 2008. The lectures will address four varieties of history of the same episode: narrative; interpretations in literature, the fine arts, and works of popular culture; political and institutional history; and theoretical analysis.

Professor White's examination of the ideas of necessary truth, indubitability, and certainty in the writings of philosophers from Descartes to the present day will involve a study of similar efforts by philosophers and thinkers of the nineteenth and twentieth centuries, thereby providing a background for the views set forth in White's Philosophy of Culture.

rative; interpretations in literature, the fine arts, and works of popular culture; political and institutional history; and theoretical analysis. The lectures are to be published in the fall of 2009. A second project now nearing completion is an exhibition of Ernst Barlach's drawings and woodcuts on two culturally and ideologically significant German myths, the Nibelungen saga and the Faust legend. Barlach's recreations of these texts in the medium of graphic art are remarkable and controversial achievements of Weimar modernism. The exhibition, which will be augmented with examples of Barlach's sculptural work, will open on February 28, 2009, at the Princeton University Art Museum.

On June 3, Professor Emeritus **Morton White** spoke at Princeton University to a gathering of philosophers celebrating the one hundredth anniversary of Willard Van Orman Quine's birth. White's topic was "W.V. Quine: Teacher, Colleague, Friend." His book, *The Intellectual versus the City: From Thomas Jefferson to Frank Lloyd Wright* (1962), written with the late Lucia Perry White, is scheduled to be reissued with a new introduction.

White continues to work on a "prequel" to his book *A Philosophy of Culture* (2002). His new work will be a critical study of the ideas of necessary truth, indubitability, and certainty in the writings of philosophers from Descartes to the present day, a study in which White tries to show how highly technical views in logic, epistemology, and metaphysics were used to defend controversial views in the wider philosophy of culture, for example in Descartes' attempt to prove the existence of God, in Hobbes's political philosophy, in Kant's ethical theory, and in Hegel's philosophy of history. This examination will continue with a study of similar efforts by philosophers and thinkers of the nineteenth and twentieth centuries, thereby providing a background for the views set forth in White's *Philosophy of Culture*.

From left: Eric Maskin, Professor in the School of Social Science, with School of Historical Studies Professor Heinrich von Staden and Professors Emeriti Morton White and Glen Bowersock



CLIFF MOORE

MEMBERS, VISITORS, AND RESEARCH STAFF

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Funding provided by the Fund for Historical Studies

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Funding provided by the Friends of the Institute for Advanced Study

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Edward T. Cone Membership in Music Studies

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Funding provided by The Gladys Krieble Delmas Foundation

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Agnes Gund and Daniel Shapiro Membership

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Ancient History ♦ École Pratique des Hautes Études, Paris
Funding provided by the Patrons' Endowment Fund

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Funding provided by The Andrew W. Mellon Foundation

John Beldon Scott

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Jonathan Skaff

Chinese History ♦ Shippensburg University ♦ f
Felix Gilbert Membership

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Archaeology ♦ Institute of Archaeology, National Academy of Sciences of Ukraine ♦ s
Funding provided by the Gerda Henkel Stiftung

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Funding provided by the Fund for Historical Studies

Giacomo Todeschini

Medieval History ♦ Università degli Studi di Trieste ♦ s
Funding provided by The Andrew W. Mellon Foundation

Nancy J. Troy

Art History ♦ University of Southern California ♦ f
Funding provided by The Andrew W. Mellon Foundation

Nurit Tsafir

Medieval Islamic Law ♦ Tel Aviv University
The Martin L. and Sarah F. Leibowitz Membership

Kevin van Bladel

Classics and Arabic/Islamic Studies ♦ University of Southern California ♦ f
Funding provided by The Herodotus Fund

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Edwin C. and Elizabeth A. Whitehead Fellowship

Thomas Weber

Modern European History ♦ University of Pennsylvania
Funding provided by The Herodotus Fund

Witold Witakowski

Semitic Studies ♦ Uppsala University
Funding provided by The Gladys Krieble Delmas Foundation

Margherita Zanasi

Chinese History ♦ Louisiana State University
National Endowment for the Humanities Fellow

Graham Zanker

Classics, Hellenistic Poetry ♦ University of Canterbury ♦ v, f

f First Term ♦ s Second Term ♦ v Visitor ♦ a Research Assistant

RECORD OF EVENTS

In addition to the more formal events listed below, there were also informal groups that gathered on a regular basis. Among these was a group that read, translated, and discussed the Quran, and another group (conducted in Persian) that studied Persian poetry and prose.

September 27

Early Modern and Nineteenth-Century Historians Workshop ♦ Initial meeting

October 1

Historical Studies Lunchtime Colloquium ♦ Introductions

October 3

Medieval Table Lunchtime Colloquium ♦ Approaches to a Vernacular Indian Epic ♦ Cynthia Talbot, The University of Texas at Austin; Member, School of Historical Studies

October 5

Ancient Studies Seminar ♦ Elagabalus, Aramaean Emperor of Rome ♦ Kevin van Bladel, University of Southern California; Member, School of Historical Studies

October 8

Historical Studies Lunchtime Colloquium ♦ William Hazlitt's *Metaphysical Discovery* ♦ Jonathan Rée, Roehampton University; Member, School of Historical Studies

October 9

East Asian Studies Seminar ♦ The Xiangfen, Taosi Site: A Chinese Neolithic "Observatory"? ♦ David Pankenier, Lehigh University

October 10

Medieval Table Lunchtime Colloquium ♦ Byzantine Art: Things in the World: A Discussion of an Exhibit Proposed for the Menil Collection in Houston ♦ Glenn Peers, The University of Texas at Austin; Member, School of Historical Studies

October 15

Historical Studies Lunchtime Colloquium ♦ Confronted Dragons, Confronted Traditions: Apotropaic Reliefs in Thirteenth-Century Islam ♦ Persis Berlekamp, The University of Chicago; Member, School of Historical Studies

October 17

Medieval Table Lunchtime Colloquium ♦ Conceptualizing Culture with Attention to the Example of the Patron-Client Relationship in Early Medieval Europe and Early Imperial China ♦ Richard Abels, United States Naval Academy, Annapolis, Maryland, and Jonathan Skaff, Shippensburg University; Members, School of Historical Studies

October 19

Early Modern and Nineteenth-Century Historians Workshop ♦ Radical Instrumentalism from Galileo to Hooke ♦ Ofer Gal, The University of Sydney; Member, School of Historical Studies

Ancient Studies Seminar ♦ "The Writing of the God" and the Textualization of Neo-Assyrian Prophecy ♦ Beate Pongratz-Leisten, Princeton University; Member, School of Historical Studies

October 22

Historical Studies Lunchtime Colloquium ♦ Global Commerce and Global Science in the Early Modern Period ♦ Harold Cook, University College London; Member, School of Historical Studies

October 24

Art History Seminar ♦ Napoleonic War Painting and Collective Memory ♦ David O'Brien, University of Illinois at Urbana-Champaign; Member, School of Historical Studies

October 29

Historical Studies Lunchtime Colloquium ♦ The Prehistory of a Hindu Nationalist Hero ♦ Cynthia Talbot, The University of Texas at Austin; Member, School of Historical Studies

October 30

East Asian Studies Seminar ♦ The Theory and Practice of Evidential Research: Qian Daxin (1728–1804) and the *Arts Critica* in Qing China ♦ Q. Edward Wang, Rowan University

November 5

Historical Studies Lunchtime Colloquium ♦ *Arabic Historians and the Astrologers* ♦ **Kevin van Bladel**, University of Southern California; Member, School of Historical Studies

November 7

Medieval Table Lunchtime Colloquium ♦ *Monastic Liturgy and the Devil* ♦ **Susan Boynton**, Columbia University; Member, School of Historical Studies

Early Modern and Nineteenth-Century Historians Workshop ♦ *Why Did Leibniz Come to Study Hobbes and How Could the Young Lawyer Get Interested in Infinitesimals?* ♦ **Ursula Goldenbaum**, Emory University; Member, School of Historical Studies

Art History Seminar ♦ *Icons' Spirited Erotics* ♦ **Glenn Peers**, The University of Texas at Austin; Member, School of Historical Studies

November 12

Historical Studies Lunchtime Colloquium ♦ *Tang China's Northern Borderlands: Historical and Ecological Perspectives on Interactions with Inner Asia* ♦ **Jonathan Skaff**, Shippensburg University; Member, School of Historical Studies

November 13

East Asian Studies Seminar ♦ *Guilty of Indigence: The Urban Poor in China, 1900–1951* ♦ **Janet Y. Chen**, Princeton University

November 14

Medieval Table Lunchtime Colloquium ♦ *On Rupa: Form, Embodiment, and Techniques in the Hindavi Sufi Romances* ♦ **Aditya Behl**, University of Pennsylvania; Member, School of Historical Studies

November 19

Historical Studies Lunchtime Colloquium ♦ *The "Pantheismusstreit" in Germany and Its Connection with the Public Debate on Jewish Emancipation* ♦ **Ursula Goldenbaum**, Emory University; Member, School of Historical Studies

November 26

Historical Studies Lunchtime Colloquium ♦ *The Ripple That Drowns: Twentieth-Century Famines as Economic History* ♦ **Cormac Ó Gráda**, University College Dublin; Member, School of Historical Studies

November 28

Early Modern and Nineteenth-Century Historians Workshop ♦ *Creative Misunderstandings? Chinese Medicine in Seventeenth-Century Europe* ♦ **Harold Cook**, University College London; Member, School of Historical Studies

November 29

Medieval Table Lunchtime Colloquium ♦ *Recent Medieval Conferences in Interdisciplinary Perspective* ♦ **Richard Abels**, United States Naval Academy, Annapolis, Maryland; Member, School of Historical Studies ♦ **Persis Berlekamp**, The University of Chicago; Member, School of Historical Studies ♦ **Giles Constable**, Professor Emeritus, School of Historical Studies

December 3

Historical Studies Lunchtime Colloquium ♦ *North African Subjects in the Late Work of Delacroix* ♦ **David O'Brien**, University of Illinois at Urbana-Champaign; Member, School of Historical Studies

December 5

Medieval Table Lunchtime Colloquium ♦ *The Thirteenth-Century "Bibles moralisées" in Their Context* ♦ **Katharine Tachau**, The University of Iowa

December 6

Film Screening ♦ *Nathan the Wise* ♦ Silent film produced by Manfred Noa in Germany in 1922

December 7

Joint Art History and East Asian Studies Seminar ♦ *Tōyo and Dongyang: Japanese and Chinese Search for "Chinese Architecture" in the Writing of World Architectural History, 1890s to 1940s* ♦ **Vimalin Rujivacharakul**, University of Delaware

December 10

Historical Studies Lunchtime Colloquium ♦ *Religious and Political Affairs in the Circum-Erythraean Area in the Beginning of the Sixth Century* ♦ **Witold Witakowski**, Uppsala University; Member, School of Historical Studies

December 11

East Asian Studies Seminar ♦ *Power through Patronage: Interethnic Political Networking in T'ang China* ♦ **Jonathan Skaff**, Shippensburg University; Member, School of Historical Studies

December 12

Medieval Table Lunchtime Colloquium ♦ *Image and Interpretation in the Florentine Bible Frontispiece* ♦ **Anne-Marie Bouché**, Research Assistant, School of Historical Studies

Early Modern and Nineteenth-Century Historians Workshop ♦ *The Secret at Galileo's Trial* ♦ **Walter (Roy) Laird**, Carleton University; Member, School of Historical Studies

Art History Seminar ♦ *Tintoretto's Semiotics of Style* ♦ **Benjamin Paul**, Rutgers, The State University of New Jersey

December 13

History of Science Seminar ♦ *The Real Issue* ♦ **Ofer Gal**, University of Sydney; Member, School of Historical Studies

December 17

Historical Studies Lunchtime Colloquium ♦ *The Synagogue and the Civilizing Process of the Portuguese Jews of Amsterdam* ♦ **Yosef Kaplan**, The Hebrew University of Jerusalem; Member, School of Historical Studies

January 9

Medieval Table Lunchtime Colloquium ♦ *Cosmology vs. Mythologization of the King in Ancient Mesopotamia* ♦ **Beate Pongratz-Leisten**, Princeton University; Member, School of Historical Studies

January 14

Historical Studies Lunchtime Colloquium ♦ *Second Term Introductions*

January 21

Historical Studies Lunchtime Colloquium ♦ *What Does the Battle of Hastings Have to Do with Pornography? The Borders of the Bayeux Tapestry and the Meaning of Marginal Images* ♦ **Peter Klein**, Universität Tübingen; Member, School of Historical Studies

January 22

East Asian Studies Seminar ♦ *In Search of Political Modernity: Sun Yat-Sen and Western Social Sciences* ♦ **Margherita Zanasi**, Louisiana State University; Member, School of Historical Studies

January 23

Medieval Table Lunchtime Colloquium ♦ *Methods and Paradigms for Considering Marginal Images in Medieval Art* ♦ **Peter Klein**, Universität Tübingen; Member, School of Historical Studies

January 28

Historical Studies Lunchtime Colloquium ♦ *Aristotle's Physics in Context. Aristotle and the Aristotelian Tradition in Antiquity* ♦ **Andrea Falcon**, Concordia University, Montreal; Member, School of Historical Studies

January 30

Medieval Table Lunchtime Colloquium ♦ *Beyond Rivers, Roots, and Branches: Rethinking Literary History and Refiguring Philology with Dante's Vita nuova* ♦ **Martin Eisner**, Duke University; Member, School of Historical Studies

Art History Seminar ♦ *The Civil War Monument of Valle de los Caídos and the Memory Politics of the Franco Regime* ♦ **Peter Klein**, Universität Tübingen; Member, School of Historical Studies

January 31

Sectarianism Seminar ♦ *Sectarianism* ♦ **Avishai Margalit**, George F. Kennan Professor, School of Historical Studies

February 1

Ancient Studies Seminar ♦ *Thessalos and the Magic of Empire: The Story of a Greek Doctor's Discoveries in Egypt* ♦ **Ian Moyer**, University of Michigan; Member, School of Historical Studies

February 4

Historical Studies Lunchtime Colloquium ♦ *The Shaping of the Divine and Divine Agency in Mesopotamia* ♦ **Beate Pongratz-Leisten**, Princeton University; Member, School of Historical Studies

February 6

History of Science Seminar ♦ *Test Objects for Microscopes and the Problem of Epistemic Iteration* ♦ **Jutta Schickore**, Indiana University; Member, School of Historical Studies

February 11

Historical Studies Lunchtime Colloquium ♦ *Adolf Hitler, the Men of the List Regiment, and the First World War* ♦ **Thomas Weber**, University of Pennsylvania; Member, School of Historical Studies

February 13

Medieval Table Lunchtime Colloquium ♦ *Paradigms and Methods in Early Medieval Studies: The Making of a Book* ♦ **Celia Chazelle**, The College of New Jersey

East Asian Studies Seminar ♦ *Art and Ritual: Princess Tombs and the Funerary Procession in Tang China, 643–706 AD* ♦ **Chao-Hui Jenny Liu**, New York University

Ancient Studies Seminar ♦ *The Growth of Roman Land Ownership in the Early Republic* ♦ **Luigi Capogrossi Colognesi**, Università degli Studi di Roma, La Sapienza; Visitor, School of Historical Studies

Sectarianism Seminar ♦ *Was the Holy Grail a Stone Cup?* ♦ **Jodi Magness**, University of North Carolina at Chapel Hill; Member, School of Historical Studies

February 16

Islamicist Seminar ♦ *Bilingualism in the Pre-Islamic Near East* ♦ **David Graf**, University of Miami; Member, School of Historical Studies

February 20

Medieval Table Lunchtime Colloquium ♦ *Silent Music: Medieval Manuscripts and the Construction of History in Eighteenth-Century Spain* ♦ **Susan Boynton**, Columbia University; Member, School of Historical Studies

Eurasian Archaeology Conference: New Developments in Eurasian Archaeology from Ukraine, Uzbekistan, and Transbaikalia ♦ *Asian Features in a Royal Sarmatian Grave in the Ukraine (first century CE)* ♦ **Oleksander Symonenko**, Institute of Archaeology, National Academy of Sciences of Ukraine; Member, School of Historical Studies ♦ *Roman Soldiers in Bactria? Western Elements in the Arms and Armor of Hellenistic Central Asia from Southern Uzbekistan (second century BCE)* ♦ **Valery Nikonorov**, Russian Academy of Sciences ♦ *A Xiongnu Royal Burial Complex in Transbaikalia (first century CE)* ♦ **Sergey Minyaev**, Russian Academy of Sciences; Member, School of Historical Studies

History of Science/Ancient Studies Seminar ♦ *Methodological Problems in the History of the Body* ♦ **Brooke Holmes**, Princeton University; Member, School of Historical Studies

Art History Seminar ♦ *Perspective, Space, and Meaning in Donatello's Reliefs for the Santo in Padua* ♦ **David Drogin**, Fashion Institute of Technology, State University of New York

February 25

Historical Studies Lunchtime Colloquium ♦ *Vipers, Venom, and the Vagaries of Experimentation* ♦ **Jutta Schickore**, Indiana University; Member, School of Historical Studies

February 27

Medieval Table Lunchtime Colloquium ♦ *Vestiges of Irish Influence in Iceland* ♦ **Jens Ulff-Møller**, Independent Scholar

February 28

Sectarianism Seminar ♦ *Positive Exclusion? Modern Sectarianism from an Ancient Perspective* ♦ **Barbara Kowalzig**, Royal Holloway, University of London; Member, School of Historical Studies

February 29

Ancient Studies Seminar ♦ *The Languages of Jesus* ♦ **Witold Witakowski**, Uppsala University; Member, School of Historical Studies

March 3

Historical Studies Lunchtime Colloquium ♦ *Cultural Representations of Warfare in the High Middle Ages: Joinville's Life of St. Louis and the Morgan Picture Bible* ♦ **Richard Abels**, United States Naval Academy, Annapolis, Maryland; Member, School of Historical Studies

March 4

East Asian Studies Seminar ♦ *Sources for a History of Tibetan War Magic in the Sixteenth and Seventeenth Centuries* ♦ **Bryan Cuevas**, Florida State University; Member, School of Historical Studies

March 7

History of Science Seminar ♦ *The Renaissance of Mechanics* ♦ **Walter (Roy) Laird**, Carleton University; Member, School of Historical Studies

March 10

Historical Studies Lunchtime Colloquium ♦ *New Aramaic and Greek Funerary Stelae from Umm al-Jimal: A Glimpse of Society and Demography in Roman Arabia* ♦ **David Graf**, University of Miami; Member, School of Historical Studies

March 12

Medieval Table Lunchtime Colloquium ♦ *A Long Transformation of Meaning: Judas's Avarice and the Representation of "Ordinary" People's Untrustworthiness* ♦ **Giacomo Todeschini**, Università degli Studi di Trieste; Member, School of Historical Studies

History of Science/Ancient Studies Seminar ♦ *The Pre-History of the Commentary Tradition: Aristotelianism in the First Century BCE* ♦ **Andrea Falcon**, Concordia University, Montreal; Member, School of Historical Studies

Art History Seminar ♦ *Silent Dialogues: Text/Image Genres and Communication (in Medieval and Modern Art)* ♦ **Anne-Marie Bouché**, Research Assistant, School of Historical Studies

March 17

Historical Studies Lunchtime Colloquium ♦ *The Frontiers of Greek Cities and the Legal Status of the Border Areas* ♦ **Denis Rousset**, École Pratique des Hautes Études, Paris; Member, School of Historical Studies

March 18

Sectarianism Seminar ♦ *The Shiah* ♦ **Nurit Tsafir**, Tel Aviv University; Member, School of Historical Studies

March 19

Medieval Table Lunchtime Colloquium ♦ *Averroism and the Conversion of Jews to Christianity in Late Medieval Spain* ♦ **Yosef Kaplan**, The Hebrew University of Jerusalem; Member, School of Historical Studies

March 24

Historical Studies Lunchtime Colloquium ♦ *Virtue, Profit, and the Market: Chinese Economic Thought from Wang Fuzhi to Adam Smith* ♦ **Margherita Zanasi**, Louisiana State University; Member, School of Historical Studies

March 26

Medieval Table Lunchtime Colloquium ♦ *Petrarch's War and the Meaning of Florentine (Military) Wages, 1349–1350* ♦ **William Caferro**, Vanderbilt University; Member, School of Historical Studies

Ancient Studies/History of Science Seminar ♦ *Aristotle on the Origin of Theoretical Sciences in Egypt (Metaphysics A 1, 2): Some Difficulties of a Locus Classicus* ♦ **Alexander Verlinsky**, St. Petersburg State University; Member, School of Historical Studies

March 31

Historical Studies Lunchtime Colloquium ♦ *Medical Analogy and the Ethics of Care in Classical Greece* ♦ **Brooke Holmes**, Princeton University; Member, School of Historical Studies

April 1

East Asian Studies Seminar ♦ *Homeland Security: Preparing for Foreign Invasion in Late Tokugawa Japan* ♦ **David Howell**, Princeton University; Visitor, School of Historical Studies

April 4

History of Science Seminar ♦ *The British-Icelandic Long Hundred Counting System as Described in an Icelandic Arithmetic Treatise from 1736* ♦ **Jens Ulf-Møller**, Independent Scholar

April 16

Art History Seminar ♦ *Raumbild as Aporia (Architectural Representation in Netherlandish Painting)* ♦ **Christopher Heuer**, Princeton University

April 17

Islamicist Seminar ♦ *Rival Eyewitness Accounts of the Surrender of Jerusalem to Saladin (1187)* ♦ **Richard Abels**, United States Naval Academy, Annapolis, Maryland; Visitor, School of Historical Studies

April 21

Islamic Freethinking and Western Radicalism Conference ♦ *Introduction* ♦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ♦ *The Islamic Background to the Three Impostors' Theme* ♦ **Sarah Stroumsa**, The Hebrew University of Jerusalem ♦ *The Three Impostors in Medieval Europe* ♦ **Thomas Gruber**, University of Oxford ♦ *From Mohammedis Imposturae to the De Tribus Impostoribus: Early Modern*

Orientalism and the Enlightenment ♦ **Guy Stroumsa**, The Hebrew University of Jerusalem ♦ *Galen, ar-Razi, and Pietro d'Abano on Human Soul* ♦ **Danielle Jacquart**, École Pratique des Hautes Études, Paris

April 22

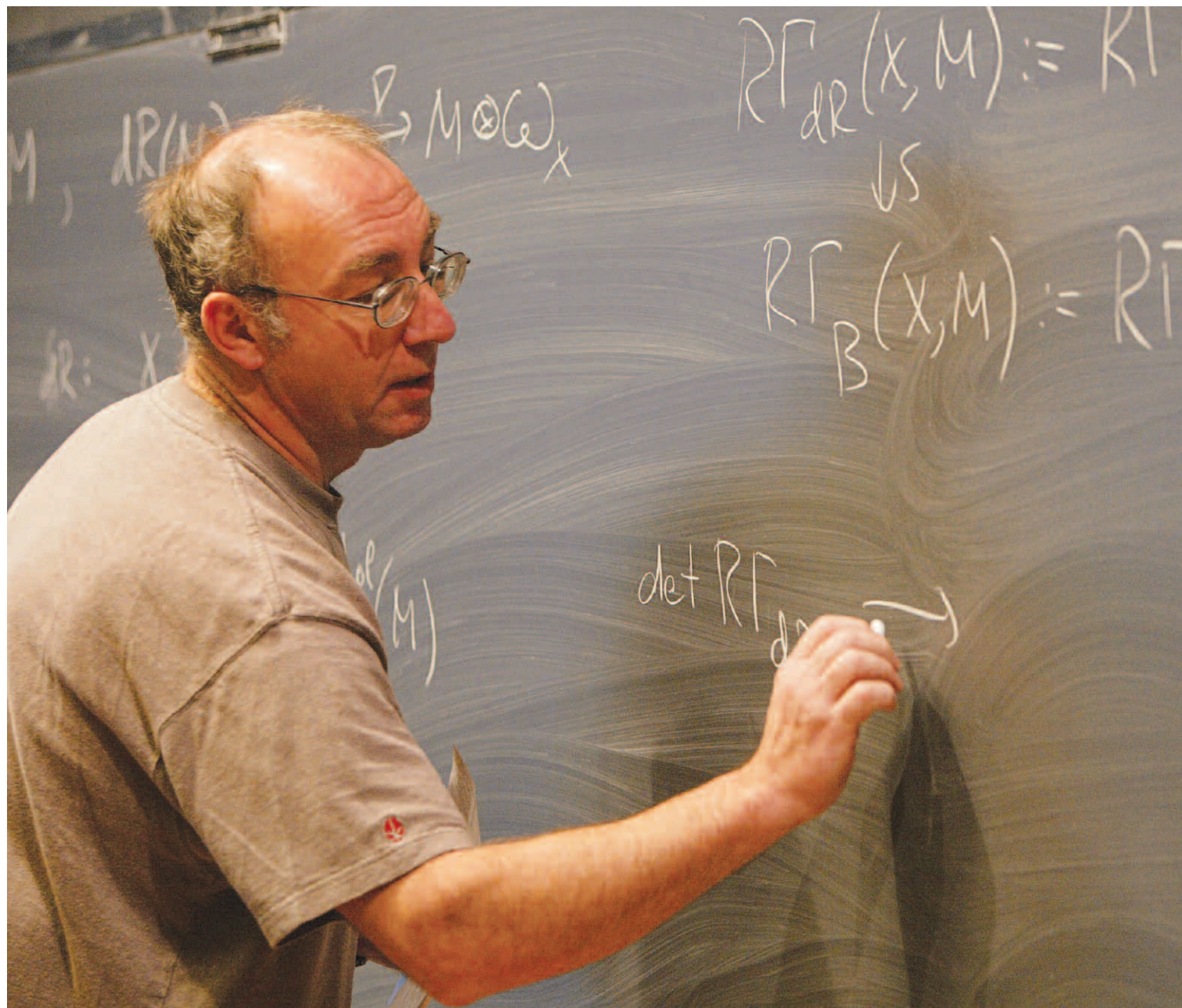
Islamic Freethinking and Western Radicalism Conference ♦ *The Legacy of Historical Astrology: Praeadamites, Horoscopes of Religion, and Natural Prophecy from Eighth-Century Iran to Eighteenth-Century Europe* ♦ **Kevin van Bladel**, University of Southern California; Member, School of Historical Studies, and **Martin Mulsow**, Rutgers, The State University of New Jersey ♦ *Was Ibn Rushd an Averroist? The Problem, the Debate, and its Philosophical Implications* ♦ **Anna Akasoy**, University of Oxford ♦ *The Idea of Spontaneous Generation among Islamic and Latin Thinkers* ♦ **Paola Zambelli**, University of Florence ♦ *"Averroism" and Skepticism in the Judeoconverso Diaspora* ♦ **Yosef Kaplan**, The Hebrew University of Jerusalem; Member, School of Historical Studies ♦ *Radical Enlightenment and the Structure of Its Theories about Arab Civilization, Islam, and Islamic Freethinking (1690–1790)* ♦ **Jonathan Israel**, Professor, School of Historical Studies

April 23

Islamic Freethinking and Western Radicalism Conference ♦ *Divine Erotics: Islam and the Hypnerotomachia Poliphili* ♦ **Samer Akkach**, University of Adelaide ♦ *Two Seventeenth-Century Ottoman Heretics* ♦ **Nenad Filipovic**, Princeton University and **Shahab Ahmed**, Harvard University ♦ *Radical Views of Islam in the Early Modern Period: Heterodox Uses of Orthodox Arguments* ♦ **Noel Malcolm**, University of Oxford ♦ *Not Quite a Radical Enlightenment: Islam and Erudite Culture in Early Modern England* ♦ **Moti Feingold**, California Institute of Technology

April 24

Islamic Freethinking and Western Radicalism Conference ♦ *From al-Qarafi to Henry Stubbe: Anti-Pauline Arguments, Islam, and Socinianism* ♦ **Martin Mulsow**, Rutgers, The State University of New Jersey ♦ *I Remember a Mahometan Story of Ahmed ben Edris': Islam and the Freethinking Challenge from Stubbe to Toland* ♦ **Justin Champion**, Royal Holloway, University of London



The School of Mathematics

Faculty

Enrico Bombieri, IBM von Neumann Professor

Jean Bourgain

Phillip A. Griffiths

Robert MacPherson, Hermann Weyl Professor

Peter Samak

Thomas Spencer

Vladimir Voevodsky

Avi Wigderson, Herbert H. Maass Professor

Professors Emeriti

Pierre Deligne (*from 1/1/2008*)

Robert P. Langlands

Atle Selberg (*deceased 8/6/2007*)

The School of Mathematics held two special programs in the 2007–08 academic year, “Arithmetic Combinatorics” and “New Connections of Representation Theory to Algebraic Geometry and Physics.”

ARITHMETIC COMBINATORICS

This program was organized by Professor **Jean Bourgain** and Member Van Vu of Rutgers, The State University of New Jersey. The main activity was concentrated in the first term.

Combinatorics is concerned with counting problems, and the theorems in the subject typically do not assume much structure and apply quite generally. Arithmetic is concerned with algebraic operations on the integers or in finite fields and is usually a very structured study. There have been a number of striking results proven in recent years that are based on the interplay between these topics, and this has resulted in a flurry of activity. One of the goals of the short program was to clarify and exploit these developments.

A quintessential example of a basic and powerful theorem in arithmetic combinatorics is the “Sum Product Theorem” of Bourgain-Katz and Terence Tao. It is an elementary but fundamental quantitative combinatorial fact about the mixing of the additive and multiplicative structures of a finite field. For a prime number p , let F_p be the finite field with p elements. This is the set of numbers $0, 1, 2, \dots, p-1$. The operations addition $+$ and multiplication $\times$ are defined on F_p as the usual addition and multiplication, keeping only the remainder when dividing by p , so that the answer falls back into the original set $0, 1, 2, \dots, p-1$. Now we state:

The Sum Product Theorem. Given $\epsilon > 0$ there is a $d > 0$ such that for p large and any A any subset of F_p whose cardinality, $|A|$, is at most $p^{(1-\epsilon)}$, either $|A \cdot A|$ or $|A + A|$ is larger than $|A|^{1+d}$, where $A \cdot A$ is the set of all $x \cdot y$ with x and y in A and similarly $A + A$ is the set of all $x + y$ with x and y in A .

In words, if the size of a subset A of F_p doesn’t grow under multiplying pairs of elements then it will do so under adding them and vice versa.

For some years now expanders have been a recurrent topic in the School of Mathematics, with Professor Wigderson and Visiting Professor Noga Alon applying them to problems in combinatorics and complexity and Professor Sarnak to problems in number theory.

Given its basic nature, it is not surprising that the Sum Product Theorem and its generalizations have wide applications, such as to algebra, number theory, theoretical computer science, and most recently to group theory. Many of these striking applications were presented in the seminars and mini-courses during the term. These included the proof by Bourgain and Member Alexander Gamburd of Alex Lubotzky's "expanders in finite groups conjecture" and the work by Member Harald Helfgott opening the door to this development. Gamburd and Helfgott were among the many experts who were present for the term. For some years now expanders have been a recurrent topic in the School of Mathematics, with Herbert H. Maass Professor **Avi Wigderson** and Visiting Professor Noga Alon applying them to problems in combinatorics and complexity and Professor **Peter Sarnak** to problems in number theory. Another very active topic in arithmetic combinatorics that was central to the program is the applications of ergodic theoretic and combinatorial methods in proofs of Szemerédi-type theorems about arithmetic progressions in sets of integers of positive density and similar results about primes. An example of such an application is the Green-Tao theorem, which asserts that the prime numbers contain arbitrary long arithmetic progressions. A third "hot" topic was concerned with combinatorial applications to algebraic properties (e.g. singularity) of random matrices with zero-one entries and of large size. This was the topic of Van Vu's mini-course.

The weekly seminars on Tuesday afternoons were especially well attended, with lively discussions about varied applications of new breakthroughs, a number of which were made during the term.

Toward the end the program Bourgain, Sarnak, and Vu organized a three-day mini-conference on additive combinatorics. Lectures were given by Yuri Bilu, Emmanuel Breuillard, Kevin Costello, Andrew Granville, Ben Green, Alex Kontorovich, Sergei Konyagin, Bryna Kra, Izabella Laba, Hoai-Minh Nguyen, Peter Sarnak, Jozsef Solymosi, Benjamin Sudakov, Endre Szemerédi, and Avi Wigderson.

NEW CONNECTIONS OF REPRESENTATION THEORY TO ALGEBRAIC GEOMETRY AND PHYSICS

This special program was organized by Member Roman Bezrukavnikov of the Massachusetts Institute of Technology.

Representation theory is formally a branch of algebra that studies algebraic structure of symmetries. Its role in contemporary mathematics is due to the fact—realized through major discoveries of the nineteenth and twentieth centuries—that the structure of symmetries holds the key to understanding basic objects of interest in algebra, number theory, and quantum physics. Thus the whole history of the subject suggests that important insights are to be derived from further expanding the rich web of connections between representation theory and neighboring fields.

Professor Jean Bourgain (left) and Member Van Vu (right) organized a special program on arithmetic combinatorics, a field in which a number of striking results have been proven in recent years that are based on the interplay between combinatorics and arithmetic.



C. J. MOZZOCHI

Some conceptually new connections of this kind have been discovered lately. Notable examples include: the interpretation of geometric Langlands duality in terms of gauge theory (by Kapustin, Witten, et al.), new homotopy-theoretic foundations of algebraic geometry (by J. Lurie, B. Toen, et al.) and their applications to representation theory including geometric Langlands duality; wall-crossing formalism in quantum field theory (by M. Douglas, G. Moore, et al.) and its algebro-geometric interpretation (T. Bridgeland, M. Kontsevich, Y. Soibelman), which opens a way to use quantum cohomology and other deep algebraic geometry as tools for the study of numerical invariants of representations.

The goal of the **Special Year** was to explore and advance these and other new directions.

The Special Year activity can be classified into three categories.

(1) Several lectures and a mini-course were given to introduce experts in representation theory to fundamentals of other subjects. Two seminars presenting the basics of quantum field theory to mathematicians (led by Member Sergei Gukov, with the participation of Duiliu-Emanuel Diaconescu, Michael Douglas, School of Natural Sciences Member Andrew Neitzke, and others) ran for the whole of the fall semester. The seminars accomplished the difficult task of introducing mathematicians to the background material necessary to understand the recent results in the physics literature that were discussed in other seminars later in the year.

Another fall seminar provided an introduction to geometric Langlands correspondence theory.

In the second semester a mini-course on categorical knot invariants was given by one of the creators of the Mikhail Khovanov theory. This part of low-dimensional topology has many intersections with representation theory, some of which are the subject of research by Institute Members Gukov and Catharina Stroppel and were reported in other seminars.

Also, a series of lectures delivered by Member Clark Barwick and short-term visitors Jacob Lurie and Bertrand Toen formed a mini-course on new homotopy-theoretic foundations of algebraic geometry, the so-called derived algebraic geometry. These have already found major applications in representations of real groups in the work of Members David Ben-Zvi and David Nadler. Many more applications are expected to appear in the near future.

(2) Seminar talks by Members, Visitors, and invited speakers informed participants of recent and current research results. Only a sample can be described here.



ANDREA KANE

Professor Emeritus Pierre Deligne (left) with School of Natural Sciences Member Andrew Neitzke, who participated in the School of Mathematics seminars that presented the basics of quantum field theory to mathematicians. The seminars accomplished the difficult task of introducing mathematicians to the background material necessary to understand the recent results in the physics literature that were discussed later in the year.

Representation theory is formally a branch of algebra that studies algebraic structure of symmetries. Its role in contemporary mathematics is due to the fact—realized through major discoveries of the nineteenth and twentieth centuries—that the structure of symmetries holds the key to understanding basic objects of interest in algebra, number theory, and quantum physics.

Regular discussions of Professor Witten and his coauthors, School of Natural Sciences Member Davide Gaiotto and School of Mathematics Member Sergei Gukov, with the special-year participants, especially with School of Mathematics Members David Ben-Zvi and David Nadler, have led to important new ideas, e.g., a physical context for understanding Koszul duality.

School of Natural Sciences Professor Edward Witten gave a series of talks that explained how spaces familiar in representation theory arise as spaces of vacua of certain quantum field theory and Langlands duality appears as a duality of boundary conditions in Yang-Mills theory.

A seminar on instanton counting was organized by Member Hiraku Nakajima. This is one of the mathematical incarnations of Seiberg-Witten theory, providing powerful identities between Gromov-Witten invariants. The approach of Member Alexander Braverman links this to deep representation theory.

Members Braverman and Michael Finkelberg gave talks about “classical” and geometric versions of representation theory of affine Kac-Moody groups over a local field, mostly due to them. This is one of the approaches to building the two-dimensional version of geometric Langlands duality. The analogues of basic facts of the one-dimensional theory present rather difficult and beautiful problems resolved mostly by these authors.

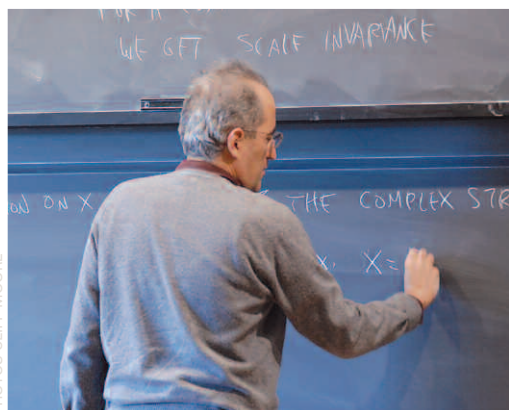
Another series of talks was devoted to wall-crossing phenomena and the related formalism of stability conditions on derived categories by short-term visitor Tom Bridgeland. Most of the talks were given by Member Valerio Toledano Laredo, who is collaborating with Bridgeland on the exciting connection of this formalism to Stokes phenomenon for ordinary differential equations. This theory is expected to provide the necessary tool for extending the established classical results of representation theory, such as Kazhdan-Lusztig theory, to a much wider context. Ramification and developments of this topic were discussed in the conference talks by Bridgeland, Andrei Okounkov, and Yan Soibelman.

Last but not least, the discussion of results from physical literature culminated in a series of talks by Edward Witten, Charles Simonyi Professor in the School of Natural Sciences, explaining the ideas of his ongoing project with School of Natural Sciences Member Davide Gaiotto. There the spaces familiar in representation theory arise as spaces of vacua of certain quantum field theory and Langlands duality appears as a duality of boundary conditions in Yang-Mills theory.

(3) Collaborations between participants and individual work have led to important new results. Again only a sample can be listed here.

Regular discussions of Witten and his coauthors Gaiotto and Gukov with the special-year participants, especially with Ben-Zvi and Nadler, have led to important new ideas, e.g., a physical context for understanding Koszul duality.

Ben-Zvi and Nadler have also made substantial progress in their project of applying homotopy techniques of Lurie, Toen, et al., as well as ideas of topo-



logical field theory to representation theory.

The work of Member Toledano Laredo (joint with Bridgeland) has culminated in an important paper on Stokes phenomenon and Bridgeland stability conditions.

Bezrukavnikov has collaborated with Finkelberg and Member Victor Ostrik on a new approach to George Lusztig's theory of character sheaves on semi-simple groups. They benefited from discussions with Member Dmitriy Boyarchenko, who works (jointly with Vladimir Drinfeld) on character sheaves on unipotent groups. Bezrukavnikov's upcoming work with Okounkov of Princeton University on modular representations of double affine Hecke algebras uncovers their close relation to quantum cohomology of Hilbert schemes of points on the plane via Bridgeland's stability conditions. Okounkov has also held discussions with Members Braverman, Finkelberg, and Leonid Rybnikov, whose work turned out to be closely related to his. An extensive collaboration of postdoctoral Member Benjamin Webster with senior colleague Stroppel has produced nice results on Whittaker sheaves and also relation of Member Mikhail Khovanov's knot invariants to geometry of Springer fibers. Another work of Webster's, on Koszul duality for hypertoric varieties, turns out to be closely related to the same type of physical duality as the one corresponding to Langlands duality by the paper of Gaiotto and Witten.

Member physicist Gukov has written a paper with Witten, and the exchange of ideas between Gukov and Nakajima has led to beautiful new conjectures on algebro-geometric knot invariants.

As part of this program, during the fall, a one-week conference was held on "Gauge Theory and Representation Theory." The speakers were Alexander Beilinson, David Ben-Zvi, Philip Boalch, Alexander Braverman, Michael Douglas, Edward Frenkel, Dennis Gaitsgory, Victor Ginzburg, Sergei Gukov, Mikhail Kapranov, Anton Kapustin, Mikhail Khovanov, Melissa Liu, Andre Losev, Juan Maldacena (Professor, School of Natural Sciences), Gregory Moore, Hiraku Nakajima, Natalia Saulina, Samson Shatashvili, Richard Thomas, Valerio Toledano Laredo, and Edward Witten.

During the spring, a one-week conference was held on "Algebro-Geometric Derived Categories and Applications." The speakers were Denis Auroux, Tom Bridgeland, Kevin Costello, Dennis Gaitsgory, Alexander Goncharov, Daniel Huybrechts, Joel Kamnitzer, Bernard Keller, Jacob Lurie, David Nadler, Andrei Okounkov, Dmitry Orlov, Alexander Polishchuk, Raphael Rouquier, Olivier Schiffman, Paul Seidel, Yan Soibelman, Catharina Stroppel, Bertrand Toen, and Gabriele Vezzosi.

OTHER ACTIVITIES

The Marston Morse Memorial Lectures were delivered by Jacob Lurie of MIT, who also participated in the "New Connections of Representation Theory to Algebraic Geometry and Physics" program as a short-term visitor. During his Morse lectures, Lurie discussed applications of homotopy



Professor Peter Sarnak, shown here delivering his Faculty lecture on "Solutions to Equations in Integers" at the Institute in March, was elected to membership in the American Philosophical Society.

techniques to topological field theories.

During the fall term, Bao-Châu Ngô delivered a series of lectures presenting his newly completed proof of the Fundamental Lemma, a conjecture of Langlands and Shelstad. The methods of Ngô are closely related to some ideas that also arose in the special program “New Connections of Representation Theory to Algebraic Geometry and Physics.”

As always, during the year there were active seminars on other subjects. The Computer Science and Discrete Mathematics seminar of Wigderson and Visiting Professors Alon, Russell Impagliazzo, and Alexander Razborov met twice per week. The seminar on number theory (joint with Rutgers and Princeton University) met weekly.

In January, a memorial conference was held in honor of Professor Emeritus **Atle Selberg**. Speakers included James Arthur, Nils Baas, IBM von Neumann Professor **Enrico Bombieri**, Brian Conrey, John Friedlander, Director Peter Goddard, Dorian Goldfeld, Dennis Hejhal, Erik Hjorth-Hansen, Henryk Iwaniec, Professor Emeritus **Robert P. Langlands**, Professor Sarnak, Betty Compton Selberg, Ingrid Selberg, Lars Selberg, Kannan Soundararajan, and Kai-Man Tsang.

Professor Emeritus **Pierre Deligne** and Professor **Phillip A. Griffiths** received the 2008 Wolf prize, jointly with David Mumford. In addition, Deligne, who became Professor Emeritus in January, was awarded a Belgian Viscountship, and a Belgian postage stamp was issued in his honor.

Professor Sarnak was elected to membership in the American Philosophical Society.

Professor Bombieri was awarded the 2008 Doob Prize of the American Mathematical Society, jointly with his coauthor Walter Gubler, for the book *Heights in Diophantine Geometry*.

Northwestern University held a conference, “Current Developments and Directions in the Langlands Program,” in honor of Professor Langlands in May.

Former Member Dennis Hejhal (left) spoke at the memorial conference in honor of Professor Emeritus Atle Selberg in January; a tea in honor of Selberg's ninetieth birthday was held at the Institute in June 2007 (center); Selberg (right), pictured in Fuld Hall, first came to the Institute in 1947, knew seven of the Institute's eight Directors (missing only founding Director Abraham Flexner), and ranks among the great figures in the Institute's history.



ANDREA KANE



PHOTOS: DINAH KAZAKOFF

MEMBERS AND VISITORS

Adi Akavia

Complexity, Coding Theory ♦ Massachusetts Institute of Technology
Funding provided by the State of New Jersey

Daniel Allcock

Discrete Groups, Algebraic Geometry ♦ The University of Texas at Austin ♦ *s*
Funding provided by the Friends of the Institute for Advanced Study

Noga Alon

Combinatorics ♦ Tel Aviv University ♦ *vp, s*

Clark Barwick

Homotopical Algebraic Geometry ♦ University of Oslo ♦ *v, f, s*

Dmitri Beliaev

Function Theory ♦ Institute for Advanced Study ♦ *vri*

David Ben-Zvi

Geometric Langlands Program ♦ The University of Texas at Austin ♦ *s*

Roman Bezrukavnikov

Representation Theory, D-modules ♦ Massachusetts Institute of Technology
Funding provided by The Ambrose Monell Foundation; The Bell Companies Fellowship; The James D. Wolfensohn Fund; and The Oswald Veblen Fund

Philip Boalch

Moduli Spaces of Meromorphic Connections ♦ École Normale Supérieure, Paris ♦ *f*

Dmitriy Boyarchenko

Character Sheaves for Unipotent Groups ♦ The University of Chicago ♦ *s*

Alexander Braverman

Representation Theory, Algebraic Geometry ♦ Brown University ♦ *s*

Emmanuel Breuillard

Ergodic Theory, Number Theory ♦ École Polytechnique, Palaiseau, France ♦ *f*

Xi Chen

Game Theory, Complexity Theory ♦ Tsinghua University
Funding provided by the State of New Jersey

Kevin Costello

Combinatorics, Discrete Probability ♦ Rutgers, The State University of New Jersey
Funding provided by the State of New Jersey

Ciprian Demeter

Ergodic Theory, Harmonic Analysis ♦ University of California, Los Angeles

Brent Doran

Geometric Invariant Theory ♦ Institute for Advanced Study

Barbara Fantechi

Quantum Cohomology ♦ Scuola Internazionale Superiore di Studi Avanzati, Trieste, Italy ♦ *s*

Michael Finkelberg

Quantum Groups ♦ Independent University of Moscow ♦ *s*
Funding provided by The Oswald Veblen Fund

Alexander Gamburd

Arithmetic Combinatorics ♦ University of California, Santa Cruz ♦ *vmef*

Jayce R. Getz

Number Theory ♦ University of Wisconsin–Madison ♦ *vri*

Alexey Glibichuk

Sum-Product Estimates ♦ Lomonosov Moscow State University ♦ *f*

Lothar Goettsche

Algebraic Geometry, Mathematical Physics ♦ The Abdus Salam International Centre for Theoretical Physics, Israel ♦ *s*
Funding provided by The Oswald Veblen Fund

William Goldman

Moduli Spaces ♦ University of Maryland ♦ *s*
Funding provided by The Oswald Veblen Fund

Mark Goresky

Geometry, Automorphic Forms ♦ Institute for Advanced Study

Andrew Granville

Analytic Number Theory ♦ Université de Montréal ♦ *f*
Funding provided by The Charles Simonyi Endowment

Ben Green

Arithmetic Combinatorics ♦ Centre for Mathematical Sciences, University of Cambridge ♦ *f*

Sergei Gukov

Representation Theory, Geometry, Physics ♦ University of California, Santa Barbara

Venkatesan Guruswami

Theory of Computation ♦ University of Washington

Nir Halman

Optimization, Stochastic Programming ♦ Institute for Advanced Study ♦ *v*

Harald Helfgott

Linear Algebraic Groups ♦ University of Bristol ♦ *f*

Michael Hochman

Dynamical Systems ♦ The Hebrew University of Jerusalem, Israel ♦ *vri*

Atsushi Ichino

Automorphic Forms ♦ Osaka City University

Russell Impagliazzo

Computational Complexity ♦ University of California, San Diego ♦ *vp*
Funding provided by The Charles Simonyi Endowment

Yukari Ito

Algebraic Geometry ♦ Nagoya University

Juhi Jang

Fluid Mechanics, Kinetic Theory ♦ Brown University

Tali Kaufman

Algorithms ♦ Institute for Advanced Study

Dubi Kelmer

Number Theory, Quantum Chaos ♦ Tel Aviv University

Mikhail Khovanov

Geometric Representation Theory ♦ Columbia University ♦ *vmef*

Rowan Killip

Spectral Theory, Random Matrices ♦ Institute for Advanced Study

Sergei Konyagin

Harmonic Analysis ♦ Lomonosov Moscow State University ♦ *f*
Funding provided by The Oswald Veblen Fund

Dong Li

Mathematical Physics, Fluid Dynamics ♦ Institute for Advanced Study

Elon Lindenstrauss

Ergodic Theory ♦ Princeton University ♦ *f*

Alina Marian

Algebraic Geometry, Representation Theory ♦ Yale University

William Massey

Dynamical Queueing Systems ♦ Princeton University

Kevin McGerty

Modular Representation Theory, Geometry ♦ Imperial College London ♦ *s*

Emanuel Milman

Asymptotic Geometric Analysis ♦ Weizmann Institute of Science

Ivan Mirkovic

Group Representations ♦ University of Massachusetts
Funding provided by The Ellentuck Fund

Sophie Morel

Shimura Varieties ♦ Institute for Advanced Study

David Nadler

Representation Theory, Algebraic Geometry, Physics ♦ Northwestern University ♦ *s*

Hiraku Nakajima

Geometry, Representation Theory ♦ Kyoto University
Funding provided by the Friends of the Institute for Advanced Study

Melvyn Nathanson

Additive Combinatorics ♦ Lehman College, The City University of New York ♦ *v, f*

Bao Châu Ngô

Algebraic Geometry, Group Theory ♦ Université Paris-Sud 11
Funding provided by The Charles Simonyi Endowment

Tuan Ngo Dac

Moduli Spaces ♦ Université Paris 13 ♦ *s*
Funding provided by The Charles Simonyi Endowment

Dmitry Orlov

Mirror Symmetry ♦ Steklov Mathematical Institute, Russian Academy of Sciences ♦ *s*
Funding provided by The Oswald Veblen Fund

Victor Ostrik

Character Sheaves, Tensor Categories ♦ University of Oregon ♦ *f*
Funding provided by The Oswald Veblen Fund

Dinh Huong Pham

Algebraic Geometry ♦ Université Paris-Sud 11, France ♦ *f*
Funding provided by The Weyl Fund

Anup Rao

Theoretical Computer Science ♦ The University of Texas at Austin

Alexander Razborov

Combinatorics, Computer Science ♦ Institute for Advanced Study ♦ *vp*

Simon Riche

Algebraic Groups, Lie Algebras ♦ Université Pierre et Marie Curie ♦ *s*

Leonid Rybnikov

Quantum Systems, Kac-Moody Algebras ♦ Alikhanov Institute for Theoretical and Experimental Physics, Russian Federation State Scientific Center

Alireza Salehi Golsefidy

Semisimple Lie Groups ♦ Institute for Advanced Study ♦ *vri*

Tom Sanders

Additive Combinatorics ♦ University of Cambridge

Olivier Schiffmann

Geometric Representation Theory ♦ École Normale Supérieure, Paris ♦ *s*
Funding provided by the Friends of the Institute for Advanced Study

Sug Woo Shin

Number Theory, Shimura Varieties ♦ Harvard University

Ilya Shkredov

Number Theory, Ergodic Theory ♦ Lomonosov Moscow State University ♦ *f*

Lior Silberman

Locally Symmetric Spaces ♦ Harvard University

Jozsef Solymosi

Combinatorics ♦ The University of British Columbia ♦ *f*
Funding provided by The Charles Simonyi Endowment

Catharina Stroppel

Representation Theory ♦ University of Glasgow ♦ *vnecf*
Funding provided by the Minerva Research Foundation

Benjamin Sudakov

Combinatorics, Number Theory ♦ Princeton University ♦ *f*

Endre Szemerédi

Number Theory, Graph Theory ♦ Rutgers, The State University of New Jersey
Funding provided by The Ellentuck Fund

Dinesh Thakur

Number Theory, Algebraic Geometry ♦ University of Arizona ♦ *s*
Funding provided by The von Neumann Fund and The Ellentuck Fund

Valerio Toledano Laredo

Quantum Groups ♦ Northeastern University

Luca Trevisan

Computational Complexity ♦ University of California, Berkeley ♦ *f*

Corinna Ulcigrai

Dynamical Systems, Ergodic Theory ♦ Princeton University ♦ *s*
Funding provided by The Giorgio and Elena Petronio Fellowship Fund

Monica Visan

Nonlinear PDE ♦ Institute for Advanced Study

Vadim Vologodsky

Algebraic Geometry ♦ The University of Chicago ♦ *s*

Van Vu

Combinatorics ♦ Rutgers, The State University of New Jersey ♦ *f*
Funding by The Charles Simonyi Endowment

Benjamin Webster

Representation Theory, Field Theory ♦ University of California, Berkeley

Andrew Wiles

Algebraic Number Theory ♦ Princeton University ♦ *v*

Julia Wolf

Arithmetic Combinatorics ♦ University of Cambridge

Sergey Yekhanin

Complexity Theory ♦ Massachusetts Institute of Technology

Bei Zhang

Number Theory ♦ Columbia University

Xiaoyi Zhang

Nonlinear Equations, Harmonic Analysis ♦ Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing

f First Term ♦ *s* Second Term ♦ *v* Visitor ♦ *vnecf* von Neumann Early Career Fellow ♦ *vp* Visiting Professor ♦ *vri* Veblen Research Instructorship

RECORD OF EVENTS**September 17**

Computer Science/Discrete Math I ♦
Algebrization: A New Barrier in Complexity Theory ♦ **Scott Aaronson**, Massachusetts Institute of Technology

September 24

Computer Science/Discrete Math I ♦ *Towards Universal Semantic Communication* ♦ **Madhu Sudan**, Massachusetts Institute of Technology

Short Talks by Postdoctoral Members ♦ *Parallel Repetition in Multiplayer Interactive Proofs* ♦

Anup Rao, The University of Texas at Austin; Member, School of Mathematics ♦ *Random Discrete Matrices* ♦ **Kevin Costello**, Rutgers, The State University of New Jersey; Member, School of Mathematics ♦ *Nearly Optimal Solutions for Stochastic Optimization Problems* ♦ **Nir Halman**, Member, School of Mathematics ♦ *Paths Beyond Local Search: On the Query Complexity of Fixed-Point Computation* ♦ **Xi Chen**, Tsinghua University; Member, School of Mathematics

September 25

Computer Science/Discrete Math II ♦ *Hardness of Solving Sparse Overdetermined Linear Systems* ♦ **Venkatesan Guruswami**, University of Washington; Member, School of Mathematics

Arithmetic Combinatorics ♦ *Applications of Quadratic Fourier Analysis* ♦ **Tim Gowers**, University of Cambridge

Special Logic/Number Theory ♦ *How the Schanuel and Andre Conjectures Affect Logical Questions about the Real and Complex Exponentials and the Weierstrass Elliptic Functions* ♦ **Angus MacIntyre**, University of London

September 26

Short Talks by Postdoctoral Members ♦ *Quantization of Maximal Poisson-Commutative Subalgebras* ♦ **Leonid Rybnikov**, Alikhanov Institute for Theoretical and Experimental Physics; Member, School of Mathematics ♦ *Algebras Associated to Hyperkähler Quotients* ♦ **Benjamin Webster**, University of California, Berkeley; Member, School of Mathematics ♦ *Growth of Linear Groups* ♦ **Emmanuel Breuillard**, École Polytechnique, Palaiseau, France; Member, School of Mathematics

September 27

Joint IAS/PU Number Theory ♦ *Hilbert Modular Generating Series with Coefficients in Intersection Homology* ♦ **Jayce Getz**, Princeton University

September 28

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Instanton Counting and Knot Invariants* ♦ **Hiraku Nakajima**, Kyoto University; Member, School of Mathematics

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Background to Yang-Mills Theory for Mathematicians* ♦ **Ivan Mirkovic**, University of Massachusetts; Member, School of Mathematics

October 1

Computer Science/Discrete Math I ♦ *The Pattern Matrix Method for Lower Bounds on Quantum Communication* ♦ **Alexander Sherstov**, The University of Texas at Austin

Short Talks by Postdoctoral Members ♦ *Counting Point Problem for Shimura Varieties* ♦ **Sug Woo Shin**, Harvard University; Member, School of Mathematics ♦ *Quantum Ergodicity and Quantum Maps* ♦ **Dubi Kelmer**, Tel Aviv University; Member, School of Mathematics ♦ *Arthur's Trace Formula and the Cohomology of Shimura Varieties* ♦ **Sophie Morel**, Member, School of Mathematics ♦ *Co-volume of Lattices in Semi-simple Lie Groups* ♦ **Alireza Salehi Golsefidy**, Member, School of Mathematics ♦ *Nonvanishing Mod P of Eisenstein Series* ♦ **Bei Zhang**, Columbia University; Member, School of Mathematics ♦ *Inverse Theorems for Large Subsets of Sums of Dissociated Sets and*

Multi-Dimensional Generalizations of Szemerédi's Theorem ♦ **Ilya Shkredov**, Lomonosov Moscow State University; Member, School of Mathematics ♦ *Bounding Periods of Automorphic Forms* ♦ **Lior Silberman**, Harvard University; Member, School of Mathematics

October 2

Computer Science/Discrete Math II ♦ *Unbounded-Error Communication Complexity of Symmetric Functions* ♦ **Alexander Sherstov**, The University of Texas at Austin

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Geometric Langlands Duality* ♦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics

Arithmetic Combinatorics ♦ *Difference Sets and the Primes* ♦ **Tom Sanders**, University of Cambridge; Member, School of Mathematics

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Modules over Affine Lie Algebras and Their Fusion* ♦ **Victor Ostrik**, University of Oregon; Member, School of Mathematics

October 3

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Yang-Mills Theory for Mathematicians* ♦ **Sergei Gukov**, University of California, Santa Barbara; Member, School of Mathematics

Short Talks by Postdoctoral Members ♦ *Partial Differential Equations on Derived Geometric Stacks* ♦ **Clark Barwick**, University of Oslo; Visitor, School of Mathematics ♦ *Theta Dualities on Moduli Spaces of Sheaves* ♦ **Alina Marian**, Yale University; Member, School of Mathematics ♦ *Pointwise Convergence of Multilinear Averages in Ergodic Theory* ♦ **Ciprian Demeter**, University of California, Los Angeles; Member, School of Mathematics ♦ *Additive Properties of Product Sets in Fields of Prime Order* ♦ **Alexey Glibichuk**, Lomonosov Moscow State University; Member, School of Mathematics ♦ *Growth, Linearity, and Incidence* ♦ **Harald Helfgott**, University of Bristol; Member, School of Mathematics ♦ *The Role of Convexity in Isoperimetry and Concentration* ♦ **Emanuel Milman**, Weizmann Institute of Science; Member, School of Mathematics ♦ *Linear Configurations in Uniform Sets* ♦ **Julia Wolf**, University of Cambridge; Member, School of Mathematics

October 4

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Background to Yang-Mills Theory for Mathematicians* ♦ **Ivan Mirkovic**, University of Massachusetts; Member, School of Mathematics

Joint IAS/PU Number Theory ♦ *On the Periods of Automorphic Forms on Special Orthogonal Groups and the Gross-Prasad Conjecture* ♦ **Atsushi Ichino**, Osaka City University; Member, School of Mathematics

October 5

New Connections of Representation Theory to Algebraic Geometry and Physics ♦ *Instanton Counting and Knot Invariants* ♦ **Hiraku Nakajima**, Kyoto University; Member, School of Mathematics

Short Talks by Postdoctoral Members ♦ *Dynamics of Gaseous Stars* ♦ **Juhi Jang**, Brown University; Member, School of Mathematics ♦ *On Subsets of F_q^n with No Short Linear Dependencies* ♦ **Sergey Yekhanin**, Massachusetts Institute of Technology; Member, School of Mathematics ♦ *Invariance, Few Orbits, and Property Testing* ♦ **Tali Kaufman**, Member, School of Mathematics ♦ *Finite Time Singularities in Generalized Quasi-Geostrophic and Related Models* ♦ **Dong Li**, Member, School of Mathematics ♦ *Error Correcting Codes for the Group Z_N* ♦ **Adi Akavia**, Massachusetts Institute of Technology; Member, School of Mathematics ♦ *Would "The Idempotent Theorem" Do?* ♦ **Tom Sanders**, University of Cambridge; Member, School of Mathematics ♦ *Nonlinear Schrödinger Equations* ♦ **Monica Visan**, Member, School of Mathematics ♦ *On the Illposedness and Blowup for Nonlinear Schrödinger Equation* ♦ **Xiaoyi Zhang**, Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing; Member, School of Mathematics

October 8

Computer Science/Discrete Math I ♦ *Erdős-Rényi Phase Transition* ♦ **Joel Spencer**, New York University

October 9

Geometric Langlands ♦ *Geometric Satake Isomorphism and Whittaker Model* ♦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics

Computer Science/Discrete Math II ♦ *New Proofs of (New) Direct Product Theorems* ♦ **Russell Impagliazzo**, University of California, San Diego; Visiting Professor, School of Mathematics

Arithmetic Combinatorics ♦ *On Square Sum-Free Sets* ♦ **Endre Szemerédi**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Representations and Fusion ♦ *Fusion for Affine Lie Algebra Modules and Quantum Groups* ♦ **Victor Ostrik**, University of Oregon; Member, School of Mathematics

October 10

Yang-Mills Theory for Mathematicians ♦ *Basic Notions of Quantum Field Theory Illustrated on Toy Models* ♦ **Sergei Gukov**, University of California, Santa Barbara; Member, School of Mathematics

Mini-Course ♦ *Sum-Products Estimates and Applications* ♦ **Jean Bourgain**, Professor, School of Mathematics

October 11

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

Mini-Course ♦ *Inverse Theorems and Random Matrices* ♦ **Van Vu**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Joint IAS/PU Number Theory ♦ *Counting Points on Igusa Varieties and Stabilization* ♦ **Sug Woo Shin**, Harvard University; Member, School of Mathematics

October 12

Instanton Counting and Knot Invariants ♦ *Chern-Simons Theory as String Theory* ♦ **Johannes Walcher**, Member, School of Natural Sciences

Background to Yang-Mills Theory for Mathematicians

October 15

Computer Science/Discrete Math I ♦ *Extractors and Rank Extractors for Polynomial Sources* ♦ **Zeev Dvir**, Weizmann Institute of Science

October 16

Geometric Langlands ♦ *Whittaker Sheaves, Quantum Groups, and Quantum Langlands Duality (after Gaitsgory and Lurie)* ♦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics

Computer Science/Discrete Math II ♦ *Sparse Random Linear Codes Are Locally Decodable and Testable* ♦ **Tali Kaufman**, Member, School of Mathematics

Arithmetic Combinatorics ♦ *Problems in Additive Number Theory* ♦ **Melvyn Nathanson**, The City University of New York; Member, School of Mathematics

Representations and Fusion ♦ *Vertex Operator Algebras* ♦ **Victor Ostrik**, University of Oregon; Member, School of Mathematics

October 17

Yang-Mills Theory for Mathematicians ♦ *Electromagnetic Duality in Abelian Gauge Theory* ♦ **Andrew Neitzke**, Member, School of Natural Sciences

Mini-Course ♦ *Sum-Products Estimates and Applications* ♦ **Jean Bourgain**, Professor, School of Mathematics

October 18

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

Mini-Course ♦ *Inverse Theorems and Random Matrices* ♦ **Van Vu**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Joint IAS/PU Number Theory ♦ *Linear Equations in Primes* ♦ **Ben Green**, University of Cambridge; Member, School of Mathematics

October 19

Instanton Counting and Knot Invariants ♦ *Large N Open/Closed Duality in Topological String Theory* ♦ **Andrew Neitzke**, Member, School of Natural Sciences

Background to Yang-Mills Theory for Mathematicians

October 22

Representations and Fusion ♦ *Introduction to Chiral Algebras* ♦ **Alexander Braverman**, Brown University; Member, School of Mathematics

Special Lecture ♦ *Quantum Cohomology of Real Varieties* ♦ **Ozgur Ceyhan**, Université de Montréal

October 23

Geometric Langlands Duality ♦ *Whittaker Patterns in Global Unramified and Local Tamely Ramified Theories* ♦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics

Arithmetic Combinatorics ♦ *Polynomial Progressions in Primes* ♦ **Tamar Ziegler**, University of Michigan

October 24

Yang-Mills Theory for Mathematicians ♦ *Duality in Maxwell Theory (continued)* ♦ **Andrew Neitzke**, Member, School of Natural Sciences

Mini-Course ♦ *Nilsequences in Additive Combinatorics* ♦ **Ben Green**, University of Cambridge; Member, School of Mathematics

October 25

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

October 26

Instanton Counting and Knot Invariants ♦ *Large N Open/Closed Duality in Topological String Theory (continued)* ♦ **Andrew Neitzke**, Member, School of Natural Sciences

October 29

Representations and Fusion ♦ *Introduction to Chiral Algebras (continued)* ♦ **Alexander Braverman**, Brown University; Member, School of Mathematics

Computer Science/Discrete Math I ♦ *Dense Subsets of Pseudorandom Objects* ♦ **Luca Trevisan**, University of California, Berkeley; Member, School of Mathematics

October 30

Computer Science/Discrete Math II ♦ *Balancing Gaussian Vectors* ♦ **Kevin Costello**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Arithmetic Combinatorics ♦ *On the Property Testing of Hereditary Graph and Hypergraph Properties* ♦ **Terence Tao**, University of California, Los Angeles

Geometric Langlands Duality ♦ *Hitchin Fibration and Langlands Duality* ♦ **Tony Pantev**, University of Pennsylvania

October 31

Yang-Mills Theory for Mathematicians ♦ *Basic Notions of Bosonic 4D Yang-Mills Theory* ♦ **Michael Movshev**, Stony Brook University, The State University of New York

Mini-Course ♦ *Nilsequences in Additive Combinatorics (continued)* ♦ **Ben Green**, University of Cambridge; Member, School of Mathematics

November 1

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

Joint IAS/PU Number Theory ♦ *Moments of Automorphic L-Functions, Spectral Identities, and Subconvexity Bounds* ♦ **Paul Garrett**, University of Minnesota

November 2

Instanton Counting and Knot Invariants ♦ *Instanton Counting* ♦ **Hiraku Nakajima**, Kyoto University; Member, School of Mathematics

November 5

Yang-Mills Theory for Mathematicians ♦ *Basic Notions of Yang-Mills Theory (continued)* ♦ **Michael Movshev**, Stony Brook University, The State University of New York

Computer Science/Discrete Math I ♦ *Markets and the Primal-Dual Paradigm* ♦ **Vijay Vazirani**, Georgia Institute of Technology

November 6

Computer Science/Discrete Math II ♦ *Locally Decodable Codes from Nice Subsets of Finite Fields and Prime Factors of Mersenne Numbers* ♦ **Sergey Yekhanin**, Massachusetts Institute of Technology; Member, School of Mathematics

Arithmetic Combinatorics ♦ *The Rank of Symmetric Matrices* ♦ **Kevin Costello**, Rutgers, The State University of New Jersey; Member, School of Mathematics

Geometric Langlands Duality ♦ *Hitchin Fibration and Langlands Duality (continued)* ♦ **Tony Pantev**, University of Pennsylvania

November 8

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

Representations and Fusion ♦ *Chiral Algebras via Ran Space* ♦ **Dmitro Arinkin**, University of North Carolina at Chapel Hill

Joint IAS/PU Number Theory ♦ *Modular Forms and Calabi-Yau Varieties* ♦ **Dinakar Ramakrishnan**, California Institute of Technology

November 9

Instanton Counting and Knot Invariants ♦ *Topological Vertex* ♦ **Melissa Liu**, Columbia University

Discussion Session

November 12

Geometric Langlands Duality ♦ *Quantum Geometric Langlands Duality* ♦ **Dennis Gaitsgory**, Harvard University

Computer Science/Discrete Math I ♦ *Developments in Holographic Algorithms* ♦ **Jin-Yi Cai**, University of Wisconsin-Madison

Representations and Fusion ♦ *A Conjectural Construction of Automorphic D-Modules via Spectral Projectors and a General Vanishing Conjecture* ♦ **Dennis Gaitsgory**, Harvard University

November 13

Computer Science/Discrete Math II ♦ *Applications of the Removal Lemma* ♦ **Jozsef Solymosi**, The University of British Columbia; Member, School of Mathematics

Yang-Mills Theory for Mathematicians ♦ *Supersymmetry in Yang-Mills Theory* ♦ **Emanuel Diaconescu**, Rutgers, The State University of New Jersey

Arithmetic Combinatorics ♦ *Product Growth and Mixing in Finite Groups: Variations on a Theme of Gowers* ♦ **Laszlo Babai**, The University of Chicago

Special Talk ♦ *Infinity Categories* ♦ **Clark Barwick**, University of Oslo; Visitor, School of Mathematics

November 14

Instanton Counting ♦ *Topological Vertex (continued)* ♦ **Melissa Liu**, Columbia University

Arithmetic Combinatorics ♦ *Decompositions into Quadratic Phase Functions* ♦ **Julia Wolf**, University of Cambridge; Member, School of Mathematics

Special Lecture ♦ *Rigid Differential Equations* ♦ **Dmitro Arinkin**, University of North Carolina at Chapel Hill

November 15

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

Arithmetic Combinatorics Mini-Course ♦ *Sum-Product Estimates and Expanders* ♦ **Alexander Gamburd**, University of California, Santa Cruz; von Neumann Early Career Fellow, School of Mathematics

Joint IAS/PU Number Theory ♦ *Companion Forms for $GS(4)$* ♦ **Jacques Tilouine**, Université Paris 13

November 16

Discussion Session

November 19

Computer Science/Discrete Math I ♦ *On a Network Creation Game* ♦ **Yishay Mansour**, Tel Aviv University and Google

Discussion Session for Yang-Mills ♦ *Geometric Formulation of Basic Supersymmetry Formalism* ♦ **Pierre Deligne**, Professor, School of Mathematics

November 20

Computer Science/Discrete Math II ♦ *Density Theorems for Bipartite Graphs and Related Ramsey-Type Results* ♦ **Benjamin Sudakov**, Princeton University; Member, School of Mathematics

Yang-Mills Theory for Mathematicians ♦ *Supersymmetry in Yang-Mills Theory and Topological Twists* ♦ **Emanuel Diaconescu**, Rutgers, The State University of New Jersey

Geometric Langlands Duality ♦ *Yang-Mills Theory and Geometric Langlands Duality: An Introduction* ♦ **Ivan Mirkovic**, University of Massachusetts; Member, School of Mathematics

November 21

Representations and Fusion ♦ *Chiral Hecke Algebras and Their Applications* ♦ **Alexander Beilinson**, The University of Chicago

November 26–30

Conference on Gauge and Representation Theory

November 26

Computer Science/Discrete Math I ♦ *On Hardness of Learning Intersection of Two Halfspaces* ♦ **Subhash Khot**, Courant Institute of Mathematical Sciences, New York University

November 27

Computer Science/Discrete Math II ♦ *The Approximation Complexity of Win-Lose Games* ♦ **Xi Chen**, Tsinghua University; Member, School of Mathematics

Arithmetic Combinatorics ♦ *Inverse Theorems for Large Subsets of Sums of Dissociated Sets* ♦ **Ilya Shkredov**, Lomonosov Moscow State University; Member, School of Mathematics

November 29

Joint IAS/PU Number Theory ♦ *Algebraic Cycles and Exotic Heegner Points* ♦ **Kartik Prasanna**, University of Maryland

December 3

Computer Science/Discrete Math I ♦ *Expander Flows, Graph Spectra, and Graph Separators* ♦ **Umesh Vazirani**, University of California, Berkeley

December 4

Computer Science/Discrete Math II ♦ *Optimal Phylogenetic Reconstruction* ♦ **Konstantinos Daskalakis**, University of California, Berkeley

December 5

Special Lecture ♦ *Baxter Operators and L-Functions* ♦ **Sergei Oblezin**, Institute of Theoretical and Experimental Physics, Moscow

Arithmetic Combinatorics ♦ *Some Properties of Sum and Product Sets in Finite Fields* ♦ **Alexey Glibichuk**, Lomonosov Moscow State University; Member, School of Mathematics

Yang-Mills Theory for Mathematicians ♦ *Ads/CFT Duality for Mathematicians* ♦ **Juan Maldacena**, Professor, School of Natural Sciences

December 6

Fundamental Lemma ♦ *Fundamental Lemma* ♦ **Bao Châu Ngô**, Université Paris-Sud 11; Member, School of Mathematics

Geometric Langlands Duality ♦ *Geometric Endoscopy and Mirror Symmetry* ♦ **Edward Frenkel**, University of California, Berkeley

Joint IAS/PU Number Theory ♦ *Heegner Divisors, L-Functions, and Harmonic Weak Maass Forms* ♦ **Jan Bruinier**, Technische Universität Darmstadt

December 7

Instanton Counting and Knot Invariants ♦
Seiberg-Witten Curves ♦ **Hiraku Nakajima**,
Kyoto University; Member, School of
Mathematics

December 10–12

Mini-Conference on Arithmetic
Combinatorics

December 10

Yang-Mills Theory for Mathematicians ♦
*Overview of D-Branes in Physics and
Mathematics* ♦ **Michael Douglas**, Rutgers,
The State University of New Jersey

December 13

Fundamental Lemma ♦ *Fundamental Lemma* ♦
Bao Châu Ngô, Université Paris-Sud 11;
Member, School of Mathematics

Geometric Langlands Duality ♦ *A-Branes and
D-Modules* ♦ **Edward Witten**, Charles
Simonyi Professor, School of Natural Sciences

December 14

Instanton Counting and Knot Invariants ♦
*Gopakumar-Vafa and Donaldson-Thomas
Invariants* ♦ **Hiraku Nakajima**, Kyoto
University; Member, School of Mathematics

December 18

Geometric Langlands Duality ♦ *A-Branes and
D-Modules (continued)* ♦ **Edward Witten**,
Charles Simonyi Professor, School of Natural
Sciences

December 19

Yang-Mills Theory for Mathematicians ♦
Superconformal Theories in Six Dimensions ♦
Anton Kapustin, California Institute of
Technology

December 20

Fundamental Lemma ♦ *Fundamental Lemma* ♦
Bao Châu Ngô, Université Paris-Sud 11;
Member, School of Mathematics

January 15

Algebraic-Geometric Derived Categories and
Applications ♦ *Introduction to Bridgeland's
Stability Conditions* ♦ **Roman Bezrukavnikov**,
Massachusetts Institute of Technology;
Member, School of Mathematics

January 16

Categories and Knot Invariants ♦ *Homological
Algebra of Link Invariants, I* ♦ **Mike
Khovanov**, Columbia University

January 17

Towards Two-Dimensional Geometric
Langlands Duality ♦ *Satake Isomorphism for
Affine Kac-Moody Groups* ♦ **Alexander
Braverman**, Brown University; Member,
School of Mathematics

January 21

Computer Science/Discrete Math I ♦ *Noisy
Binary Search and Applications* ♦ **Avinatan
Hassidim**, The Hebrew University of
Jerusalem

January 22

Computer Science/Discrete Math II ♦ *A
Study of Multiplication Codes* ♦ **Adi Akavia**,
Massachusetts Institute of Technology;
Member, School of Mathematics

Algebraic-Geometric Derived Categories
and Applications ♦ *Stability Conditions and
Quantum Cohomology for P^2* ♦ **Roman
Bezrukavnikov**, Massachusetts Institute of
Technology; Member, School of Mathematics

January 23

Categories and Knot Invariants ♦
*Homological Algebra of Link Invariants II:
Matrix Factorizations and Link Homology* ♦
Mike Khovanov, Columbia University;
Member, School of Mathematics

January 24

Towards Two-Dimensional Geometric
Langlands Duality ♦ *Pursuing the Double
Affine Grassmannian* ♦ **Michael Finkelberg**,
Independent University of Moscow; Member,
School of Mathematics

January 25

Joint IAS/PU Number Theory ♦ *The
Waldspurger Formula and the Gross-Zagier
Formula* ♦ **Xinyi Yuan**, Columbia University

January 28

Computer Science/Discrete Math I ♦
Hardness Amplification Proofs Require Majority ♦
Emanuele Viola, Columbia University

January 29

Computer Science/Discrete Math II ♦
*Arithmetic Complexity—The Power of Partial
Derivatives* ♦ **Avi Wigderson**, Herbert H.
Maass Professor, School of Mathematics

Categories and Knot Invariants ♦
Homological Algebra of Link Invariants III ♦
Mikhail Khovanov, Columbia University;
Member, School of Mathematics

January 30

Algebraic-Geometric Derived Categories
and Applications ♦ *Stability Conditions and
Stokes Factors* ♦ **Valerio Toledano Laredo**,
Northeastern University; Member, School
of Mathematics

January 31

Towards Two-Dimensional Geometric
Langlands Duality ♦ *Double Affine Hecke
Algebra from Loop Groups over p -adic Fields
(after Kapranov and Gaiety-Kazhdan)* ♦
Alexander Braverman, Brown University;
Member, School of Mathematics

February 1

Special Lecture ♦ *From Automorphic Sheaves
to the Cohomology of the Moduli Spaces of
F-Bundles* ♦ **Yakov Varshavsky**, The
Hebrew University of Jerusalem

February 4

Computer Science/Discrete Math I ♦
The Rules of the Game ♦ **Michael
Krivelevich**, Tel Aviv University

February 5

Computer Science/Discrete Math II ♦
*Arithmetic Complexity—The Power of Partial
Derivatives* ♦ **Avi Wigderson**, Herbert H.
Maass Professor, School of Mathematics

Categories and Knot Invariants ♦
*Categorification of Link Invariants via
Representation Theory* ♦ **Catharina Stroppel**,
University of Glasgow; von Neumann Early
Career Fellow, School of Mathematics

February 6

Algebraic-Geometric Derived Categories and
Applications ♦ *Stability Conditions and Stokes
Factors (continued)* ♦ **Valerio Toledano
Laredo**, Northeastern University; Member,
School of Mathematics

February 7

Towards Two-Dimensional Geometric
Langlands Duality ♦ *Duality from Six
Dimensions* ♦ **Edward Witten**, Charles
Simonyi Professor, School of Natural Sciences

Joint IAS/PU Number Theory ♦
The Subconvexity Bounds for L-Functions ♦
Xiaoqing Li, University of Buffalo, The
State University of New York

February 8

Special Lecture ♦ *Towards a Global Langlands
Correspondence over Function Fields* ♦ **Yakov
Varshavsky**, The Hebrew University of
Jerusalem

February 11

Computer Science/Discrete Math I ♦ *Uniform
Direct Product Theorems: Simplified, Optimized,
and Derandomized* ♦ **Valentine Kabanets**,
Simon Fraser University

February 12

Computer Science/Discrete Math II ♦
Efficient Algorithms for Some Algebraic Problems ♦
Neeraj Kayal, Rutgers, The State University
of New Jersey

Special Lecture ♦ *Affine Tangles and Irreducible
Exotic Sheaves* ♦ **Rina Anno**, Harvard
University

February 13

Categories and Knot Invariants ♦ *Link Homologies, Instantons, and BPS Invariants* ♦ **Sergei Gukov**, University of California, Santa Barbara; Member, School of Mathematics

February 14

Towards Two-Dimensional Geometric Langlands Duality ♦ *Duality from Six Dimensions (continued)* ♦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

Joint IAS/PU Number Theory ♦ *Prime Chains and Pratt Trees* ♦ **Kevin Ford**, The University of Illinois at Urbana-Champaign

February 15

Special Lecture ♦ *A Gentle Introduction to Derived Algebraic Geometry* ♦ **Clark Barwick**, University of Oslo; Member, School of Mathematics

February 18

Computer Science/Discrete Math I ♦ *Integrality Gaps for Sherali-Adams Relaxations* ♦ **Yury Makarychev**, Microsoft Research

February 19

Computer Science/Discrete Math II ♦ *New Results and Open Problems in Computing Nash Equilibria* ♦ **Christos Papadimitriou**, University of California, Berkeley

Algebro-Geometric Derived Categories and Applications ♦ *D-Modules and Loop Spaces* ♦ **David Nadler**, Northwestern University; Member, School of Mathematics

February 21

Categories and Knot Invariants ♦ *Link Homologies and Refined BPS Invariants* ♦ **Sergei Gukov**, University of California, Santa Barbara; Member, School of Mathematics

Towards Two-Dimensional Geometric Langlands Duality ♦ *Duality from Six Dimensions (continued)* ♦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

Joint IAS/PU Number Theory ♦ *Integral Models of Some Shimura Varieties* ♦ **Mark Kisin**, The University of Chicago

February 22

Special Lecture ♦ *Introduction to Non-Abelian p -adic Hodge Theory* ♦ **Vadim Vologodsky**, The University of Chicago; Member, School of Mathematics

February 25

Computer Science/Discrete Math I ♦ *Security Under Key-Dependent Inputs* ♦ **Shai Halevi**, IBM Thomas J. Watson Research Center, Yorktown Heights, New York

February 26

Computer Science/Discrete Math II ♦ *Sound Three-Query PCPPs Are Long* ♦ **Arie Matsliah**, Technion-Israel Institute of Technology

Algebro-Geometric Derived Categories and Applications ♦ *Character Sheaves and Real Groups* ♦ **David Ben-Zvi**, The University of Texas at Austin; Member, School of Mathematics

February 27

Special Lecture ♦ *Infinity Categories* ♦ **Clark Barwick**, University of Oslo; Member, School of Mathematics

Analysis Seminar ♦ *Orbit of the Diagonal of a Power of a Nilmanifold* ♦ **Alexander Leibman**, The Ohio State University

February 28

Categories and Knot Invariants ♦ *Refined Topological Vertex and Homological Invariants of Knots and Three-Manifolds* ♦ **Sergei Gukov**, University of California, Santa Barbara; Member, School of Mathematics

Towards Two-Dimensional Geometric Langlands Duality ♦ *Boundary Conditions in Gauge Theory* ♦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

Joint IAS/PU Number Theory ♦ *Hilbert Spaces of Entire Functions and Automorphic L-Functions* ♦ **Jeffrey Lagarias**, University of Michigan

February 29

Special Lecture ♦ *Introduction to Non-Abelian p -adic Hodge Theory (continued)* ♦ **Vadim Vologodsky**, The University of Chicago; Member, School of Mathematics

March 3

Computer Science/Discrete Math I ♦ *Disjointness Is Hard in the Multi-Party Number-on-the-Forehead Model* ♦ **Troy Lee**, Rutgers, The State University of New Jersey

Marston Morse Lecture ♦ *Topological Quantum Field Theories in Low Dimensions* ♦ **Jacob Lurie**, Massachusetts Institute of Technology

March 4

Computer Science/Discrete Math II ♦ *The Sign-Rank of AC^0* ♦ **Alexander Razborov**, Visiting Professor, School of Mathematics

Algebro-Geometric Derived Categories and Applications ♦ *Hall Algebras for Triangulated (dg-) Categories and Higher Algebraic Stacks* ♦ **Bertrand Toen**, Université Pierre et Marie Curie

March 5

Marston Morse Lecture ♦ *Topological Quantum Field Theories in Low Dimensions* ♦ **Jacob Lurie**, Massachusetts Institute of Technology

March 6

Categories and Knot Invariants ♦ *Knot Homology and Braid Group Actions on Derived Categories of Coherent Sheaves* ♦ **Joel Kamnitzer**, University of California, Berkeley, and American Institute of Mathematics

Towards Two-Dimensional Geometric Langlands Duality ♦ *Boundary Conditions in Gauge Theory (continued)* ♦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

Joint IAS/PU Number Theory ♦ *Counting Rational Points on a Cubic Surface* ♦ **Ritabrata Munshi**, Rutgers, The State University of New Jersey

March 10–14

Conference on Algebro-Geometric Derived Categories and Applications

March 10

Computer Science/Discrete Math I ♦ *A Frieman Isomorphism-Type Lemma for Polynomials* ♦ **Philip Matchett Wood**, Rutgers, The State University of New Jersey

March 11

Computer Science/Discrete Math II ♦ *The Sign-Rank of AC^0 (continued)* ♦ **Alexander Razborov**, Visiting Professor, School of Mathematics

Special Lecture ♦ *Arithmetic Invariants of Discrete Langlands Parameters* ♦ **Benedict Gross**, Harvard University

March 12

Analysis Seminar ♦ *Constructing Wild Groups* ♦ **Lior Siberman**, Harvard University; Member, School of Mathematics

March 13

Joint IAS/PU Number Theory ♦ *Iwasawa Theory of Elliptic Curves for Supersingular Primes* ♦ **Byoung du Kim**, Northwestern University

March 17

Special Lecture ♦ *Kazhdan-Lusztig Equivalence Between Quantum Groups and Affine Algebras via Factorizable Sheaves* ♦ **Dennis Gaitsgory**, Harvard University

Marston Morse Lecture ♦ *Topological Quantum Field Theories in Low Dimensions* ♦ **Jacob Lurie**, Massachusetts Institute of Technology

March 19

Marston Morse Lecture ♦ *Topological Quantum Field Theories in Low Dimensions* ♦ **Jacob Lurie**, Massachusetts Institute of Technology

March 21

Special Lecture ♦ *Introduction to Non-Abelian Hodge Theory (continued)* ♦ **Vadim Vologodsky**, The University of Chicago; Member, School of Mathematics

March 24

Computer Science/Discrete Math I ♦ *Testing Symmetric Properties of Distributions* ♦ **Paul Valiant**, Massachusetts Institute of Technology

March 25

Computer Science/Discrete Math II ♦ *Expander Cryptography—Cryptography with Constant Computational Overhead* ♦ **Amit Sahai**, University of California, Los Angeles

Algebraic-Geometric Derived Categories and Applications ♦ *Cluster Algebras and Quiver Representations* ♦ **Bernard Keller**, Université Paris Diderot

March 26

Algebraic-Geometric Derived Categories and Applications ♦ *Triangulated Categories: Enhancements, Generators, and Dimensions* ♦ **Dmitry Orlov**, Steklov Mathematical Institute, Russian Academy of Sciences; Member, School of Mathematics

March 27

Algebraic-Geometric Derived Categories and Applications ♦ *Derived Algebraic Geometry* ♦ **Jacob Lurie**, Massachusetts Institute of Technology

March 28

Algebraic-Geometric Derived Categories and Applications ♦ *Perverse Equivalences and Calabi-Yau Categories* ♦ **Raphael Rouquier**, University of Oxford

Special Lecture ♦ *Joyce Invariants for K3 Surfaces and Mock Theta Functions* ♦ **So Okada**, The Australian National University

March 31

Computer Science/Discrete Math I ♦ *On Proving Hardness of Improper Learning from Worst-Case Assumptions* ♦ **Benny Applebaum**, Princeton University

April 1

Computer Science/Discrete Math II ♦ *The Distribution of Polynomials over Finite Fields* ♦ **Tali Kaufman**, Member, School of Mathematics

Special Lecture ♦ *Opers With Irregular Singularities and Spectra of the Quantum Shift of Argument Subalgebra* ♦ **Leonid Rybnikov**, Alikhanov Institute for Theoretical and Experimental Physics, Moscow; Member, School of Mathematics

April 2

Special Lecture ♦ *Hypertoric Varieties and Koszul Duality* ♦ **Ben Webster**, University of California, Berkeley; Member, School of Mathematics

Analysis Seminar ♦ *Stationary Measures and Equidistribution on the Torus* ♦ **Elon Lindenstrauss**, Princeton University; Member, School of Mathematics

April 3

Towards Two-Dimensional Geometric Langlands Correspondence ♦ *Classification of Finite Dimensional Representations of DAHA (after Varagnolo and Vasserot)* ♦ **Olivier Schiffmann**, École Normale Supérieure, Paris; Member, School of Mathematics

Joint IAS/PU Number Theory ♦ *Cohen-Lenstra Heuristics and the Negative Pell Equation* ♦ **J. Klüeners**, Heinrich-Heine-Universität Düsseldorf

April 7

Computer Science/Discrete Math I ♦ *Merkle Puzzles Are Optimal* ♦ **Mohammad Mohmoody Ghidary**, Princeton University

April 8

Computer Science/Discrete Math II ♦ *Spherical Cubes or Coordinated Random Choices in High Dimensions* ♦ **Anup Rao**, The University of Texas at Austin; Member, School of Mathematics

Special Lecture ♦ *Quasi-Coxeter Algebras, Dynkin Diagram Cohomology and Quantum Weyl Groups* ♦ **Valerio Toledano Laredo**, Northeastern University; Member, School of Mathematics

April 9

Special Lecture ♦ *Unipotent Classes and Special Weyl Groups Representations* ♦ **George Lusztig**, Massachusetts Institute of Technology

April 10

Special Lecture ♦ *Crystal Structures on (Some) Global Nilpotent Cones* ♦ **Olivier Schiffmann**, École Normale Supérieure, Paris; Member, School of Mathematics

Joint IAS/PU Number Theory ♦ *On a Result of Waldspurger in Higher Rank* ♦ **David Whitehouse**, Massachusetts Institute of Technology

April 14

Computer Science/Discrete Math I ♦ *Embeddings of Discrete Groups and the Speed of Random Walks* ♦ **Assaf Naor**, Courant Institute of Mathematical Sciences, New York University

Special Lecture ♦ *An Introduction to the Statistical Mechanics of Random Band Matrices* ♦ **Tom Spencer**, Professor, School of Mathematics

April 15

Computer Science/Discrete Math II ♦ *Nearly Diagonally Dominant Matrices and Their Applications* ♦ **Noga Alon**, Tel Aviv University; Visiting Professor, School of Mathematics

Special Lecture ♦ *Hall Algebras and Quantum Frobenius* ♦ **Kevin McGerty**, Imperial College London; Member, School of Mathematics

April 16

Algebraic-Geometric Derived Categories and Applications ♦ *Real Groups via Base Change* ♦ **David Nadler**, Northwestern University; Member, School of Mathematics

Analysis Seminar ♦ *Expanders and Random Walks in $SL(d, q)$* ♦ **Jean Bourgain**, Professor, School of Mathematics

Special Lecture ♦ *An Introduction to the Statistical Mechanics of Random Band Matrices (continued)* ♦ **Tom Spencer**, Professor, School of Mathematics

April 17

Towards Two-Dimensional Geometric Langlands Correspondence ♦ *H^3 and Gerbal Extensions* ♦ **Xinwen Zhu**, University of California, Berkeley

Joint IAS/PU Number Theory ♦ *Nonvanishing Mod P of Eisenstein Series* ♦ **Bei Zhang**, Columbia University; Member, School of Mathematics

Algebraic-Geometric Derived Categories and Applications ♦ *Towards Categorification of Quantum Groups* ♦ **Mikhail Khovanov**, Columbia University; Member, School of Mathematics

April 23

Joint IAS/PU Number Theory ♦ *Automorphic Lifts of Prescribed Type* ♦ **Toby Gee**, Northwestern University

Analysis Seminar ♦ *A Hardy Field Extension of Szemerédi's Theorem* ♦ **Nikos Frantzikinakis**, University of Memphis

April 24

Joint IAS/PU Number Theory ♦ *Explicit Reduction Mod P of Certain Crystalline Representations* ♦ **Toby Gee**, Northwestern University

April 28

Computer Science/Discrete Math I ♦ *Security Under Key-Dependent Inputs* ♦ **Shai Halevi**, IBM Thomas J. Watson Research Center, Yorktown Heights, New York

April 29

Computer Science/Discrete Math II ♦ *Optimal Monotone Encodings* ♦ **Rani Hod**, Tel Aviv University

Algebraic-Geometric Derived Categories and Applications ♦ *Categorification of Quantum Groups and Floer Theory* ♦ **Hao Zheng**, Rutgers, The State University of New Jersey

April 30

Special Lecture ♦ *Strange Duality on Moduli of Sheaves on Curves and Surfaces* ♦ **Alina Marian**, Yale University; Member, School of Mathematics

May 1

Special Lecture ♦ *Equivariant Cohomology of Laumon's Quasiflags Spaces and the Quantum Calogero-Moser Hamiltonian* ♦ **Andrei Negut**, Princeton University

Joint IAS/PU Number Theory ♦ *Multizeta Values and Related Structures in Function Field Arithmetic* ♦ **Dinesh Thakur**, University of Arizona; Member, School of Mathematics

May 7

Algebraic-Geometric Derived Categories and Applications ♦ *Representations of Rational Cherednik Algebras and Miracles of Science* ♦ **Roman Bezrukavnikov**, Massachusetts Institute of Technology; Member, School of Mathematics

May 8

Joint IAS/PU Number Theory ♦ *The Divisor Matrix, Dirichlet Series, and $SL(2, \mathbb{Z})$* ♦ **Peter Sin**, University of Florida

May 12

Computer Science/Discrete Math I ♦ *Artin Map, Cyclotomic Function Fields, and Folded List-Decodable Codes* ♦ **Venkatesan Guruswami**, University of Washington; Member, School of Mathematics

May 13

Computer Science/Discrete Math II ♦ *A Dirac-Type Theorem for Three-Uniform Hypergraphs* ♦ **Endre Szemerédi**, Rutgers, The State University of New Jersey; Member, School of Mathematics

May 14

Analysis Seminar ♦ *On the Two Dimensional Bilinear Hilbert Transform and $\mathbb{Z}$ Actions* ♦ **Ciprian Demeter**, University of California, Los Angeles; Member, School of Mathematics

May 16

Computer Science/Discrete Math II ♦ *Reconstruction of Depth-Three Arithmetic Circuits* ♦ **Amir Shpilka**, Technion-Israel Institute of Technology

May 23

Computer Science/Discrete Math I ♦ *The Finite Field Kakeya Conjecture* ♦ **Zeev Dvir**, Weizmann Institute of Science

May 27

Computer Science/Discrete Math II ♦ *Approximating Functions in Logarithmic Space and Time: A "Plug & Play" Approach* ♦ **Nir Halman**, Visitor, School of Mathematics

June 10

Computer Science/Discrete Math II ♦ *Computability and Complexity of Julia Sets* ♦ **Mark Braverman**, University of Toronto

Program for Women and Mathematics



ANDREA KANE

"Knots, Surfaces, the Curve Complex, Foliations, and all that . . ." was the research topic of the fifteenth annual Program for Women and Mathematics, whose goal is to encourage undergraduate and graduate students to continue their mathematics education.

The fifteenth annual Program for Women and Mathematics was held at the Institute for Advanced Study from May 12–23, 2008. The program, whose research topic was "Knots, Surfaces, the Curve Complex, Foliations, and all that . . ." was sponsored by the Institute and Princeton University and generously supported by the National Science Foundation and The Starr Foundation.

The goal of the program is to encourage undergraduate and graduate students to continue their mathematics education. Research mathematicians offer lectures and seminars on a focused topic, as well as mentoring, discussions on peer relations, and an introduction to career opportunities.

Including teaching assistants and lecturers, there were fifteen postdoctoral mathematicians, thirty-eight graduate students, and nineteen undergraduate students who participated in the program. Mentors and students were accommodated in the Institute's housing complex, which gave them an opportunity to meet Institute Members and mathematicians from neighboring institutions.

Ingrid Daubechies of Princeton University served as the organizer of the program this year. The first half of the advanced course, "Foliations and Laminations," was given by Rachel Roberts of Washington University, St. Louis. Jennifer Schultens of the University of California, Davis, gave the second half of the course, titled "Surfaces in 3-Manifolds." Joan Licata of Stanford University and Alice Stevens of the University of California, Davis, served as teaching assistants.

Genevieve Walsh of Tufts University lectured for the first week while Maggy Tomova of Rice University lectured for the second week of the beginning lecture course titled, "Surfaces, Orbifolds, and Knots." Ellen Goldstein of Tufts University and Yvonne Lai of the University of California, Davis, served as teaching assistants.

Tanya Khovanova of the Massachusetts Institute of Technology organized the research seminars, which were

as follows: Tanya Khovanov, MIT, “Topology in Art”; Brandy Guntel, University of Texas, “Dean Knots”; Chia-yen Tsai, University of Illinois, “Bounds of Least Pseudo-Anosov Dilatations”; Kate Petersen, Queen’s University, “Character Varieties of a Family of Two-Bridge Knots”; Joan Licata, Stanford University, “Local Link Alterations and the Thurston Norm”; Zsuzsanna Dancso, University of Toronto, “Algebraic Knot Theory and the Kontsevich Integral”; Emily Landes, University of Texas, “Two-Bridge Knots and the Character Variety”; Vera Vertesi, Columbia University, “A Way of Distinguishing Transverse Knots”; Melissa Macasieb, University of British Columbia, “Commensurability Classes of $(-2,3,n)$ Pretzel Knot Complements”; and Keiko Kawamuro, Rice University, “Classification of Transverse Knots in Contact Manifolds.”

Two colloquia were part of the afternoon activities. Dusa McDuff of Stony Brook University, The State University of New York, spoke on “Symplectic Embeddings of Four-Dimensional Ellipsoids” and Krystyna Kuperberg of Auburn University lectured on “Dynamics: Wild and 2-Wild.”

The Women-in-Science seminar was organized by Khovanova of MIT and Katy Bold of Princeton University. Eight seminars were held in the afternoons (one of which was held at Princeton University); speakers included Shelley Costa of Swarthmore College, who spoke on “Women in Mathematics,” and Deborah Lockhart from the National Science Foundation, who talked about “An Introduction to the National Science Foundation and Funding Opportunities.” There was “A Chat with Alice Chang and Ingrid Daubechies,” a showing of the movie *Flatland*, a mathematics party, and panel discussions on a day in the life of a mathematician and how to apply to and survive graduate school and a postdoc position.

On May 16, the program participants were bused to the campus of Princeton University for Princeton Day, during which they toured the campus, listened to lectures, and were treated to lunch and dinner.

The Institute for Advanced Study and the School of Mathematics appreciate the dedication of the senior women who have graciously given their time and talents since the inception of the program in 1994. Organizers, program committee members, and lecturers have all contributed to the growth and success of the women’s program. In the past fifteen years, many young women in the field of mathematics, or contemplating entering the field, have been encouraged and supported by Karen Uhlenbeck, the program founder, and her collaborator and coorganizer Chuu-Lian Terng. The commitment to the program’s goal has been unparalleled.

Questionnaires were distributed to the participants on the last day in order to gain feedback about the structure and quality of the program. Both undergraduates and graduate students expressed their sincere appreciation of being part of a program that takes place in what they called the ultimate learning environment. The Institute is a place that is relaxed yet focused. Also, many felt it renewed their interests and broadened their knowledge in mathematics and that it was inspirational to get to work with so many women who had the same interests as them.



PHOTOS ANDREA KANE

Many young women in the field of mathematics, or contemplating entering the field, have been encouraged and supported by former School of Mathematics Member Karen Uhlenbeck, the program’s founder, and her collaborator and coorganizer Chuu-Lian Terng.



RANDALL HAGADORN

The School of Natural Sciences

Faculty

Stephen L. Adler

Nima Arkani-Hamed *(from 1/1/08)*

Peter Goldreich

Arnold J. Levine

Juan Maldacena

Nathan Seiberg

Scott Tremaine, Richard Black Professor

Edward Witten, Charles Simonyi Professor

Professor Emeritus

Freeman J. Dyson

ACADEMIC ACTIVITIES

Professor **Stephen L. Adler** worked in two areas last year: (1) phenomenology of modified forms of quantum theory and (2) particle physics phenomenology relating to axions, growing out of his work last year relating to PVLAS (Polarizzazione del Vuoto con LASer), an experiment attempting to detect axions.

In work relating to tests of modified forms of quantum theory, Adler completed a paper with Princeton University graduate student Fethi Ramazanoglu on a calculation of electromagnetic radiation from neutral general atomic systems induced by stochastic fluctuations in the continuous spontaneous localization (CSL) model, and in a similar model with a noise spectrum cutoff. This confirmed earlier estimates based on a calculation for a single free electron, and suggested that looking at non-white noise in greater detail would be important in studying CSL model phenomenology. With Angelo Bassi, Adler wrote a paper initiating a detailed study of non-white noises, which showed that the white-noise equivalence of real and imaginary noises for processes such as noise-induced electromagnetic radiation could be extended, to leading order in perturbation theory, to Gaussian non-white noises. This paper also set up a general formalism for Gaussian non-white noises, including a state vector reduction proof and derivation of the master equation for the density matrix. In a second paper underway with Bassi, Adler is following up on this work by studying noises, such as thermal noises, in which the spatial and temporal correlations are intertwined by a mass-shell condition. The aim here is to investigate whether the noise source needed for objective state vector reduction theories could have a cosmological origin.

Last year, Adler wrote a detailed paper analyzing effects resulting from vacuum birefringence in a rotating magnetic field (corresponding to the geometry of the PVLAS experiment), and showed that claims of an infinite set of sidebands are incorrect. Despite the complexities of wave propagation in the rotating field “medium,” the polarization parameters of the emerging laser beam are exactly as calculated by assuming that the magnetic field can be treated as instantaneously “frozen” at the current rotation angle, and applying the known formulas for a stationary field. The methods used in this paper have applications to other wave-matching

problems, and this led Adler (with a group of Chilean collaborators) to undertake a detailed calculation of photon-axion and axion-photon conversion in a strong magnetic field, which is relevant for “light shining through a wall” experiments to search for axions. The calculation unearthed a novel feature, which may have implications for future searches for axions: when

the axion mass is nonzero, there is a threshold cusp, greatly enhancing the photon-axion conversion amplitude near threshold. This effect was calculated by several independent methods, including an exact wave matching calculation that showed how unitarity is maintained near threshold.

In 2007, Professor **Nima Arkani-Hamed** continued to actively work on the task of reconstructing the underlying theory of the TeV scale from Large Hadron Collider data. He also continued to explore questions raised by the possible presence of a large landscape of vacua in string theory.

Together with a number of colleagues, Arkani-Hamed described a coherent strategy and set of tools for reconstruct-

ing the fundamental theory of the TeV scale from LHC data, using On-Shell Elective Theories (OSETs). This work has since been continued in an ongoing collaboration with experimentalists at the Compact Muon Solenoid (CMS), a particle and phenomena detector.

With a number of postdocs, Arkani-Hamed showed that while the long-distance effective field theory of our Universe—the Standard Model coupled to gravity—has a unique 4D vacuum, it also has a landscape of lower-dimensional AdS $\times$ S¹ vacua, with the circle size around twenty microns big, stabilized by Casimir energy. They showed that it is possible to realize Casimir-stabilized AdS vacua as near-horizon regions of new kinds of quantum extremal black objects in the higher-dimensional space—near-critical black strings in 4D, near-critical black holes in 3D.

They also showed that in any model of noneternal inflation satisfying the null energy condition, the area of the de Sitter horizon increases by at least one Planck unit in each inflationary e-folding. This observation gives an operational meaning to the finiteness of the entropy S_{dS} of an inflationary de Sitter space, eventually exiting into an asymptotically flat region: the asymptotic observer is never able to measure more than $e^{S_{\text{dS}}}$ independent inflationary modes. This suggests a limitation on the amount of de Sitter space outside the horizon that can be consistently described at the semi-classical level, fitting well with other examples of the breakdown of locality in quantum gravity, such as in black hole evaporation.

In a collaboration with Joe Polchinski and his student, Arkani-Hamed returned to examine an old issue in quantum gravity possibly related to the modern paradoxes associated with the landscape—Euclidean wormholes.



RANDALL HAGADORN

Professor Nima Arkani-Hamed continued to actively work on the task of reconstructing the underlying theory of the TeV scale from Large Hadron Collider data.

They showed how to embed axionic wormhole solutions consistently in string theory; the AdS/CFT correspondence then suggests that the wormholes cannot be interpreted in a classic way first suggested by Coleman.

During the 2007–08 academic year, Professor **Peter Goldreich** worked on the project described below.

Reading the Record of Ancient Impacts

Debris from asteroids and comets continually bombards the earth. Big impacts launch molten ejecta on trajectories that take them thousands of kilometers from the impact site. These occur several times every hundred million years. A minimum of about a cubic kilometer of melt is required to penetrate the atmosphere. Ejecta from these impacts are found in discrete layers of submillimeter size spherules in sea floor sediments. Larger, aerodynamically shaped objects are found on land.

Goldreich investigated the physical processes that occur in energetic impacts with emphasis on determining the size of the ejecta and the luminosity of the fireball. His research indicates that impact melts are born in a state of turbulence. As a melt decompresses, it breaks up into a spray of drops. Some vapor is also produced. The drops collide and coagulate, reaching the maximum size at which they can survive collisions. As the expansion progresses, the velocity field approaches a Hubble flow, the turbulence weakens, and collisions between drops occur at lower speeds. Ultimately the collision frequency drops below the expansion rate. Surface tension is responsible for binding drops at temperatures above 2000 degrees Kelvin. Drops bound by surface tension attain sizes of a few hundred microns at the cessation of collisions. Below 2000 degrees Kelvin, viscosity dominates surface tension in preventing drops from breaking apart when they collide. Drops protected by viscosity can grow to tens of centimeters in size. The ejecta cloud remains opaque until it extends to more than a thousand kilometers. Its luminosity peaks at about 10^{-10} times that of the sun and decays on a timescale of a few minutes.

During the 2007–08 academic year, Professor **Arnold J. Levine**'s research focus has been upon the evolutionary changes that occur in the genomes of influenza viruses and in selected genes involved in stress responses in humans. The influenza virus evolves rapidly; there are examples of genome sequences from 1918 to 2008 collected from many different host species in many diverse locations. The human genome evolves more slowly; there are present-day examples of sequences from several demographic groups collected all over the world. The virus and its host interact, so that each can exert selective pressures upon the other. Thus (with Raúl Rabadán, Benjamin Greenbaum, Shoichi Metsugi, and Gyan Bhanot), Levine is examining the changes (random mutation followed by natural selection for favorable variations) occurring in genomes in different genetic backgrounds both over time and at diverse locations and environments.

Influenza viruses from birds have much higher CpG dinucleotide frequencies in their RNA genomes than

Professor Goldreich investigated the physical processes that occur when debris from asteroids and comets continually bombards the earth and big impacts launch molten ejecta on trajectories that take them thousands of kilometers from the impact site. These occur several times every hundred million years.

Professor Arnold Levine (standing) conducted studies that show how two forces, reproduction rates and infectious diseases, can shape the human genome sequences and alter the agents that infect humans so as to optimize the reproduction of the virus and its host.



DINAH KAZAKOFF



ANDREA KANE

Professor Juan Maldacena (right) primarily worked on the gauge/string duality with particular emphasis on understanding some aspects of gauge theory dynamics.

viruses derived from humans. Similarly the genes from birds also have much higher CpG frequencies than the corresponding gene from humans (the virus sequences often mimic the host patterns). Indeed, bird viruses that infect humans grow poorly because they cause a large innate immune response. The CpG dinucleotides are a known trigger of this response, mounted in humans but not birds. A bird influenza virus that jumped into the human population in 1918 evolved lower CpG frequencies with time and then replicated better and elicited a weaker innate immune response, explaining the selection pressure that changes this genome in a species-specific host response. It is this powerful innate immune response of humans to bird viruses that infect them directly that caused the extreme symptoms and high death rate in humans during the 1918 influenza epidemic.

The genes that populate the innate immune system of humans have been shown to have a very low CpG dinucleotide content. This also arises by a selection against this dinucleotide in humans because genes with high CpG levels would set up a positive feedback loop when activated, by making transcripts with high CpG and signaling for higher levels of innate immunity (as in the case of bird influenza in humans).

In another project (with Gurinder Atwal and Gareth Bond) several human genes, including p53, MDM-2, and MDM-4, which respond to many different types of stress, such as DNA damage, infections, and inflammation, have been analyzed for their genetic or sequence changes over the time period of human evolution. Some sequences, or alleles, show good evidence for rapid and positive selection pressures in Northern European populations. This is due, at least in part, to the observation that these genes (p53 and MDM-4) have been shown to be involved in the implantation efficiency of fertilized eggs into the uterus of humans and mice. Thus, fecundity, which is a strong contributor to selection in a species, is affected by the different alleles of these genes.

These studies show how two forces, reproduction rates and infectious diseases, can shape the human genome sequences and alter the agents that infect humans so as to optimize the reproduction of the virus and its host.

During this academic year, Professor **Juan Maldacena**'s main research effort has been on the gauge/string duality with particular emphasis on understanding some aspects of gauge theory dynamics.

Maldacena studied with Luis F. Alday the properties of operators with large spin in conformal gauge theories. These are operators that are very important for understanding the dynamics of gauge theories. In quantum chromodynamics (QCD) their anomalous dimensions control the evolution of parton distribution functions and other high-energy processes. They considered the conformal case, and some properties were proven by using conformal symmetry. In addition, in the case of $N=4$ super Yang Mills, a connection was found between the planar diagrams of the gauge theory in a particular limit and the $SO(6)$ sigma model. This is a full quantum mechanical relation.

With Diego Hofman (a student from Princeton University), Maldacena considered the problem of planar diagrams with boundaries that arise in some

configurations of $N=4$ super Yang Mills. In this case the problem reduces to a spin chain with boundary and in some cases the full problem with the boundary condition is integrable. They computed the boundary reflection matrix up to an overall phase by applying a method developed by Niklas Beisert for the bulk case. In this way one can compute the anomalous dimension of some special operators for all values of the 't Hooft coupling.

Previous work by other authors had suggested that this problem was not integrable, but they found an error in the previous arguments and they showed that the results are indeed consistent with integrability.

Separately with Alday, Maldacena considered the problem of gluon scattering in $N=4$ super Yang Mills at strong coupling using the method they developed earlier. This previous paper had shown that the n gluon scattering amplitude can be computed at strong coupling by finding a minimal area surface in AdS_5 that ends on an n sided polygon at the boundary. The surface is explicitly known for four gluons, but it is not known explicitly for a large number of gluons. They showed that for $n=5$, even though the surface is not known, the final result is determined by the conformal symmetry of the problem. For $n>5$ the result is not determined by conformal symmetry. By taking the limit $n\rightarrow\infty$, which corresponds to a large number of gluons, it was shown that the strong coupling answer did not agree with a previous conjecture that had been made in the literature. This suggested that for $n=6$ and two loops there might be a disagreement with that conjecture. Subsequently, explicit computations were carried out by other groups, which showed that this is indeed the case and, furthermore, they were consistent with another conjectured relation between Wilson loops and amplitudes. Maldacena is continuing to study this problem with Nathan Berkovits, and there will soon be a paper that will further clarify some of these issues.

Hofman and Maldacena systematically studied energy correlations in a conformal field theory. Energy correlations is an observable that is very useful for characterizing jet physics. They studied this observable for conformal theories and found some general results. The energy one-point functions are related to three-point functions in the conformal field theories. Demanding positivity one gets interesting constraints on some parameters characterizing the stress tensor operator. In addition, the small angle behavior of energy correlations has a simple form determined by the scaling dimension of certain spin three operators. Also the gravity description of these energy correlations was studied at strong coupling. In the gravity approximation the energy distributions are perfectly spherically symmetric. Stringy corrections imply that there will be small energy fluctuations.

Maldacena, together with Oren Bergman, a Member in the School, and Ofer Aharony and Daniel Jafferis, studied certain three-dimensional theories with Chern-Simons terms. These theories have a large amount of symmetries and describe certain branes in M-theory. They also have interesting gravity duals, which involve a four-dimensional negatively curved spacetime.

During the past year, Professor **Nathan Seiberg** continued his work on the phenomenology of low-energy supersymmetry.

In collaboration with Michael Dine and Scott Thomas, he interpreted the current experimental limit on the lightest Higgs boson mass to suggest that if nature is supersymmetric, there are additional interactions beyond those of

Professor Seiberg continued his work on the phenomenology of low-energy supersymmetry. With his collaborators Michael Dine and Scott Thomas, he interpreted the current experimental limit on the lightest Higgs boson mass to suggest that if nature is supersymmetric, there are additional interactions beyond those of the Minimal Supersymmetric Standard Model.

the Minimal Supersymmetric Standard Model (MSSM). These arise from new degrees of freedom around the TeV scale. Within an effective field theory analysis, the leading order corrections to the MSSM were described in terms of only two operators. This provided a highly constrained description of beyond MSSM physics. The scalar Higgs spectrum as well as the chargino and neutralino spectrum and couplings are modified in a distinctive way. These operators can be generated by a variety of microscopic mechanisms that were also briefly discussed.

With Patrick Meade and David Shih, he gave a general definition of gauge mediated supersymmetry breaking that encompasses all the known gauge mediation models. In particular, it includes both models with messengers as well as direct mediation models. A formalism for computing the soft terms in the generic model was presented. Such a formalism is necessary in strongly coupled direct mediation models where perturbation theory cannot be used. It allows to identify features of the entire class of gauge mediation models and to distinguish them from specific signatures of various subclasses.

Although most of Seiberg's work during the year has circled around the phenomenology of low-energy supersymmetry, together with Philip Argyres he explored four-dimensional $N=2$ superconformal theories. A solution to the infinite coupling problem of such gauge theories was presented. The infinitely coupled theories were argued to be interacting superconformal field theories (SCFTs) with weakly gauged flavor groups. Consistency checks of this proposal were found by examining some low-rank examples. As part of these checks, they showed how to compute new exact quantities in these SCFTs: the central charges of their flavor current algebras. Also, the isolated rank one E6 and E7 SCFTs were found as limits of Lagrangian field theories.

Richard Black Professor **Scott Tremaine** gave the Distinguished Lecture Series at the Lewiner Institute for Theoretical Physics of the Technion and the John Bahcall Lecture at the Weizmann Institute of Science. Working with Professor James Binney of Oxford, he also completed a second edition of *Galactic Dynamics*, a graduate-level textbook on the structure and evolution of stellar systems first published in 1987.

Member Rachel Mandelbaum spoke at an informal astrophysics seminar on weak lensing—the very small perturbations in the shapes of distant source galaxies due to massive foreground galaxies and clusters—which can be used to answer a variety of astrophysical questions, including those pertaining to the nature of dark matter and dark energy.



The massive black holes found at the centers of most galaxies, including our own Milky Way, are surrounded by thousands to millions of stars that orbit under the gravitational influence of the black hole. The distribution and dynamics of these stars probe the properties of the black hole, determine the rate at which stars are swallowed or disrupted by it, and govern the rate and intensity of bursts of gravitational radiation that may be detectable by planned space observatories. With Visitor Jihad Touma of the American University of Beirut, Tremaine has been investigating the evolution of stellar systems around black holes, including resonant relaxation effects, novel numerical techniques to solve the N-body problem, and phase transitions in stellar

disks. With graduate student Yue Shen, Tremaine has examined the long-term stability of distant satellites around the giant planets of the solar system. In the past decade, dozens of new satellites have been discovered around these planets, at distances up to about 50 to 60 percent of the boundary of the planet's sphere of influence (variously called the Hill, Roche, or tidal radius). They have found that satellite orbits in some regions outside the sphere of influence of Uranus and Neptune can also be stable for long times (at least 100 million years) and suggest that new satellites may be found by dedicated searches of these regions.

Most of the mass in the universe consists of dark matter of some unknown form, most probably some novel elementary particle, generically called a weakly interacting massive particle (WIMP). Many experiments are searching for evidence of interactions between WIMPs from the Galactic halo and laboratory detectors. A major uncertainty in estimates of the detection rate is the contribution from WIMPs that are bound to the solar system, through capture from the halo by elastic scattering in the sun or gravitational scattering by the planets. Graduate student Annika Peter, working with Tremaine, has investigated the solar-system WIMP capture rate through massive numerical simulations that involve following the orbits of WIMPs in the solar system for hundreds of millions of years. They have shown that the contribution of bound dark matter to current or planned detection experiments is negligible for any plausible particle masses or cross sections.

In 2007–08, Charles Simonyi Professor **Edward Witten**, with Member Davide Gaiotto, began a detailed study of supersymmetric boundary conditions in certain four-dimensional gauge theories and how they transform under electric-magnetic duality. The analogous problem in two dimensions has been much studied and is important both in string theory and in relation to mirror symmetry. The four-dimensional case has hitherto been mostly neglected. The problem is also closely related to the problem of supersymmetric domain walls.

In the process of this work, Witten and Gaiotto made several new constructions concerning supersymmetric conformal field theories in three dimensions, new supersymmetric Chern-Simons theories, field theory constructions of supersymmetric Janus configurations, etc. The results are to appear in a series of papers.

Witten also continued his work with School of Mathematics Member Sergei Gukov on surface operators in gauge theory. These operators are analogous to Wilson and 't Hooft line operators, but they are supported on a two-dimensional surface. They described a new class of “rigid” surface operators and attempted to understand the behavior under duality, with partial results.

With Alex Maloney, Witten continued his work on three-dimensional quantum gravity with negative cosmological constant. They carried out a direct calculation of the exact partition function of this theory, based on a certain standard set of assumptions. The computation gave an answer that does not have satisfactory properties physically. Either one of the standard assumptions about the quantum gravity path integral is incorrect, or pure three-dimensional quantum gravity with negative cosmological constant is not really a meaningful quantum theory.

Witten continued his work on the gauge theory approach to geometric

Most of the mass in the universe consists of dark matter of some unknown form, most probably some novel elementary particle, generically called a weakly interacting massive particle (WIMP). Many experiments are searching for evidence of interactions between WIMPs from the Galactic halo and laboratory detectors. An investigation by Professor Tremaine determined the contribution of WIMPs that may be captured by the solar system, by following their complex orbits for hundreds of millions of years.



DINAH KAZAKOFF

Professor Emeritus Freeman Dyson was interviewed in December by the PBS program *American Experience* for a documentary on former Institute Director (1947–66) J. Robert Oppenheimer.

Langlands (described in last year's report) with a paper explaining how to understand "wild ramification" in this framework. Physically, this amounts to studying the behavior of gauge theory in the presence of surface operators that are associated with rather severe singularities. Somewhat surprisingly, these operators are well-behaved even though the singularities involved appear unrenormalizable at first sight. In addition, with Edward Frenkel, Witten investigated the role of "orbifolds" in geometric Langlands.

Professor Emeritus **Freeman J. Dyson** did not do any significant research this year. He spent his time preparing and giving lectures at international meetings in Portugal and Italy, visiting small colleges in the United States, and writing book reviews for *The New York Review of Books*. His interests are now more in biology and astronomy than in physics. His most recent book review, with the title "Questions about Global Warming," gave him the opportunity to express unpopular opinions about this contentious subject.

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f First Term ♦ *s* Second Term ♦
m Long-term Member ♦ *v* Visitor ♦
a Research Assistant

RECORD OF EVENTS

Particle Physics Activities

September 11

Special Phenomenology Seminar ♦ *Mass
Determination in SUSY-like Events with Missing
Energy* ♦ **Hsin-Chia Cheng**, University of
California, Davis

September 17

High Energy Theory Seminar ♦ *Simplifying
DS(B)* ♦ **Eva Silverstein**, Stanford
University

September 27

Informal Phenomenology Seminar ♦ *The
Randall-Sundrum Model and High Energy Top
Quarks* ♦ **Ben Lillie**, Argonne National Lab

October 1

High Energy Theory Seminar ♦ *Remarks on
Wall-Crossing Formulae for BPS States* ♦
Gregory Moore, Rutgers, The State
University of New Jersey

October 3

Physics Group Meeting ♦ *Various Twisted
Sigma-Models in Physics and Their Relation to
Chiral Differential Operators in Mathematics* ♦
Meng-Chwan Tan, National University
of Singapore; Member, School of Natural
Sciences

October 5

High Energy Theory Seminar ♦ *Localization
of Supersymmetric Gauge Theories and Circular
Wilson Loops* ♦ **Vasily Pestun**, Princeton
University

October 11

Informal Phenomenology Seminar ♦
Z'-mediated Supersymmetry Breaking ♦ **Itay
Yavin**, Princeton University

October 15

High Energy Theory Seminar ♦ *Hidden Sector
Running and the B-μ Problem in Gauge Media-
tion* ♦ **Martin Schmaltz**, Boston University

October 17

Physics Group Meeting ♦ *Sphere Packings in
High Dimensions: Disorder versus Order* ♦
Salvatore Torquato, Princeton University;
Member, School of Natural Sciences

October 19

High Energy Theory Seminar ♦ *LHC and
Our String Theory Vacuum* ♦ **Gordon Kane**,
University of Michigan; Member, School of
Natural Sciences

October 25

Informal Phenomenology Seminar ♦ *The
G₂-MSSM at the LHC* ♦ **Bobby Acharya**,
The Abdus Salam International Centre for
Theoretical Physics, Trieste, Italy

October 26

High Energy Theory Seminar ♦ *The Phase Diagram of Holographic QCD* ♦ **Oren Bergman**, Technion–Israel Institute of Technology; Member, School of Natural Sciences

October 29

Joint LHC EXP–TH Group Meeting ♦ *LHC and Statistics* ♦ **Kyle Cramner**, New York University

High Energy Theory Seminar ♦ *Stringy Instantons, Geometric Transitions, and Dynamical Supersymmetry Breaking* ♦ **Shamit Kachru**, Stanford University

October 31

Physics Group Meeting ♦ *Exact Correlators in AdS_3/CFT_2* ♦ **Ari Pakman**, Stony Brook University, The State University of New York

November 7

Physics Group Meeting ♦ *Singularity Resolution by M-Theory Fivebranes, Calibrated Geometry and AdS Solutions, and Special Holonomy Metrics* ♦ **Oisín Mac Conamhna**, Imperial College London

November 8

Informal Phenomenology Seminar ♦ *Searching for Warped Throats and Hidden Valleys at the LHC* ♦ **Kathryn M. Zurek**, University of Wisconsin–Madison

November 9

High Energy Theory Seminar ♦ *Finite Flavor Groups?* ♦ **Pierre Ramond**, University of Florida; Member, School of Natural Sciences

November 12

High Energy Theory Seminar ♦ *Quantum Criticality and Black Holes* ♦ **Subir Sachdev**, Harvard University

November 13

Special High Energy Theory Seminar ♦ *A New Farey Tail* ♦ **Jan Manschot**, University of Amsterdam

November 14

Physics Group Meeting ♦ *More on G_2 -MSSM Construction—Why 84?* ♦ **Jing Shao**, University of Michigan

November 21

Physics Group Meeting ♦ *Informal Discussion—Suggested Reading arXiv:hep-th/0611108, arXiv:hep-th/0711.0955* ♦ **Anirban Basu**, Member, School of Natural Sciences

November 26

High Energy Theory Seminar ♦ *Partition Functions of 3D Pure Gravity* ♦ **Xi Yin**, Boston University

November 28

Physics Group Meeting ♦ *Incipient Black Holes* ♦ **Tanmay Vachaspati**, Case Western Reserve University; Member, School of Natural Sciences

November 29

Informal Phenomenology Seminar ♦ *Constraints on the S-Parameter in Holographic Technicolor* ♦ **Matt Reece**, Cornell University

December 10

High Energy Theory Seminar ♦ *Flavor, CB, and Extra Dimensions* ♦ **Lisa Randall**, Harvard University

December 13

Informal Phenomenology Seminar ♦ *Neutrinos: Results and Future* ♦ **Boris Kayser**, Fermi National Accelerator Laboratory

December 14

High Energy Theory Seminar ♦ *Torsion and SUSY Breaking* ♦ **Brian Wecht**, Massachusetts Institute of Technology; Member, School of Natural Sciences

December 19

Physics Group Meeting ♦ *Tachyon Condensation in String Theory* ♦ **Simeon Hellerman**, Member, School of Natural Sciences

January 9

Physics Group Meeting ♦ *Informal Discussion—Suggested Readings arXiv:hep-th/0712.1196 and arXiv:hep-th/0712.1397* ♦ **Brian Wecht**, Member, School of Natural Sciences

January 16

Physics Group Meeting ♦ *New S-Duality in $d=4$ $N=2$ Gauge Theories* ♦ **Yuji Tachikawa**, The University of Tokyo; Member, School of Natural Sciences

January 24

Informal Phenomenology Seminar ♦ *MSSM-like Models from Strings* ♦ **Akin Wingerter**, The Ohio State University

January 28

High Energy Theory Seminar ♦ *Searching for Gravity Waves and New Physics with Atom Interferometry* ♦ **Peter Graham**, Stanford Linear Accelerator Center

January 31

Informal Phenomenology Seminar ♦ *Informal Discussion*

February 1

High Energy Theory Seminar ♦ *Factorization and Soft Collinear Effective Theory* ♦ **Christian Bauer**, Lawrence Berkeley National Laboratory

February 4

High Energy Theory Seminar ♦ *The Measure Problem in Cosmology* ♦ **Raphael Bousso**, Lawrence Berkeley National Laboratory

February 6

Physics Group Meeting ♦ *What's the Meaning of the Wall Crossing Formula?* ♦ **Davide Gaiotto**, Harvard University; Member, School of Natural Sciences

February 7

Informal Phenomenology Seminar ♦ *Informal Discussion*

February 14

Informal Phenomenology Seminar ♦ *Informal Discussion*

February 21

Informal Phenomenology Seminar ♦ *The Muon Magnetic Moment as a Precise Test of the Standard Model* ♦ **Francisco Yndurain**, Universidad Autonoma de Madrid

February 22

High Energy Theory Seminar ♦ *Tree Amplitudes in Gauge Theory and Gravity* ♦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

February 28

Informal Phenomenology Seminar ♦ *Informal Discussion* ♦ **Neal Weiner**, New York University

February 29

High Energy Theory Seminar ♦ *General Gauge Mediation* ♦ **Nathan Seiberg**, Professor, School of Natural Sciences

March 3

High Energy Theory Seminar ♦ *Positron Signals in the Halo from Exciting Dark Matter* ♦ **Neal Weiner**, New York University

March 5

Physics Group Meeting ♦ *Preparing for the First New Physics at the LHC* ♦ **Philip Schuster** and **Natalia Toro**, Stanford University

March 6

Informal Phenomenology Meeting ♦ *$b \rightarrow s \Gamma$* ♦ **Gil Paz** and **Tomer Volansky**, Members, School of Natural Sciences

March 14

High Energy Theory Seminar ♦ *Field Theoretic Formulation of Two Time Physics* ♦ **Itzhak Bars**, University of Southern California

March 17

High Energy Theory Seminar ♦ *The Leading Singularity Approach to Scattering Amplitudes* ♦ **Freddy Cachazo**, Perimeter Institute

March 19

Physics Group Meeting ♦ *Amplitudes in Gravity and Yang-Mills* ♦ **N. Emil Jannik Bjerrum-Bohr**, Member, School of Natural Sciences

March 26

Physics Group Meeting ♦ *Vacuum States of $N=4$ SYM on T^3 and S-duality* ♦ **Mans Henningson**, Chalmers University

March 27

Informal Phenomenology Seminar ♦ *Informal Discussion—Suggested Readings: Nature 452, 332–335 (2008)* ♦ **Satoshi Mishima**, Member, School of Natural Sciences

March 31

High Energy Theory Seminar ♦ *Viscosity Bound and Causality Violation* ♦ **Hong Liu**, Massachusetts Institute of Technology

April 2

Physics Group Meeting ♦ *Stable Islands in the Landscape* ♦ **Korneel van den Broek**, Rutgers, The State University of New Jersey

April 3

Informal Phenomenology Seminar ♦ *Informal Discussion* ♦ **Raman Sundrum**, Johns Hopkins University

April 9

Physics Group Meeting ♦ *Discerning SUSY in Cascade Decay Correlations* ♦ **Jessie Shelton**, Rutgers, The State University of New Jersey

April 11

Informal Phenomenology Seminar ♦ *Informal Discussion* ♦ **George Sterman**, Stony Brook University, The State University of New York

April 14

High Energy Theory Seminar ♦ *Phases of $N=2$ Theories in 1+1 Dimensions with Boundary* ♦ **Kentaro Hori**, University of Toronto

April 16

Physics Group Meeting ♦ *Statistical Predictions from Field Theory Landscapes* ♦ **Vijay Balasubramanian**, University of Pennsylvania; Member, School of Natural Sciences

April 18

High Energy Theory Seminar ♦ *Symmetry-Breaking Vacua and Baryon Condensates in AdS/CFT* ♦ **Dario Martelli**, Member, School of Natural Sciences

April 23

Physics Group Meeting ♦ *Chiral Algebras of $(0,2)$ Sigma-Models: Beyond Perturbation Theory* ♦ **Meng-Chwan Tan**, National University of Singapore; Member, School of Natural Sciences

April 24

Informal Phenomenology Seminar ♦ *Hiding the Higgs* ♦ **Spencer Chang**, New York University

April 28

High Energy Theory Seminar ♦ *Chiral Gravity in Three Dimensions* ♦ **Andrew Strominger**, Harvard University

April 30

Physics Group Meeting ♦ *Modeling Multiple MZ Branes* ♦ **Neil Lambert**, Kings College London

May 1

Informal Phenomenology Seminar ♦ *Cosmic Magnetic Fields and Baryogenesis* ♦ **Tanmay Vachaspati**, Case Western Reserve University; Member, School of Natural Sciences

May 2

High Energy Theory Seminar ♦ *Closed String Tachyon Condensation: An Overview* ♦ **Ian Swanson**, Member, School of Natural Sciences

May 7

Physics Group Meeting ♦ *The E & M of HQCD* ♦ **Oren Bergman**, Technion–Israel Institute of Technology; Member, School of Natural Sciences

May 8

High Energy Theory Seminar ♦ *Baryogenesis and Higgs Phenomenology* ♦ **Michael Ramsey-Musolf**, University of Wisconsin–Madison

May 12

High Energy Theory Seminar ♦ *Gauge-Theory Amplitudes from Weak to Strong Coupling* ♦ **David Kosower**, CEA, France

May 14

Physics Group Meeting ♦ *Local Phenomenological Models in M-Theory* ♦ **Jacob Bourjaily**, Princeton University

May 22

Informal Phenomenology Seminar ♦ *An Effective Field Theory Look at Deep Inelastic Scattering* ♦ **Gil Paz**, Member, School of Natural Sciences

May 29

Informal Phenomenology Seminar ♦ *Reducing Theoretical Uncertainties in the Galaxy 3-pt Function* ♦ **Liam Fitzpatrick**, Harvard University

May 30

High Energy Theory Seminar ♦ *Lee-Wick Field Theory* ♦ **Donal O'Connell**, California Institute of Technology; Member, School of Natural Sciences

Astrophysics Activities**September 11**

Astrophysics Seminar ♦ *Faint Ia Supernovae from Ultracompact Binaries* ♦ **Lars Bildsten**, Kavli Institute for Theoretical Physics

September 18

Astrophysics Seminar ♦ *Physics, Cosmology, and the Large Hadron Collider* ♦ **Nima Arkani-Hamed**, Harvard University

September 20

Astrophysics Informal Seminar ♦ *Turbulent, Magnetized, MRI-Driven Accretion Disks: Beyond the Standard α -Disk Models* ♦ **Martin Pessah**, The University of Arizona; Member, School of Natural Sciences

September 25

Astrophysics Seminar ♦ *Binaries, Rubble-Piles, and Tidal Evolution* ♦ **Re'em Sari**, California Institute of Technology

September 27

Astrophysics Informal Seminar ♦ *Three Problems in Planet Formation: The Kuiper Belt, Hot Jupiters, and Transitional Disks* ♦ **Ruth Murray-Clay**, University of California, Berkeley

October 2

Astrophysics Seminar ♦ *Pulsar Theory* ♦ **Andrei Gruzinov**, New York University

October 3

Astrophysics Informal Seminar ♦ *The Origin of Instabilities in Stellar Systems* ♦ **Mir Abbas Jalali**, Sharif Institute of Technology

October 9

Astrophysics Seminar ♦ *An Explosion of Explosions* ♦ **Shri Kulkarni**, California Institute of Technology

October 11

Astrophysics Informal Seminar ♦ *Quasars in a Cosmological Context: Fueling, Self-Regulation, and Feedback* ♦ **Phil Hopkins**, Harvard-Smithsonian Center for Astrophysics

October 16

Astrophysics Seminar ♦ *Three Astrophysical Laboratories for Particle Physics* ♦ **Avi Loeb**, Harvard University

October 18

Astrophysics Informal Seminar ♦ *Dark Matter, Small-Scale Structure, and Dwarf Galaxies* ♦ **Louie Strigari**, University of California, Irvine

October 23

Astrophysics Seminar ♦ *The Metallicities and Physical Conditions in Star-Forming Galaxies at High-Redshift* ♦ **Alice Shapley**, Princeton University

October 25

Astrophysics Informal Seminar ♦ *CHON Ices and the Formation of Saturn* ♦ **Sarah E. Robinson**, University of California, Santa Cruz

November 1

Astrophysics Informal Seminar ♦ *From Galaxy Clustering to Dark Matter Clustering* ♦ **Jaiyul Yoo**, Harvard-Smithsonian Center for Astrophysics

November 6

Astrophysics Seminar ♦ *Degeneracy and Confidence in Planetary Microlensing* ♦ **Andy Gould**, The Ohio State University

November 8

Astrophysics Informal Seminar ♦ *Microlensing of an Extended Source by a Power-Law Mass Distribution* ♦ **Art Congdon**, Rutgers, The State University of New Jersey

November 9–10

AstroGPU 2007 Workshop ♦ *General Purpose Computation on Graphics Processing Units in Astronomy and Astrophysics* ♦ Various Topics, Speakers, and Affiliations; Chair: **Mario Juric**, Member, School of Natural Sciences

November 13

Astrophysics Seminar ♦ *Spiral Waves in Accretion Disks* ♦ **Edmund Bertschinger**, Massachusetts Institute of Technology

November 15

Astrophysics Informal Seminar ♦ *Constraining Dark Matter Using (Resolved) Stars in Local Group Galaxies* ♦ **Julio Chaname**, Space Telescope Science Institute, NASA, Baltimore

November 27

Astrophysics Seminar ♦ *MHD Turbulence and Some of Its Effects in the Solar Wind* ♦ **Bill Matthaeus**, University of Delaware

November 29

Astrophysics Informal Seminar ♦ *Lessons about Galaxy Formation and Cosmology from Weak Lensing* ♦ **Rachel Mandelbaum**, Member, School of Natural Sciences

December 4

Astrophysics Seminar ♦ *Crucial Dynamical Phases in Solar System Formation* ♦ **Alessandro Morbidelli**, CNRS-Observatoire de la Côte d'Azur, Nice, France

December 11

Astrophysics Seminar ♦ *Testing Gravity Theories with Lensing and Other Large-Scale Probes* ♦ **Bhuvnesh Jain**, University of Pennsylvania

December 13

Astrophysics Informal Seminar ♦ *Multiple Galaxy Mergers, Cosmological Context, and Elliptical Galaxy Formation* ♦ **Greg Novak**, University of California, Santa Cruz

December 20

Astrophysics Informal Seminar ♦ *Relativistic Blast Waves and GRB Afterglows* ♦ **Z. Lucas Uhm**, Columbia University

January 3

Astrophysics Informal Seminar ♦ *Astrophysical Applications of Gravitational Waves* ♦ **Bence Kocsis**, Harvard-Smithsonian Center for Astrophysics

January 10

Astrophysics Informal Seminar ♦ *Cold and Warm Gas in NGC 2974: Inferring the Shape of Its Dark Matter Halo* ♦ **Anne-Marie Weijmans**, Leiden University

January 17

Astrophysics Informal Seminar ♦ *Constraining the Evolution of the Most Massive Galaxies since $z \sim 1$* ♦ **Richard Cool**, The University of Arizona

January 22

Astrophysics Seminar ♦ *The Evolution of Galaxies in Different Environments* ♦ **Jacqueline van Gorkom**, Columbia University

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Astrophysics Seminar ♦ *Examining the Far Outer Solar System* ♦ **Charles Alcock**, Harvard-Smithsonian Center for Astrophysics

January 31

Astrophysics Informal Seminar ♦ *Secular Instabilities in Nearly Keplerian Systems: The Tale of Two Counter-Streams* ♦ **Jihad Touma**, American University of Beirut

February 5

Astrophysics Seminar ♦ *Life Cycles of Globular Star Clusters: From Formation to Dissolution* ♦ **Michael Fall**, Space Telescope Science Institute, NASA, Baltimore; Member, School of Natural Sciences

February 7

Astrophysics Informal Seminar ♦ *Exploring GRB Astrophysics via a Correlated Broad-Band and Multi-Messenger Paradigm* ♦ **Mike Stamatikos**, Goddard Space Flight Center

February 12

Astrophysics Seminar ♦ *Rethinking Inflation and the Search for Alternatives* ♦ **Paul Steinhardt**, Princeton University

February 14

Astrophysics Informal Seminar ♦ *Hydrogen Emission from Shocks in Supernova Remnants* ♦ **Matthew van Adelsberg**, Joint Institute for Laboratory Astrophysics (JILA), University of Colorado

February 19

Astrophysics Seminar ♦ *Hypervelocity Stars Ejected from the Galactic Center* ♦ **Warren Brown**, Harvard-Smithsonian Center for Astrophysics

February 26

Astrophysics Seminar ♦ *First Results from OWLS: The Overwhelmingly Large Simulations Project* ♦ **Joop Schaye**, Leiden University

February 28

Astrophysics Informal Seminar ♦ *Understanding Titan from the Perspective of Earth's Climate* ♦ **Jonathan Mitchell**, The University of Chicago; Member, School of Natural Sciences

March 4

Astrophysics Seminar ♦ *Cosmology from Cosmic Energy Inventory* ♦ **Masataka Fukugita**, Institute for Cosmic Ray Research, The University of Tokyo; Visitor, School of Natural Sciences

March 6

Astrophysics Informal Seminar ♦ *Galaxy Cluster Mergers* ♦ **Alexia Schulz**, University of California, Berkeley; Member, School of Natural Sciences

March 11

Astrophysics Seminar ♦ *Electrodynamics of Magnetars* ♦ **Chris Thompson**, Canadian Institute for Theoretical Astrophysics

March 13

Astrophysics Informal Seminar ♦ *New Forms of Convection in Magnetized Plasmas* ♦ **Eliot Quataert**, University of California, Berkeley

March 18

Astrophysics Seminar ♦ *So What Is the Matter with Solar Abundances?* ♦ **Sarbani Basu**, Yale University

March 20

Astrophysics Informal Seminar ♦ *New Tests of Strong-Field General Relativity with Black Holes and Neutron Stars* ♦ **Dimitrios Psaltis**, The University of Arizona

March 25

Astrophysics Seminar ♦ *Modeling the Recombination Epoch* ♦ **Chris Hirata**, California Institute of Technology

April 1

Astrophysics Seminar ♦ *Reading the Record of Ancient Impacts* ♦ **Peter Goldreich**, Professor, School of Natural Sciences

April 3

Astrophysics Informal Seminar ♦ *From Massive Cores to Massive Stars* ♦ **Mark Krumholz**, Princeton University

April 7

Astrophysics Informal Seminar ♦ *The Search for the Origin of Short Gamma-Ray Bursts* ♦ **Ehud Nakar**, California Institute of Technology

April 8

Astrophysics Seminar ♦ *The Era of Comparative Exoplanetology* ♦ **David Charbonneau**, Harvard-Smithsonian Center for Astrophysics

April 10

Astrophysics Informal Seminar ♦ *The Inner Workings of Spiral Galaxies with Star-Forming Nuclear Rings* ♦ **Jesus Falcon-Barroso**, European Space Research and Technology Centre

April 14

Astrophysics Informal Seminar ♦ *Discussion on Probing Mass Assembly in the Early Universe* ♦ **Kirsten Shapiro**, University of California, Berkeley

April 15

Astrophysics Seminar ♦ *Star Formation: Disks, Jets, and Bipolar Outflows* ♦ **Frank Shu**, University of California, San Diego

April 16

Astrophysics Informal Seminar ♦ *Discussion on the Status of and Future Prospects for CMB Measurements* ♦ **Lyman Page**, Princeton University

April 17

Astrophysics Informal Seminar ♦ *Cosmology with Gravitational Wave Standard Sirens* ♦ **Daniel Holz**, Los Alamos National Laboratory

April 22

Astrophysics Seminar ♦ *Cosmic Carbon Chemistry* ♦ **Pascale Ehrenfreund**, Leiden University

April 24

Astrophysics Informal Seminar ♦ *The Eddington Limit in Cosmic Rays: An Explanation for the Observed Faintness of Starbursting Galaxies* ♦ **Aristotle Socrates**, Princeton University

April 29

Astrophysics Seminar ♦ *How Cold Is Cold Dark Matter: dSph Galaxies as Cosmological Probes* ♦ **Gerry Gilmore**, University of Cambridge

April 30

Astrophysics Seminar ♦ *The Massive Black Hole at the Center of the Milky Way* ♦ **Reinhard Genzel**, Max Planck Institute for Extraterrestrial Physics

May 6

Astrophysics Seminar ♦ *Very High Energy Gamma-Ray Sources* ♦ **Felix Aharonian**, Max Planck Institute for Nuclear Physics

May 8

Astrophysics Informal Seminar ♦ *Binaries Near Massive Black Holes* ♦ **Clovis Hopman**, Leiden University

May 9

Astrophysics Seminar ♦ *Carbon Monoxide and CII 158 Micron Line Emission from Merging Galaxies as a CMB Foreground: Tomography of the Star Forming Universe* ♦ **Rashid Sunyaev**, Max Planck Institute for Astrophysics

May 13

Astrophysics Seminar ♦ *Galactic Disks* ♦ **Ken Freeman**, The Australian National University

May 15

Astrophysics Informal Seminar ♦ *A Simple Theory of Hydrogen Shocks* ♦ **Kevin Heng**, University of Colorado; Member, School of Natural Sciences

May 20

Astrophysics Seminar ♦ *Beyond the Perfect Machine* ♦ **Tim de Zeeuw**, European Southern Observatory

May 27

Astrophysics Seminar ♦ *Super Earths or Super Venuses?* ♦ **Raymond T. Pierrehumbert**, The University of Chicago

The Simons Center for Systems Biology Activities

July 2–3

p53 Meeting ♦ *p53 Regulation of Genes in the Nervous System* ♦ **Zhaohui Feng** ♦ The Cancer Institute of New Jersey ♦ *p53 Regulation of the Endosomal Compartment* ♦ **Xin Yu**, The Cancer Institute of New Jersey ♦ *Finding Functional Single Nucleotide Polymorphisms Using the NCI-60 Cancer Cell Panel* ♦ **Alexei Vazquez**, Member, School of Natural Sciences ♦ *Regulation of p63 Protein Turnover* ♦ **Yingchun Li**, Columbia University ♦ *RPS7 Is Both an Effector and Affector of Mdm2* ♦ **Yan Zhu**, Columbia University ♦ *Senescence and the Innate Immune System in Liver Cirrhosis* ♦ **Valery Krizhanovsky**, Cold Spring Harbor Laboratory ♦ *An In Vivo RNAi Screen for New Tumor Suppressor Genes* ♦ **Anka Bric**, Cold Spring Harbor Laboratory ♦ *Deregulation of the Translation Initiation Machinery in Tumorigenesis* ♦ **Scott Lowe**, Cold Spring Harbor Laboratory ♦ *Androgen Receptor in Prostate Cancer* ♦ **Carlos Cordon-Cardo**, Columbia University ♦ *Influenza Virus:*

Predictions of the Dynamics of Influenza Infections ♦ **Raúl Rabadán**, Member, School of Natural Sciences

July 3

The Simons Center for Systems Biology Seminar ♦ *The Microtubule-Destabilizing Protein Stathmin/Op18 in Human Cancer – A Link to p53?* ♦ **Stephan Singer**, University of Heidelberg

July 10–11

The Simons Center for Systems Biology Seminar ♦ *Mathematical Problems in Genome Biology* ♦ **Michael Wigler**, Cold Spring Harbor Laboratory

July 12–13

The Simons Center for Systems Biology Seminar ♦ *Biology, Biochemistry, and Molecular Biology: What Are Some of the Problems that Need Mathematics and Physics?* ♦ **George M. Whitesides**, Harvard University

July 20

Parkinson's Disease Meeting ♦ *Genetic Causes of Parkinson's Disease* ♦ **Maral Mouradian**, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School ♦ *The p53 Pathway and the Brain* ♦ **Arnold J. Levine**, Professor, School of Natural Sciences

July 24

The Simons Center for Systems Biology Seminar ♦ *Uncovering the Transcriptional Complexity of the Human Genome in the ENCODE Project* ♦ **Roderic Guigó**, Centre for Genomic Regulation, Barcelona, and Universitat Pompeu Fabra, Barcelona

September 28

The Simons Center for Systems Biology Seminar ♦ *The Evolutionary Genomics of Influenza Virus* ♦ **Eddie Holmes**, Center for Infectious Disease Dynamics, The Pennsylvania State University, and Fogarty International Center, National Institutes of Health

October 5

The Simons Center for Systems Biology Seminar ♦ *Modeling Influenza Infection and Vaccination* ♦ **Alan Perelson**, Los Alamos National Laboratory

October 8

The Simons Center for Systems Biology Seminar ♦ *Nuclear Localization of an L1 Retrotransposon Protein in Human Cancers* ♦ **Chris Harris**, The Verto Institute

October 10

The Simons Center for Systems Biology Group Meeting

October 12

The Simons Center for Systems Biology Seminar ♦ *Cancer Biology and Cognitive Neuroscience: Unexpected Common Interests* ♦ **Marcus E. Raichle, M.D.**, Washington University in St. Louis

October 19

The Simons Center for Systems Biology Seminar ♦ *Searching for Viral Genes that Modulate Host Regulatory Pathways* ♦ **James M. Pipas**, University of Pittsburgh

October 23

The Simons Center for Systems Biology Group Meeting

November 16

The Simons Center for Systems Biology Seminar ♦ *Life at Low Molecule Number* ♦ **Terry Sejnowski**, Salk Institute

November 19

The Simons Center for Systems Biology Seminar ♦ *Who's Afraid of Chaotic Networks? Models of Sensory and Motor Processing in the Face of Spontaneous Neuronal Activity* ♦ **Larry Abbott**, Columbia University

November 26 – 27

NF-kappa B Oscillation Workshop ♦ *Introduction and p53-MDM-2* ♦ **Arnold J. Levine**, Professor, School of Natural Sciences ♦ *Does Temporal Regulation of NF-kB Activity Constitute a Specificity Code?* ♦ **Alex Hoffman**, University of California, San Diego ♦ *Interference Between the NF-kappa B and p53 Circuits* ♦ **Andrei Gudkov**, Roswell Park Cancer Institute ♦ *Do p53 Oscillations Carry Information Downstream?* ♦ **Gustavo A. Stolovitsky**, IBM Thomas J. Watson Research Center, Yorktown Heights, New York ♦ *Oscillation Patterns in Genetic Regulation: Hes1, p53-mdm2, and NF-kB* ♦ **Mogens Høgh Jensen**, Niels Bohr Institute, University of Copenhagen ♦ *Similarities and Differences in the p53-mdm2 and NF-kB Feed-Back Loops* ♦ **Sandeep Krishna**, Niels Bohr Institute, University of Copenhagen

November 28

The Simons Center for Systems Biology Seminar ♦ *Efficiency of Carcinogenesis With and Without a Mutator Mutation* ♦ **Robert A. Beckman**, Merck & Co., Inc.

December 5

Influenza Group Meeting

December 7

The Simons Center for Systems Biology Seminar ♦ *Orchestration of the Inflammatory Response by Transcription Factors and MicroRNAs* ♦ **David Baltimore**, California Institute of Technology

December 19

The Simons Center for Systems Biology Group Meeting

January 8

The Simons Center for Systems Biology Seminar ♦ *From Networks to Hyperstructures* ♦ **Nils Baas**, Norwegian University of Science and Technology

January 9

The Simons Center for Systems Biology Seminar ♦ *Complex Genetics of Childhood Leukemia Susceptibility* ♦ **M. Tefvik Dorak**, Humigen, LLC, The Institute for Genetic Immunology

January 24

The Simons Center for Systems Biology Group Meeting

January 25

The Simons Center for Systems Biology Seminar ♦ *Quest for the lp36 Tumor Suppressor: Mouse Holds the Key* ♦ **Anindya Bagchi**, Cold Spring Harbor Laboratory

February 6

The Simons Center for Systems Biology Seminar ♦ *Cell Fate Decisions in Multi-Potent Cells: Towards a Formal Description of Waddington's Epigenetic Landscape* ♦ **Sui Huang**, Institute for Biocomplexity and Informatics, University of Calgary, and Children's Hospital, Harvard Medical School

February 8

The Simons Center for Systems Biology Seminars ♦ *Stress and Natural Selection in Humans* ♦ **Gurinder Atwal**, Member, School of Natural Sciences ♦ *Identifying Single Nucleotide Polymorphisms that Affect Human Cancer Using the NCI60 Cell Panel* ♦ **Alexei Vazquez**, Member, School of Natural Sciences ♦ *Towards Understanding the Regulatory Networks of Estrogen and Androgen Receptors* ♦ **Jun Song**, Member, School of Natural Sciences ♦ *Great Ideas of Biology* ♦ **Paul Nurse**, The Rockefeller University

February 13

The Simons Center for Systems Biology Seminar ♦ *Comprehensive Transposon Mapping in the Human Genome* ♦ **Kathleen Burns**, The Johns Hopkins Hospital

February 14

The Simons Center for Systems Biology Group Meeting

February 15

The Simons Center for Systems Biology Seminar ♦ *Membrane Mechanics: Translating Biophysical Models into Subcellular Organization* ♦ **Kerwyn Huang**, Princeton University

February 22

The Simons Center for Systems Biology Symposium ♦ *Towards Statistical Biology: Some Simple Examples* ♦ **Stanislas Leibler**, The Rockefeller University ♦ *The Evolution of Influenza* ♦ **Raúl Rabadán**, Member, School of Natural Sciences ♦ *New Approaches to the Study of Size Regulation in Mammalian Cells* ♦ **Mark W. Kirschner**, Harvard Medical School ♦ *Suppression of Immediate-Early Viral Gene Expression by Herpesvirus-Coded microRNAs: Implications for Latency* ♦ **Jiri Vanicek**, École Polytechnique Fédérale de Lausanne ♦ *Exploring the Diversity of the T-cell Repertoire* ♦ **Harlan Robins**, Fred Hutchinson Cancer Research Center ♦ *Stress and Natural Selection in Humans* ♦ **Gurinder Atwal**, Member, School of Natural Sciences ♦ *Genomics and Medicine in the Twenty-first Century* ♦ **Eric S. Lander**, Broad Institute

March 4

The Simons Center for Systems Biology Seminar ♦ *Co-adapted Alleles and the Evolution of Complex Traits* ♦ **Gary A. Churchill**, The Jackson Laboratory

March 6

The Simons Center for Systems Biology Group Meeting

March 26

The Simons Center for Systems Biology Seminar ♦ *Biophysical Constraints on the Antigenic Evolution of Influenza* ♦ **Jesse Bloom**, California Institute of Technology

March 27

The Simons Center for Systems Biology Group Meeting

March 28

The Simons Center for Systems Biology Seminar ♦ *Neutral Mutations and Gene Surfing in Microorganisms* ♦ **David Nelson**, Harvard University

April 4

The Simons Center for Systems Biology Seminar ♦ *Towards a Comprehensive Understanding of Cellular Metabolism* ♦ **Joshua D. Rabinowitz**, Princeton University

April 10

The Governor's Conference on Effective Partnering in Cancer Research: Stem Cells and Cancer ♦ *Dissecting Cell Fate Regulation in Stem Cells* ♦ **Ihor Lemischka**, Mount Sinai School of Medicine ♦ *MicroRNAs: Maestros of Hematopoiesis* ♦ **Curt I. Civin**, Johns Hopkins School of Medicine ♦ *The Wnt Target Gene Lgr5, A Marker for Adult Stem Cells in Multiple Tissues* ♦ **Hans Clevers**, Netherlands Institute for Developmental Biology ♦ *Cancer Stem Cells and Malignant Progression* ♦ **Robert A. Weinberg**, Whitehead Institute,

Massachusetts Institute of Technology ♦ *Direct Visualizations of Mammary Stem Cell Dynamics In Vivo: Implications for Breast Cancer* ♦ **Yibin Kang**, Princeton University ♦ *Stem Cells or Sushi?: Zebrafish as a Leukemia and Stem Cell Transplant Model* ♦ **Hatem Sabaawy**, The Cancer Institute of New Jersey

Discussion ♦ *Cancer Stem Cells* ♦ **Arnold J. Levine**, Professor, School of Natural Sciences ♦ **Robert A. Weinberg**, Whitehead Institute, Massachusetts Institute of Technology

April 17

The Simons Center for Systems Biology Group Meeting

April 18

The Simons Center for Systems Biology Seminar ♦ *Growing Brain Tumors In Silico* ♦ **Salvatore Torquato**, Princeton University; Member, School of Natural Sciences

April 23

The Simons Center for Systems Biology Seminar ♦ *Dynamics of Gene Expression and Signal Transduction in Single Cells: Noise, Feedback, and Survival* ♦ **Alexander van Oudenaarden**, Massachusetts Institute of Technology

April 24

The Simons Center for Systems Biology Group Meeting

May 12

The Simons Center for Systems Biology Seminar ♦ *Telomere Dynamics and Cell Proliferation in Cancer and Aging With and Without Telomerase* ♦ **Krstan B. Blagoev**, National Science Foundation

May 14

The Simons Center for Systems Biology Seminar ♦ *Deciphering Transcriptional Regulatory Networks in Cancer* ♦ **Myles Brown**, Harvard Medical School and Dana-Farber Cancer Institute

May 15

Joint Meeting ♦ *p53 Regulation of Energy Metabolism and the Central Nervous System* ♦ **Zhaohui Feng**, The Cancer Institute of New Jersey ♦ *The M30 Apoptosome Assay as a Marker of Apoptosis* ♦ **Mika Sovak**, The Cancer Institute of New Jersey ♦ *The PALB2-BRCA2 Pathway in Breast Cancer and Fanconi Anemia* ♦ **Bing Xia**, The Cancer Institute of New Jersey

May 16

The Simons Center for Systems Biology Seminar ♦ *How Insulin and TGF- β Signaling Influence C. elegans Lifespan and Reproduction* ♦ **Coleen Murphy**, Princeton University

May 27

The Simons Center for Systems Biology Seminars ♦ *Modeling the Estrogen Receptor Network: Distal Enhancers and CTCF Insulators* ♦ **Jun Song**, Member, School of Natural Sciences ♦ *The Evolution of Influenza A* ♦ **Raúl Rabadán**, Member, School of Natural Sciences ♦ *Protein Sectors: A Case Study* ♦ **Olivier Rivoire**, The Rockefeller University ♦ *Population Dynamics in Closed Ecosystems* ♦ **Doeke Hekstra**, The Rockefeller University ♦ *Simpson's Paradox in a Synthetic Microbial System of Producers and Non-producers* ♦ **John Chuang**, The Rockefeller University

May 29–30

HIV Vaccine Conference: Why do we not yet have an HIV vaccine? ♦ *HIV Vaccinology: An Historical Perspective and a Fresh Look* ♦ **Margaret Johnston** for **Anthony S. Fauci**, National Institutes of Health ♦ *A Perspective on HIV Vaccine Research* ♦ **Peter S. Kim**, Merck Research Laboratories ♦ *Merck's HIV-1 Vaccine: How Well Did the STEP Trial Test the CMI Hypothesis for a Prophylactic Vaccine?* ♦ **John W. Shiver**, Merck Research Laboratories ♦ *Durable Control of HIV Replication* ♦ **Bruce D. Walker**, Massachusetts General Hospital, Harvard Medical School and Howard Hughes Medical Institute ♦ *A Different Approach* ♦ **David Baltimore**, California Institute of Technology ♦ *Reverse Immunization: A Novel Model for In Vivo SIV Neutralization* ♦ **Philip R. Johnson**, The Children's Hospital of Philadelphia and University of Pennsylvania School of Medicine ♦ *Regulatory T-cells in Autoimmunity and Infection* ♦ **Alexander Y. Rudensky**, University of Washington ♦ *Knowledge and Knowledge Gaps* ♦ **Rino Rappuoli**, Novartis Vaccines and Diagnostics ♦ *Innate Control of Adaptive Immunity* ♦ **Ruslan Medzhitov**, Yale University School of Medicine and Howard Hughes Medical Institute

Panel I ♦ *Vaccines* ♦ **Adel A. F. Mahmoud**, Princeton University ♦ **Alan Bernstein**, Global HIV Vaccine Enterprise ♦ **Dennis R. Burton**, The Scripps Research Institute ♦ **Mark B. Feinberg**, Merck & Co., Inc. ♦ **Wayne C. Koff**, International AIDS Vaccine Initiative ♦ **Rino Rappuoli**, Novartis Vaccines and Diagnostics

How Effective are CTLs in HIV and SIV Infections ♦ **Angela McLean**, University of Oxford ♦ *Nonhuman Primates: Partners in AIDS Vaccine Research* ♦ **Neal Nathanson**, University of Pennsylvania School of Medicine ♦ *A Protective HIV Vaccine Must Effectively Control the Acute Virus Infection* ♦ **Malcolm A. Martin**, National Institute of Allergy and Infectious Diseases, National Institutes of Health ♦ *Virus Restriction Factors and Innate Immunity: ZAP and TRIM* ♦ **Stephen P. Goff**, College of Physicians and

Surgeons, Columbia University and Howard Hughes Medical Institute ♦ *Exploring the Diversity of the T-cell Repertoire* ♦ **Harlan Robins**, Fred Hutchinson Cancer Research Center

Panel II ♦ *Where Do We Go From Here?* ♦ **Donald E. Ganem**, University of California, San Francisco ♦ **Michael Krasnitz**, Member, School of Natural Sciences ♦ **Joshua B. Plotkin**, University of Pennsylvania ♦ **Raúl Rabadán**, Member, School of Natural Sciences

Prospects in Theoretical Physics

Prospects in Theoretical Physics (PiTP), is an intensive two-week summer program geared specifically to graduate students and postdoctoral scholars considering a career in theoretical physics. First held at the Institute in 2002, Prospects in Theoretical Physics has, in past years, covered topics ranging from the Large Hadron Collider to string theory.

The program builds upon the strong relationship between the research groups at the Institute for Advanced Study and Princeton University. Representatives from both institutions are among the program's organizers and lecturers. PiTP encourages the participation of women, minorities, and students from smaller institutions that do not have extensive programs in theoretical physics.

The 2008 Prospects in Theoretical Physics program was held from July 14 to 25 on the campus of the Institute. The theme of the 2008 program was "Strings and Phenomenology." This program was designed for string theorists who wanted to learn about issues of compactification relevant to phenomenology and cosmology, and for phenomenologists who wanted to learn about strings and their applications to phenomenology. The topics in strings and phenomenology were chosen so as to make the maximum contact between the two fields.

Over 125 individuals were officially enrolled in the program, with a majority of the visiting students living in the Institute's housing complex during the two-week program. Moreover, the program lectures attracted many students, postdocs, and professors from nearby institutions.

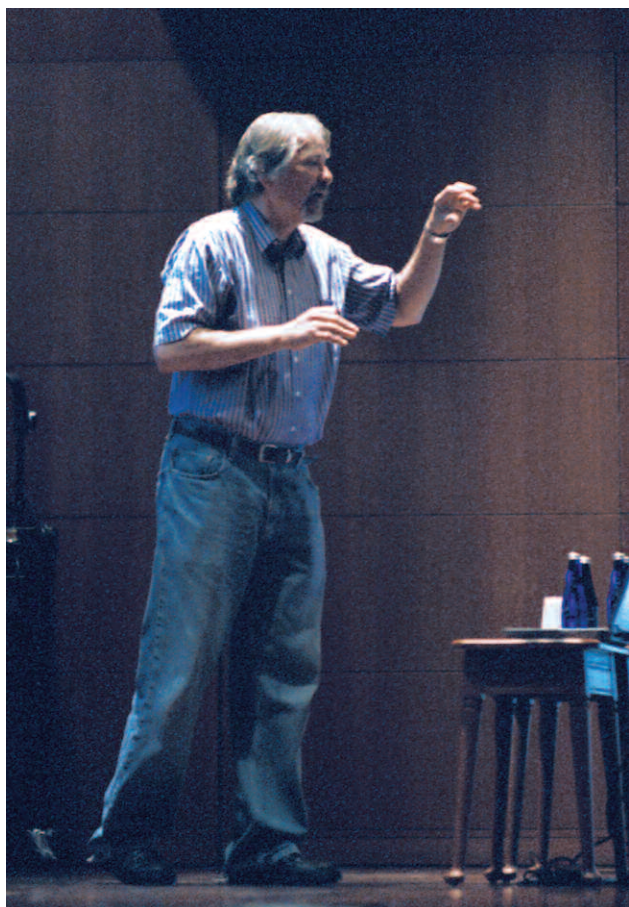
The Prospects in Theoretical Physics program is under the direction of Chiara R. Nappi, a Professor of Physics at Princeton University, who is assisted by a local organizing committee of area physicists. This year's organizers and Program Directors were John Schwarz of the California Institute of Technology and Herman Verlinde of Princeton University.

In addition to the organizers, lecturers included: Nima Arkani-Hamed (Institute for Advanced Study), Luis E. Ibáñez (Universidad Autónoma de Madrid), Shamit Kachru (Stanford University), Hans-Peter Nilles (Physikalisches Institut der Universität Bonn), Stuart Raby (The Ohio State University), and Edward Witten (Institute for Advanced Study).

Prospects in Theoretical Physics 2008 was supported by The Concordia Foundation.



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The School of Social Science

Faculty

Danielle Allen, UPS Foundation Professor

Eric S. Maskin, Albert O. Hirschman Professor

Joan Wallach Scott, Harold F. Linder Professor

Professors Emeriti

Albert O. Hirschman

Michael Walzer

ACADEMIC ACTIVITIES

The School of Social Science invited twenty scholars from a pool of 196 applicants from the United States and abroad to be part of the School's scholarly community as Members for the 2007–08 academic year. Four Visitors and two Research Assistants also participated in the year's activities, as well as a Director's Visitor who formerly served as a United Nations diplomat. The National Endowment for the Humanities partially or fully funded three Members. Economists were supported by grants from the Leon Levy Foundation and Institute Trustee Roger W. Ferguson, Jr., as well as the Richard B. Fisher and the Deutsche Bank Memberships. Fields of inquiry of the group included law, political science, economics, anthropology, history, and sociology. The thematic focus for 2007–08 was "The Rule of Law under Pressure." The pressure comes from the "war on terrorism" (and other wars) and from the claim that military and political emergencies require the expansion of executive power and the violation of conventional moral norms. The group was interested in exploring all these issues as they arise, and as they have arisen, in political life: dirty hands, Machiavellian princes, emergency powers, the debate about torture, and so on. They were also interested in the opposite of these: constitutionalism, limited government, judicial review, and civil liberties. How does the rule of law work to protect ordinary citizens? What is the role of judges and courts in maintaining the rule of law? When do the "needs of the hour" override constitutional limits? What does "necessity" mean in politics and war, and who decides when it comes into play?

The School conducted three seminar series—the Social Science Thursday Luncheon Seminar; "The Rule of Law under Pressure" Thematic Seminar, which expanded its activities to include a monthly film screening and discussion group; and the IAS/Princeton University Economics Workshop. In June, the School served as the host site for a three-day conference, "Justice, Culture, and Tradition," organized by former Member Yitzhak Benbaji with the support of the Carnegie Council for Ethics in International Affairs, recognizing Professor Michael Walzer's contributions to the ethical and political philosophy of the twentieth century.

The School also continued publication of its series of *Occasional Papers* and *Economics Working Papers*, which can be accessed online from the Institute's website.

The School of Social Science is particularly proud of the 2007 Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel that was bestowed on Professor Eric Maskin this year. Maskin is the fifth Institute Faculty member to have become a Nobel Laureate.

UPS Foundation Professor **Danielle Allen** spent much of the year drafting a book on the Declaration of Independence and a book on the role of philosophy in politics, both for publication in 2009. She also published commentary on the presidential primaries and began research on the impact of the Internet on poli-

Professor Allen spent much of the year drafting a book on the Declaration of Independence and a book on the role of philosophy in politics. She also published commentary on the presidential primaries and began research on the impact of the Internet on politics.

tics. She gave the Blackwell Lectures at Bristol University and lectures at Lehigh University, The University of Texas at Austin, Bryn Mawr College, Reed College, and at the Institute. She was appointed to the Board of The Andrew W. Mellon Foundation, served on the Pulitzer Prize Board, and received an honorary degree from Lake Forest College at its May commencement. At the Institute, she led the School's yearlong seminar on "The Rule of Law under Pressure."

In December 2007, Albert O. Hirschman Professor **Eric S. Maskin** gave his Nobel Memorial Lecture on his work in the theory of mechanism design. This was also the subject of public lectures in Seville, Taipei, Hong Kong, and Frankfurt and at the University of California, Irvine, and the Institute for Advanced Study. He spoke on the subject of rising income inequality in public lectures in Jeddah, Stockholm, Lagos, Havana, Tijuana, and Jerusalem. Finally, he gave lectures on the effect of evolution in repeated games at New York University, Yale University, Princeton University, and Stockholm School of Economics, and in Taipei and Tijuana. In 2008, Maskin is assuming the directorship of the Summer School in Economic Theory at The Hebrew University's Institute for Advanced Studies in Jerusalem. He will also begin a two-year term as Executive Vice President of the Game Theory Society. This year, Eric Maskin was elected to the National Academy of Sciences. He also received the Kempe Award in Environmental Economics, the EFR-Business Week Award, a Doctor of Humane Letters degree from Bard College, and the Nobel Memorial Prize in Economics.

Harold F. Linder Professor **Joan Wallach Scott**'s new book on the 2004 French law banning Islamic headscarves in public schools, *The Politics of the Veil*, was published by Princeton University Press. It has already been translated into Bulgarian and will appear in Arabic translation in 2009. She also published "History Writing as Critique," in *Manifestos for History* (edited by Keith Jenkins, et al., Routledge). A Korean edition of *Women, Work, and Family* (coauthored with Louise Tilly) was published this year. Professor Scott lectured at Cornell University; the University of California, Berkeley; Princeton; Columbia; Yale; Temple; NYU; and the University of Kentucky. She spoke to the World Affairs Council of Northern California and gave a

seminar on her new book at Alwan, the Arab cultural center in New York City. In London in January, she lectured at the London School of Economics, Birkbeck College, and the Westminster College of Law. In February, she gave the Mary Reckford lecture at the University of North Carolina at Chapel Hill, and in May, she delivered the Rene Wellek lectures at the University of California, Irvine. She was elected a fellow of the American Academy of Arts and Sciences.

During the academic year 2007–08, Professor Emeritus **Michael Walzer** gave the Thomas More Lecture at

Professor Joan Wallach Scott's book on the 2004 French law banning Islamic headscarves in public schools, *The Politics of the Veil* (Princeton University Press, 2007), has already been translated into Bulgarian and will appear in Arabic translation in 2009.



CLIFF MOORE

Radboud University, the Netherlands, then journeyed to Beijing to Tsinghua University, where he was the keynote speaker at the international conference “Public Reason and the Harmonious Society: The Future of Political Philosophy in a Cross-Cultural Perspective.” Walzer visited the University of Pennsylvania to present “War and Death: Reflections on Lebanon 2006,” and Siena College, Albany, New York, to participate in the “Symposium on Living Philosophers: The Work of Michael Walzer.” In Los Angeles, he served as reactor-at-large at the Ethikon Conference on Poverty and Morality. Most recently, Walzer received the juried 2008 Spinozalens award in Amsterdam and lectured on “Local and Global Justice” at The Peace Palace in The Hague. A book in Dutch entitled *Justice Without Boundaries*, comprised of his lecture, other essays, and an interview, was published simultaneously to the awarding of the Spinozalens prize. He also gave the Samuel and Althea Stroum Lectures at the University of Washington—a series of three presentations on “Biblical Politics.” In June, to commemorate his becoming Professor Emeritus, a three-day conference on “Justice, Culture, and Tradition,” was held at the Institute for Advanced Study. Conferees from universities around the world convened to focus on such topics as “The Interpretive View of Ethics” and “Multiculturalism, Civil Society, and the Politics of Recognition.”

Walzer is currently working on the third volume (of four projected) of *The Jewish Political Tradition*, a comprehensive collaborative project focused on the history of Jewish political thought published by Yale University Press. His most recent book, *Thinking Politically: Essays in Political Theory*, was published in November 2007, also by Yale. A translation of *On Toleration* was released in Bulgarian, *Thick and Thin: Moral Argument at Home and Abroad* and *Politics and Passion: Toward a More Egalitarian Liberalism* appeared in Japanese, *Spheres of Justice* in Polish, and *Just and Unjust Wars* in Greek.



CLIFF MOORE

Professor Emeritus Michael Walzer was the honoree of “Justice, Culture, and Tradition,” a three-day conference that recognized Walzer’s contributions to the ethical and political philosophy of the twentieth century.

Professor Danielle Allen (left) led the School’s yearlong seminar on “The Rule of Law under Pressure,” which focused on the pressure that comes from the “war on terrorism” (and other wars) and from the claim that military and political emergencies require the expansion of executive power and the violation of conventional moral norms.

Professor Eric Maskin (right), who was awarded the 2007 Nobel Memorial Prize in Economics, spoke to the Institute community about mechanism design in May.



RANDALL HAGADORN



CLIFF MOORE

MEMBERS, VISITORS, AND RESEARCH STAFF

Lakhdar Brahimi

Political Science ♦ Institute for Advanced Study ♦
dv

Benjamin Brower

History ♦ Texas A&M University ♦ *n*
National Endowment for the Humanities Fellow

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Cruz ♦ *v, f*

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Shalom Hartman Institute, Jerusalem ♦ *a*

Piero Gottardi

Economics ♦ University of Venice ♦ *v*

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*Funding provided by the Association of Members of
the Institute for Advanced Study (AMIAS)*

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*Funding provided by the Friends of the Institute
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Navin Kartik

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Diego
*The Roger W. Ferguson, Jr., and Annette L.
Nazareth Membership*

R. Daniel Kelemen

Political Science ♦ Rutgers, The State University
of New Jersey

Ellen Kennedy

Political Science ♦ University of Pennsylvania
*Rosanna and Charles Jaffin Founders' Circle
Member*

Alan B. Krueger

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Leon Levy Foundation Member

Lisa J. Laplante

Law ♦ Praxis Institute for Social Justice, Lima,
Peru

Patrick Macklem

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Louise and John Steffens Founders' Circle Member

Helen Nissenbaum

Philosophy ♦ New York University ♦ *v, s*

Daijiro Okada

Economics ♦ Rutgers, The State University of
New Jersey
Richard B. Fisher Membership

Bruno Perreau

Political Science ♦ Sciences Po, Paris
Florence Gould Foundation Membership

Ralf Poscher

Law ♦ Ruhr Universität Bochum

Nancy Ries

Anthropology ♦ Colgate University

Ian Roxborough

Sociology ♦ Stony Brook University, The State
University of New York ♦ *v*

Hilary Silver

Sociology ♦ Brown University ♦ *n*
National Endowment for the Humanities Fellow

Brian Z. Tamanaha

Law ♦ St. John's University School of Law

Olivier Tercieux

Economics ♦ CNRS and École Normale
Supérieure, Paris
Deutsche Bank Membership

Sari Wastell

Anthropology ♦ Goldsmiths, University of
London

f First Term ♦ *s* Second Term ♦
v Visitor ♦ *a* Research Assistant ♦
dv Director's Visitor ♦ *n* NEH Supported

RECORD OF EVENTS

September 27

Social Science Thursday Lunch Seminar ♦
*Understanding Legal Pluralism: Past to Present,
Local to Global* ♦ **Brian Z. Tamanaha**, St.
John's University School of Law; Member,
School of Social Science

October 3

The Rule of Law under Pressure Thematic
Seminar ♦ *Organizing Meeting*

October 4

Social Science Thursday Lunch Seminar ♦
*Military Futurology and the Return of the Third
World* ♦ **Ian Roxborough**, Stony Brook
University, The State University of New York;
Visitor, School of Social Science

October 10

IAS/Princeton University Economics
Workshop ♦ *Markets for Information* ♦ **Piero
Gottardi**, University of Venice; Visitor,
School of Social Science

October 11

Social Science Thursday Lunch Seminar ♦
Democracy and Discourse ♦ **Michael Walzer**,
Professor Emeritus, School of Social Science

October 17

Rethinking War: A Film Series and
Discussion Group ♦ *All Quiet on the
Western Front*

October 18

Social Science Thursday Lunch Seminar ♦
*Human Uniqueness: Scale of Kinship-Independent
Cooperation* ♦ **Daijiro Okada**, Rutgers, The
State University of New Jersey; Member,
School of Social Science

October 24

IAS/Princeton University Economics
Workshop ♦ *Expectational Coordination in
Two Classes of Economic Models: Strategic
Complementarities versus Strategic
Substitutabilities* ♦ **Roger Guesnerie**,
Paris-Jourdan Sciences Économiques

The Rule of Law under Pressure Thematic
Seminar ♦ *Is the Constitution Failing? Carl
Schmitt and the New American Anti-terrorist
State* ♦ **Ellen Kennedy**, University of
Pennsylvania; Member, School of Social
Science

October 25

Social Science Thursday Lunch Seminar ♦
Social Exclusion: Meanings and Mechanisms ♦
Hilary Silver, Brown University; Member,
School of Social Science

October 31

IAS/Princeton University Economics
Workshop ♦ *Opinions as Incentives* ♦ **Navin
Kartik**, University of California, San Diego;
Member, School of Social Science

November 1

Social Science Thursday Lunch Seminar ♦
*What is International Human Rights Law? Three
Applications of a Distributive Approach* ♦ **Patrick
Macklem**, University of Toronto; Member,
School of Social Science

November 7

The Rule of Law under Pressure Thematic Seminar ♦ *The Profession and Vocation of Politics* ♦ **Danielle Allen**, UPS Foundation Professor, School of Social Science

Rethinking War: A Film Series and Discussion Group ♦ Z

November 8

Social Science Thursday Lunch Seminar ♦ *Potato Ontology: Surviving Postsocialism in Russia* ♦ **Nancy Ries**, Colgate University; Member, School of Social Science

November 14

IAS/Princeton University Economics Workshop ♦ *National Time Accounting: The Currency of Life* ♦ **Alan B. Krueger**, Princeton University; Member, School of Social Science

The Rule of Law under Pressure Thematic Seminar ♦ *Multiculture Me No More! On Multicultural Qualifications and the Palestinian-Arab Minority of Israel* ♦ **Michael M. Karayanni**, The Hebrew University of Jerusalem; Member, School of Social Science

November 15

Social Science Thursday Lunch Seminar ♦ *Suing for Europe: The Rise of Adversarial Legalism in the European Union* ♦ **R. Daniel Kelemen**, Rutgers, The State University of New Jersey; Member, School of Social Science

November 19

IAS/Princeton University Economics Workshop ♦ *Implementation with Evidence Disclosure* (with Bart Lipman) ♦ **Elchanan Ben-Porath**, The Hebrew University of Jerusalem

November 28

The Rule of Law under Pressure Thematic Seminar ♦ *Judicial Politics and Independence* ♦ **R. Daniel Kelemen**, Rutgers, The State University of New Jersey; Member, School of Social Science

November 29

Social Science Thursday Lunch Seminar ♦ *Figures of Political Thought: Commercial Man* ♦ **Ellen Kennedy**, University of Pennsylvania; Member, School of Social Science

December 6

Social Science Thursday Lunch Seminar ♦ *The Colonial Hajj: Muslim Pilgrimage and French Rule in Algeria* ♦ **Benjamin Brower**, Texas A&M University; Member, School of Social Science

December 12

The Rule of Law under Pressure Thematic Seminar ♦ *Globalization as a Challenge for Constitutional Law* ♦ **Ralf Poscher**, Ruhr-Universität Bochum; Member, School of Social Science

Rethinking War: A Film Series and Discussion Group ♦ *The Specialist: Portrait of a Modern Criminal*

December 13

Social Science Thursday Lunch Seminar ♦ *The Victims of Terrorism and Just War Theory* ♦ **Jean-Marc Flükiger**, University of Fribourg

January 16

The Rule of Law under Pressure Thematic Seminar ♦ *How Do We Know a Genocide When We See It?* ♦ **Sari Wastell**, Goldsmiths, University of London; Member, School of Social Science

January 17

Social Science Thursday Lunch Seminar ♦ *Competing Conceptions of Necessity in the Emergency Powers Debate* ♦ **Leonard C. Feldman**, University of Oregon; Member, School of Social Science

January 23

IAS/Princeton University Economics Workshop ♦ *Continuous Implementation* (with Marion Oury) ♦ **Olivier Tercieux**, CNRS and École Normale Supérieure, Paris; Member, School of Social Science

January 24

Social Science Thursday Lunch Seminar ♦ *America and the Crisis of Liberal Internationalism* ♦ **G. John Ikenberry**, Princeton University; Member, School of Social Science

January 30

The Rule of Law under Pressure Thematic Seminar ♦ *The "Dark Side" of the Relationship Between the Rule of Law and Liberalism* ♦ **Brian Z. Tamanaha**, St. John's University School of Law; Member, School of Social Science

January 31

Social Science Thursday Lunch Seminar ♦ *The State of Exception: A Theoretical Approach* ♦ **Ralf Poscher**, Ruhr-Universität Bochum; Member, School of Social Science

Rethinking War: A Film Series and Discussion Group ♦ *La Historia Oficial* ♦ Brief remarks following the film focused on *Argentina's Memory of the Dictatorship*, by **Federico Finchelstein**, The New School

February 6

IAS/Princeton University Economics Workshop ♦ *Capacity Investment, Dynamic Operation, and Intertemporal Budget Balance* ♦ **Daniel Danau**, Independent Scholar

February 7

Social Science Thursday Lunch Seminar ♦ *Separate We Stand, Religious Matching under Israeli Adoption Law* ♦ **Michael M. Karayanni**, The Hebrew University of Jerusalem; Member, School of Social Science

February 13

The Rule of Law under Pressure Thematic Seminar ♦ *Judging Necessity: Democracy and Extra-Legalism* ♦ **Leonard C. Feldman**, University of Oregon; Member, School of Social Science

February 14

Social Science Thursday Lunch Seminar ♦ *After the Truth: The Politics of Reparations in Post Truth Commission Peru* ♦ **Lisa J. Laplante**, Praxis Institute for Social Justice, Lima, Peru; Member, School of Social Science

February 21

Social Science Thursday Lunch Seminar ♦ *Gandhi, Mandela, and the African Modern* ♦ **Jonathan Hyslop**, University of the Witwatersrand; Member, School of Social Science

February 27

The Rule of Law under Pressure Thematic Seminar ♦ *Martial Law and Military Power in the Construction of the South African State: Jan Smuts and the "Solid Guarantee of Force" 1899–1924* ♦ **Jonathan Hyslop**, University of the Witwatersrand; Member, School of Social Science

February 28

Social Science Thursday Lunch Seminar ♦ *Rousseau and the Tradition of the "Social Contract"* ♦ **Peter Meyers**, Université de la Sorbonne Nouvelle; Visitor, School of Historical Studies

March 5

Rethinking War: A Film Series and Discussion Group ♦ *Secrecy* ♦ Filmmakers **Peter Galison** and **Robb Moss**

March 6

Social Science Thursday Lunch Seminar ♦ *Executive Compensation and Managerial Hedging* ♦ **Piero Gottardi**, University of Venice; Visitor, School of Social Science

March 12

The Rule of Law under Pressure Thematic Seminar ♦ *War Stories and the War Power* ♦ **Mary L. Dudziak**, University of Southern California School of Law; Member, School of Social Science

March 13

Social Science Thursday Lunch Seminar ♦ *Rational Herds in Sequential Elections* ♦ **Navin Kartik**, University of California, San Diego; Member, School of Social Science

March 19

IAS/Princeton University Economics Workshop ♦ *Expanding "Choice" in School Choice* ♦ **Yeon-Koo Che**, Columbia University

The Rule of Law under Pressure Thematic Seminar ♦ *Humanitarian Intervention and the Distribution of Sovereignty in International Law* ♦ **Patrick Macklem**, University of Toronto; Member, School of Social Science

March 20

Social Science Thursday Lunch Seminar ♦ *The Sexual Imaginary of Political Crises: The Fear of a Gay Disloyalty to the French State since WWI* ♦ **Bruno Perreau**, Sciences Po, Paris; Member, School of Social Science

March 26

IAS/Princeton University Economics Workshop ♦ *Legit-Response Dynamics and Comparison of Markov Chains* ♦ **Daijiro Okada**, Rutgers, The State University of New Jersey; Member, School of Social Science

April 3

Social Science Thursday Lunch Seminar ♦ *Common Knowledge and Coordination* ♦ **Olivier Tercieux**, CNRS and École Normale Supérieure, Paris; Member, School of Social Science

April 9

The Rule of Law under Pressure Thematic Seminar ♦ *Combatant Status Review Tribunal Transcripts from Guantanamo* ♦ **Leonard C. Feldman**, University of Oregon; Member, School of Social Science

April 10

Social Science Thursday Lunch Seminar ♦ *Law, War, and the History of Time* ♦ **Mary L. Dudziak**, University of Southern California School of Law; Member, School of Social Science

April 17

Social Science Thursday Lunch Seminar ♦ *Closing Time in the Hague: Legacies and Lessons from the International Criminal Tribunal for the Former Yugoslavia* ♦ **Sari Wastell**, Goldsmiths, University of London; Member, School of Social Science

April 23

IAS/Princeton University Economics Workshop ♦ *Let Them Burn Money: Making Elections More Informative* ♦ **Colin Campbell**, Rutgers, The State University of New Jersey

April 24

Social Science Thursday Lunch Seminar ♦ *Philosophy in Politics: A Case Study* ♦ **Danielle Allen**, UPS Foundation Professor, School of Social Science

May 1

Social Science Thursday Lunch Seminar ♦ *What Makes a Terrorist: Economics and the Roots of Terrorism* ♦ **Alan B. Krueger**, Princeton University; Member, School of Social Science

May 7

Rethinking War: A Film Series and Discussion Group ♦ *The Colonel*

May 14

The Rule of Law under Pressure Thematic Seminar ♦ *Alberto Fujimori on Trial in Peru* ♦ **Lisa J. Laplante**, Praxis Institute for Social Justice, Lima, Peru; Member, School of Social Science

May 21

The Rule of Law under Pressure Thematic Seminar ♦ *Of Law and War* ♦ **David Kennedy**, Brown University

May 28

Film Screening and Discussion ♦ *Southside: The Fall and Rise of an Inner-City Neighborhood* ♦ **Hilary Silver**, Brown University; Member, School of Social Science

June 11

IAS/Princeton University Economics Workshop ♦ *An Operational Measure of Riskiness* ♦ **Sergiu Hart**, The Hebrew University of Jerusalem

The IAS Community

For seventy-eight years, the Institute for Advanced Study has had a profound influence on the fields of study represented here: Historical Studies, Mathematics, Natural Sciences, and Social Science. Any day at lunch or tea, you will hear leading scientists and scholars from around the world discussing topics as diverse as the response to terrorism, how to combat the next influenza virus, fourteenth-century Mongolian history, the very latest developments in string theory, the mathematical basis of computer security, and many others.

Members, who typically stay for one year but some of whom may stay for up to five years, live together with their families in housing adjacent to the Institute campus in what might be described as a true academic village. Throughout the year, the Office of the Director hosts a broad range of concerts, lectures, programs, and forums, as listed on the following pages. In addition, the Institute offers a series of activities for Members, Visitors, and their families. In the 2007–08 academic year, these included the Institute Film Series, AMIAS Movie Mondays, play readings, ballroom dancing classes, yoga, tennis lessons, trips to local places of interest, and activities for children in the Institute community.



ANDREA KANE



"There are bright people to talk to, interesting lectures to attend, excellent math libraries, and time to think about both the hot topics in mathematics and the subjects that are obscure and not (yet) in the mainstream."

Record of Events

September 24

Member Welcome Reception

October 5 and 6

Tradition Redefined Concert ♦ **David Krakauer**, clarinet; **Marija Stroke**, piano; **Will Holshouser**, accordion; and **Nicki Parrott**, bass ♦ *Beyond Crossover*

October 17

Faculty Lecture ♦ **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, School of Historical Studies ♦ *The History of Others: Foreign Peoples in Early Chinese Historiography*

October 21

Princeton Symphony Orchestra Concert ♦ **Basia Danilow**, violin; **Peter Sanders**, cello; **Albert Stanziano**, piano ♦ Works by Mozart, Debussy, and Dvořák

October 25

Public Lecture ♦ **Charles Simonyi**, Institute Trustee and President and CEO, Intentional Software Corporation ♦ *Space Tourist*

November 2

Friends Culture and Cuisine ♦ **Sasha Issenberg**, writer-at-large for *Philadelphia Magazine* ♦ *The Sushi Economy: Globalization and the Making of a Modern Delicacy*

November 14

Friends Forum ♦ **Lakhdar Brahimi**, former Special Adviser to the Secretary-General of the United Nations and Director's Visitor ♦ *A Visit to Darfur: Any Prospects for Peace?*

November 18

Princeton Symphony Orchestra Concert ♦ **Alistair MacRae**, cello; **Heather Conner**, piano ♦ Works by Bach and Rachmaninoff

November 28

Friends Fireside Chat ♦ **Martin J. Sherwin**, Walter S. Dickson Professor of English and American History at Tufts University ♦ *American Prometheus*

November 30 and December 1

Tradition Redefined Concert ♦ **Maria Bachmann**, violin; **Simon Mulligan**, piano ♦ *The Red Violin*

December 5

Faculty Lecture ♦ **Arnold Levine**, Professor, School of Natural Sciences ♦ *Tracking Influenza Virus Epidemics over the Past Century: Can We Predict Next Year's Epidemic?*

PHOTO CREDITS, TOP TO BOTTOM: ANDREA KANE, CLIFF MOORE, RANDALL HAGADORN, CLIFF MOORE, ANDREA KANE

"I have found inspiration for my work from unexpected sources, such as formal talks focused on subjects very far from my own work, and from informal interactions with other Members and Visitors."

January 11

Atle Selberg Memorial Program ♦ Scientific Talks ♦ **Kannan Soundararajan**, Stanford University ♦ *Selberg's Contributions to the Theory of Riemann Zeta Function and Dirichlet L-Functions* ♦ **John Friedlander**, University of Toronto ♦ *Selberg and the Sieve: A Positive Approach*

January 12

Atle Selberg Memorial Program ♦ Scientific Talks ♦ Moderated by **Robert P. Langlands**, Professor Emeritus, School of Mathematics ♦ **Henryk Iwaniec**, Rutgers, The State University of New Jersey ♦ *Spectral Theory of Automorphic Forms and Its Impact on Analytic Number Theory* ♦ **James Arthur**, University of Toronto ♦ *Recent History of the Trace Formula* ♦ **Peter Sarnak**, Professor, School of Mathematics ♦ *The Selberg Integral, Rankin Selberg Method, Arithmeticity* ♦ Life and Work ♦ Moderated by **Peter Goddard**, Director, Institute for Advanced Study ♦ **Enrico Bombieri**, IBM von Neumann Professor, School of Mathematics ♦ *Prime Numbers from Eratosthenes to Selberg* ♦ Remembrances and Tributes ♦ **Kai-Man Tsang**, University of Hong Kong; **Dorian Goldfeld**, Columbia University; **Brian Conrey**, University of Bristol; **Dennis Hejhal**, University of Minnesota and Uppsala University; **Erik Hjorth-Hansen**; **Betty Compton Selberg**; **Ingrid Selberg**; **Lars Selberg**; **Nils Baas**, Norwegian University of Science and Technology; and **Peter Goddard**

January 13

Princeton Symphony Orchestra Concert ♦ **Miranda Cuckson** and **Annaliesa Place**, violins; **Stephanie Griffin**, viola; **Joanne Lin**, cello ♦ Works by Mamlok, Klein, Schnittke, and Janáček

January 22

Member Welcome Reception

February 6

Friends Fireside Chat ♦ **Robert Schulman**, coeditor of *Einstein on Politics* ♦ *"Beware of Rotten Compromises": The Moral Foundations of Einstein's Politics*

February 8 and 9

Tradition Redefined Concert ♦ Enso String Quartet ♦ **Maureen Nelson** and **John Marcus**, violin; **Melissa Reardon**, viola; **Richard Belcher**, cello

February 20

Friends Forum ♦ **Scott Tremaine**, Richard Black Professor, School of Natural Sciences ♦ *New Worlds: The Search for Planets Outside the Solar System*

February 27

Faculty Lecture ♦ **Danielle Allen**, UPS Foundation Professor, School of Social Science ♦ *What to Do with Sound-Bites: On Politics and Propaganda in the Twenty-first Century*



PHOTO CREDITS, TOP TO BOTTOM: ALLISON BRIDGE, ROY LAIRD, ANDREA KANE, CLIFF MOORE, ANDREA KANE



"Perhaps the major benefit for me of my stay at the Institute is one that is not likely to yield a publication in the immediate future, but rather is an opening of a new research direction (or, rather, a development of an old one with new techniques)."

March 2

Princeton Symphony Orchestra Concert/Lecture ♦ **Peter Paret**, Professor Emeritus, School of Historical Studies ♦ *Modernism Between Weimar and the Third Reich* ♦ **Basia Danilow** and **Kiri Murakami**, violins; **Stephanie Griffin**, viola; **Elizabeth Thompson**, cello ♦ Works by Mendelssohn, Schulhoff, and Webern

March 7 and 8

Tradition Redefined Concert ♦ Quartet New Generation ♦ **Susanne Frohlich**, **Andrea Guttman**, **Hannah Pape**, and **Heide Schwarz**

March 26

Faculty Lecture ♦ **Peter Sarnak**, Professor, School of Mathematics ♦ *Solutions to Equations in Integers*

April 2

Leon Levy Lecture ♦ **Alan Krueger**, Leon Levy Foundation Member, School of Social Science ♦ *The Lot of the Unemployed*

April 13

Princeton Symphony Orchestra Concert ♦ **Greg Giannascoli**, marimba; **Rebecca Edie**, piano ♦ Works by Popper, Abe, and Osada

April 16

Friends Forum ♦ **Jacob Kuriyan**, President and CEO of Phymark, Inc. ♦ *U.S. Healthcare: A Riddle, Wrapped in a Mystery, Inside an Enigma*

April 25

Friends Fireside Chat ♦ **John Rassweiler**, historian and collector ♦ *Practical Art: Medieval Seals and Signatures*

May 2

Faculty Lecture ♦ **Eric S. Maskin**, Albert O. Hirschman Professor, School of Social Science ♦ *Mechanism Design: How to Implement Social Goals*

May 12

Lecture for the Institute Community ♦ **Eric S. Maskin**, Albert O. Hirschman Professor, School of Social Science ♦ *The Implementation of Society's Goals*

May 16

Friends Culture and Cuisine Series ♦ **Marcie Cohen Ferris**, Associate Director, Carolina Center for Jewish Studies, University of North Carolina ♦ *Moonlight, Mavens, and Matzoh Balls: A Culinary Exploration of Southern Jewish History*

May 21

Faculty Lecture ♦ **Jonathan Israel**, Professor, School of Historical Studies ♦ *The Islamic World and the Radical Enlightenment: Toleration, Freethinking, and Personal Liberty*

June 17

Staff Picnic

After Hours Conversations

After Hours Conversations, a program conceived and organized by Caroline Walker Bynum of the School of Historical Studies and Piet Hut of the Program in Interdisciplinary Studies, was launched in February to encourage inter-School conversations in an informal and relaxed environment. Each Monday, Tuesday, and Thursday evening in February and March, an Institute Professor, Member, or Visitor gave a ten-minute talk on an academic topic, followed by twenty minutes of group discussion. Each of the talks took place in Harry's Bar on the upper level of the Dining Hall and was attended by between fifteen and fifty members of the Institute community, who actively participated in sharing their views on the topics presented.

A webpage was created for the program (www.ids.ias.edu/conversations0708.html), to serve as a resource on dates, speakers, and topics. After Hours Conversations will continue in the academic year 2008–09 with talks planned for October and November 2008 and February and March 2009.



School of Historical Studies Member Roy Laird discussed why, after almost 400 years, the condemnation of Galileo still disturbs the Catholic Church.

CLIFF MOORE



Tom Phillips, *Study for IAS Earth Sudoku*, 2008

Special Programs

Program in Interdisciplinary Studies

Professor **Piet Hut**'s activities included both his astrophysics research and his responsibilities as the Head of the Program of Interdisciplinary Studies. The latter program had thirty-one visitors, with durations of their visits ranging from days to months, in fields including physics, mathematics, chemistry, biology, computational science, artificial intelligence, cognitive science, philosophy, history, education, and media.

Hut's main focus this year has been the exploration of virtual worlds. After he established two organizations using Qwaq Forums in the spring of 2007, one for astrophysics collaborations and one for broadly interdisciplinary studies, these two environments have been used successfully for communication and collaboration among both scientists and scholars, and for outreach as well. The collaboration with Qwaq has been mutually beneficial; it included two brief visits of the Chief Executive Officer and the Chief Technology Officer of Qwaq in the spring of 2008.

A breakthrough in virtual collaborations came when Hut let both of these organizations branch out into Second Life, currently the largest nongame 3D online virtual world, with a continued presence in-world of roughly 50,000 residents at any given time. Since April 2008, the astrophysics organization Meta Institute for Computational Astrophysics (MICA) has formed the equivalent of a virtual academic department with various scheduled talks and discussions every week and ongoing research collaborations. Also since April, a very broadly interdisciplinary initiative, Play as Being (PaB), has involved daily meetings in Second Life to discuss the nature of knowledge from many different angles.

In the fall, Hut was one of the organizers of a workshop on general-purpose computation on graphics processing units (GPUs) in astrophysics, a meeting at the Institute that attracted over a hundred participants and was the first astrophysics workshop especially aimed at using game-based hardware technology for scientific simulations.

In the spring, Hut organized with Professor Caroline Walker Bynum of the School of Historical Studies a series of After Hours Conversations, which were held at the Institute in Harry's Bar three times a week for a period of two months. Each get-together had a more formal aspect that lasted thirty minutes, starting with a ten-minute talk by a speaker that was followed by a twenty-minute period of questions. In addition, many participants would continue informal conversations afterward. These activities were widely seen as an effective way to lower the threshold for inter-School communication at the Institute.

Professor Hut was one of the organizers of a workshop on general-purpose computation on graphics processing units in astrophysics, one of the first workshops especially aimed at using game-based hardware technology for scientific simulations.



Professor Piet Hut (near right) organized After Hours Conversations with School of Historical Studies Professor Caroline Walker Bynum, which encouraged inter-School communication at the Institute.

Artist-in-Residence Program

Paul Morevec, Composer

The 2007–08 academic year marked the first season of *Tradition Redefined*, led by Pulitzer Prize-winning composer and Artist-in-Residence Paul Moravec. *Tradition Redefined* was developed to explore the wide variety of aesthetic perspectives in art music, especially of the twentieth and twenty-first centuries, through chamber-music concerts and talks.

Beginning with the October 2007 concerts, the series will permanently carry the name of the late Edward T. Cone, who was a distinguished composer and musical scholar with long-standing ties to the Institute. The Edward T. Cone Concert Series began with *Beyond Crossover*, featuring clarinetist David Krakauer, who was joined by Marija Stroke, Will Holshouser, and Nicki Parrott in performing the music of composers Leoš Janáček, Johannes Brahms, Olivier Messiaen, Steve Reich, and Claude Debussy, in addition to a set of traditional klezmer music. *The Red Violin* featured violinist Maria Bachmann and pianist Simon Mulligan and featured the music of Debussy, Corigliano, Enescu, Gershwin, and Moravec. The Enso String Quartet performed the music of Haydn, Wolf, Ravel, and Moravec. Quartet New Generation, a Berlin-based recorder collective, played the music of Bach and Bruckner; early-music composers Thomas Tompkins, John Dowland, and Samuel Scheidt; and contemporary composers Petros Ovsepyan, Gordon Beeferman, and Chiel Meijering. They also gave the world premiere performance of Moravec's *Mortal Flesh*.

Speakers in the series included Mark Slobin, Professor of Music at Wesleyan University, who presented "Jewish Music and the Electric Eclectic"; Paul Moravec, who presented "A Composer's World Today"; music and drama critic Terry Teachout, a writer for *Commentary* magazine and *The Wall Street Journal*, who presented "Confessions of a Critic"; and legendary countertenor Russell Oberlin, who presented "The High Male Voice: Castrato, Countertenor, and Male Alto."

In addition to directing *Tradition Redefined*, Moravec composed *The Letter*, scheduled to premiere at the Santa Fe Opera in the summer of 2009. He also completed *The Blizzard Voices*, an evening-length oratorio to be premiered by Opera Omaha in September 2008. Additional compositions include *Raritan Triptych* for premiere by the Newman/Oltman Guitar Duo in late May 2008; several short works for the New Jersey Music Teachers Association; and a concerto grosso titled *Brandenburg Gate* for the Orpheus Chamber Orchestra, premiering at Carnegie Hall in the fall of 2008. Moravec's substantial catalogue of compositions continued to be performed throughout the United States, Europe, and Australia. Several compact discs of his music were released this season, including *Mark Twain Sez* (Matt Haimovitz on Oxingale), *Passacaglia* (Trio Solisti on Bridge Records), and an album of his chamber music performed by the Bridgehampton Chamber Music Festival players on Naxos International.



Top: Artist-in-Residence Paul Moravec (right) with musicians from the *Beyond Crossover* concert; bottom: violinist Maria Bachmann and pianist Simon Mulligan

PHOTOS DINAH KAZAKOFF

Director's Visitors

Director's Visitors, scholars who work in a variety of fields, including areas not represented in the Schools, contribute much to the vitality of the Institute. They are invited to the Institute for varying periods of time, depending on the nature of their work.

Former Special Adviser to the Secretary-General of the United Nations, **Lakhdar Brahimi** worked on a book with Salman Ahmed, who has worked closely with Brahimi in several UN Peace Operations, that will look at conflict and post-conflict problems in a post-9/11 world and reflect more broadly on the shape and direction of international relations in the years to come, both inside and outside of the UN.

This year as well as presenting the completion of the opera *Heart of Darkness*, **Tom Phillips** took earth samples from the grounds around Einstein Drive to incorporate into a larger work involving earth colors from around the world to picture the international compass of the Institute.

Siobhan Roberts is a Toronto-based journalist and the author of *King of Infinite Space: Donald Coxeter, The Man Who Saved Geometry*, published in the United States by Walker & Company (Bloomsbury). During her visits in the fall of 2007 and spring 2008, Roberts accomplished a significant amount of research for her next book, a biography of Princeton's John Horton Conway, who has a number of colleagues at the Institute, including Director Peter Goddard and Professor Peter Sarnak, both of whom provided invaluable insights (since her stay, this work has been acquired by Walker/Bloomsbury for publication in 2010). She also attended the history seminars, including those focused on the history of science, and enjoyed the breadth of knowledge and creative thinking showcased at the After Hours Conversations series, at which she also delivered a talk on the use of analogy as a tool for investigation and discovery in mathematics and science.

Claudine Serre is a French diplomat and a writer with a Ph.D. on Simone de Beauvoir. As one of the founders of the women's movement in France in 1970, Claudine Serre has published five books under the pen name of Claudine Monteil, all translated into several languages. During her stay at the Institute, she conducted research for her future publications, which involve both the history of the Institute during and after World War II and the present situation of women scientists in the academic world, with a special focus on the Institute's Program for Women and Mathematics.



Director's Visitor Siobhan Roberts, pictured (right) speaking with School of Historical Studies Professor Emeritus Irving Lavin, worked on a biography of John Horton Conway during her time at the Institute.

Institute for Advanced Study/Park City Mathematics Institute (PCMI)



PHOTOS TODD HICKEN

The Summer Session offers each group a series of high-quality lectures or seminars combined with activities and events designed to foster all-institute interaction; this interaction, a hallmark of PCMI, serves to increase awareness of the roles of professionals in all mathematics-based occupations.

The IAS/Park City Mathematics Institute (PCMI) is a program of professional development for the mathematics community, including research mathematicians, graduate students, undergraduate students, mathematics education researchers, undergraduate faculty, and mathematics teachers at the secondary-school level. Affiliated with the Institute for Advanced Study's School of Mathematics, PCMI has been an outreach program of the Institute for Advanced Study since 1994.

The flagship activity of PCMI is the three-week residential Summer Session, held annually in Park City, Utah, which strives to create a strong sense of community for all participants. The Summer Session offers each group a series of high-quality lectures or seminars combined with activities and events designed to foster all-institute interaction. This interaction, a hallmark of PCMI, serves to increase awareness of the roles of professionals in all mathematics-based occupations.

In addition to the annual Summer Session, PCMI has year-round professional development offerings: Secondary-school mathematics teachers may participate in the academic-year activities of PCMI's Math Science Partnership Project (known as PD³) or PCMI's many Professional Development and Outreach Groups. Additionally, the graduate-level *Park City Mathematics Series*, a collection of lecture notes, is published and made available to the mathematics research and academic community by the American Mathematical Society.

The Annual Summer Session

The eighteenth annual Summer Session, held July 6–26, 2008, in Park City, Utah, attracted some 250 participants combined in all programs.

The Summer Session started off with an address of welcome from the Honorable Jon Huntsman, Jr., Governor of the State of Utah. Governor Huntsman's remarks were delivered to a standing-room-only crowd in PCMI's main lecture hall and were well-received by the PCMI participants.

The following programs took place during the Summer Session:

Designing and Delivering Professional Development Seminar (one week)

Graduate Summer School

Research Program in Mathematics

Secondary-School Teachers Program

Undergraduate Faculty Program

Undergraduate Summer School

Except as noted, all programs met for the entire three weeks.

The mathematical topic for 2008 was “Analytic and Algebraic Geometry: Common Problems, Different Approaches”; this topic informed the work of the Graduate Summer School, the Research Program, the

Undergraduate Summer School and the Undergraduate Faculty Program. The topic “Knowledge for Teaching Mathematics” provided the focus for the education programs, including the Designing and Delivering Professional Development seminar and the Secondary School Teachers Program.

Each of the programs met daily for a series of courses and seminars. The groups also met together for Crossprogram Activities three or four days each week. A complete listing of courses, seminars, and activities of the Summer Session is included within this report.

Graduate Summer School and Research Program

The Graduate Summer School and the Research Program were organized by Professor Jeffery McNeal of The Ohio State University and Mircea Mustață of the University of Michigan. This year’s program focused on recent developments in the study of higher-dimensional complex algebraic varieties. Over the past three years there has been spectacular progress, coming from both the algebraic and analytic side, on fundamental questions related to birational geometry. While the end result is (almost) the same—namely, the finite generation of the canonical ring—the methods used in the two approaches are very different. The PCMI program brought together these two points of view. In addition to the topics covered by the graduate lectures, the research program explored other active directions in this area.

The Graduate Summer School had one hundred and eight applications and the Research Program had fifty-eight. With the addition of financial support from institutional and individual research grants, the program was able to accommodate seventy-five graduate student participants and fifty-one researchers; the stimulating environment of PCMI will leave a lasting mark on the field through the many students who were able to benefit from the courses and from the collaborations forged between the research participants.

For graduate students and postdocs who were at the PCMI Summer Session, a year of follow-up workshops and lectures funded by the National Science Foundation (NSF) will take place at The Ohio State University.

THE GRADUATE SUMMER SCHOOL

The common theme for the 2008 Graduate Summer School was the interaction between analytic and algebraic geometry. While this interaction goes back to classical times, recent breakthroughs in the study of higher-dimensional algebraic varieties, coming from both directions, highlighted the need for wider communication between the two fields. The wide interest in the topic, and the high quality of the lecturers, contributed to the success of this event.

There were eight series of lectures, each consisting of five lectures, plus three discussion sessions. The courses were evenly divided between the analytic and the algebraic aspects. In each of the two groups of the lecture series, one series started at an elementary level, and one series built up to the level of current developments. The lecture series were interconnected, with emphasis placed on the techniques employed in the two fields to attack problems of common interest.

THE LECTURE SERIES OF THE GRADUATE SUMMER SCHOOL:

L²-Methods for the Dbar-Equation; Bo Berndtsson, Chalmers University of Technology and the University of Göteborg

Real and Complex Geometry Meet the Cauchy-Riemann Equations; John P. D’Angelo, University of Illinois at Urbana-Champaign

Analytic Approach of the Minimal Model Program and of the Abundance Conjectures; Jean-Pierre Demailly, Université de Grenoble

Higher-Dimensional Minimal Model Program; Christopher D. Hacon, University of Utah

Introduction to Minimal Models and Flips; János Kollár, Princeton University

Multiplier Ideals and Their Applications; Robert Lazarsfeld, University of Michigan

Introduction to Resolution of Singularities; Mircea Mustață, University of Michigan

L² Methods in Complex Geometry; Dror Varolin, Stony Brook University, The State University of New York

There were two sessions of graduate-student presentations near the end of the three-week Summer Session. The young participants had an opportunity to give short talks on their work to an audience formed by their peers and also by the experts in the field. The talks generated much interest and were of a very high quality.

The Graduate Summer School opened the three-week session with an evening social, an event that proved to be very popular with the graduate students. The intent was to introduce the lecturers, organizers, and Clay Senior Scholars to the students in a casual setting and to foster early acquaintances among the diverse student population. The social was a great success and will be incorporated into future Summer Sessions.

THE RESEARCH PROGRAM

The Research Program was opened by the program principal, Yum-Tong Siu, with a lecture introducing ideas from partial differential equations that recently found many surprising applications to algebraic problems. The lecture generated a lot of interest, and it set the stage for the remaining lectures. The program consisted of one or two daily talks, given by experts in the field. With a good balance between analytic and algebraic aspects, the lectures bridged the divide between the two fields and created a stimulating working environment. The discussions generated by the seminars often continued in front of the hallway blackboards during the day, or during informal meeting in the evenings.

RESEARCH SEMINARS AT THE 2008 SUMMER SESSION:

Singularities on Arbitrary Normal Varieties; Tommaso De Fernex, University of Utah
 Positivity of Higher Direct Images; Christophe Mourougane, Université de Rennes 1
 Stability of Orbifolds and Embeddings in Weighted Projective Space; Julius Ross, University of Cambridge
 Applications of Multiplier Ideal Sheaves in Complex Geometry; Gordon Heier, Lehigh University
 The Birational Geometry of Kontsevich Moduli Spaces; Izzet Coskun, University of Illinois at Chicago
 Historic Evolution of Multiplier Ideal Sheaves and Their Applications; Yum-Tong Siu, Harvard University
 Application of Algebraic Geometry to the Partial Neumann Problem; Yum-Tong Siu, Harvard University
 Exceptional Vector Bundles Associated with Degenerations of Surfaces; Paul Hacking, University of Washington
 Complex Brunn-Minkowski Inequalities; Bo Berndtsson, Chalmers University of Technology and University of Göteborg
 Special Orbifolds and Birational Classification; Frederic Campana, Université Henri Poincaré
 Complex Varieties in Pseudoconvex Real-Analytic Hypersurfaces; J. J. Kohn, Princeton University
 Base Manifolds for Fibrations of Projective Irreducible Symplectic Manifolds; Jun-Muk Hwang, Korea Institute for Advanced Study
 Growth of Balls of Holomorphic Sections and Equidistribution of Fekete Points; Sebastien Boucksom, CNRS and Paris 7
 The Cone Theorem Revisited; James McKernan, Massachusetts Institute of Technology
 Weighted Grassmannians and Higher-Dimensional Generalizations of Hassett's Weighted Stable Curves; Valery Alexeev, University of Georgia
 L^2 Extension of Adjoint Line Bundle Sections; Dano Kim, The University of Chicago
 Gluing Semi-Log Canonical Schemes; János Kollár, Princeton University
 Analytic Approach to the Finite Generation of Canonical Ring and the Abundance Conjecture; Yum-Tong Siu, Harvard University
 Global Regularity of the Bergman Projection on Forms; Anne-Katrin Herbig, University of Vienna
 Holomorphic Dynamics: A Birational Perspective; Mattias Jonsson, University of Michigan
 Q -conic Bundles and the General Elephant Conjecture; Shigefumi Mori, Research Institute for Mathematical Science, Kyoto, Japan
 The Minimal Model Conjecture; Caucher Birkar, University of Cambridge
 Multiplier Ideals in Analysis: Past, Present, and Future; Joseph J. Kohn, Princeton University

CLAY MATHEMATICS INSTITUTE SENIOR SCHOLAR-IN-RESIDENCE.

Through the generous support of the Clay Mathematics Institute, Cambridge, Massachusetts, PCMI welcomed two Scholars-in-Residence to the 2008 Summer Session: Robert Lazarsfeld of the University of Michigan was

both a lecturer in the PCMI Graduate Summer School and the Clay Senior Scholar-in-Residence; Yum-Tong Siu of Harvard University was the program principle of the Research Program for 2008. Both played pivotal roles in the Research Program. Both gave very successful general-audience lectures aimed at the crossprogram PCMI audience, and both engaged in mathematical conversations with the Secondary-School Teachers Program and Undergraduate Faculty Program. The Clay Senior Scholars-in-Residence program, which is in its fifth year at PCMI, has become a keystone to the success of the PCMI Graduate Summer School and Research Program.

Undergraduate Summer School

Forty undergraduate students attended the Undergraduate Summer School (USS) at the PCMI Summer Session. As is usual, the USS was organized around two courses, one aimed at introductory-level students and the other intended for students at a more advanced undergraduate level. The introductory course, "Introduction to Algebraic Geometry," was given by David Perkinson of Reed College. The advanced course was given in two parts, utilizing three different lecturers: "Algorithmic Fewnomial Theory," by J. Maurice Rojas of Texas A&M University; and "Projective Algebraic Geometry and Toric Surfaces," by Jessica Sidman of Mt. Holyoke College and C. Herbert Clemens of The Ohio State University.

Both courses were well attended by the undergraduate participants, and several of the mathematicians present for the Undergraduate Faculty Program also attended these courses. Problem sessions were conducted daily by selected graduate students and advanced undergraduate students.

For the first time in its history, the USS opened with an evening social, an event that proved to be very useful in fostering relationship-building among the participants. The social was also an excellent venue for introductions of the lecturers and organizers in a casual atmosphere. The evening, attended by all who were associated with the USS, was a huge success and will be incorporated into the PCMI schedule in future years.

Another highlight of the 2008 USS was the connection with a Research Experience for Undergraduates (REU) program held at the University of Utah for the three weeks prior to the PCMI Summer Session. The dual program (REU and PCMI) was organized by Aaron Bertram, who is the Mathematics Department Chair at the University of Utah and a coorganizer of PCMI's USS. Some twenty of the undergraduates at PCMI attended the REU first, which contributed greatly to their understanding of the mathematical content and gave them a solid immersion in a rich research environment.

Undergraduate Faculty Program

For faculty members whose main focus is teaching undergraduate students, the Undergraduate Faculty Program (UFP) at PCMI offers the opportunity to renew excitement about mathematics, talk with peers about new teaching approaches, address some challenging research questions, and interact with the broader mathematical community. The UFP is unique in that it bridges the educational and research objectives of PCMI, attracting both undergraduates and graduate students and teachers from the secondary-school program in addition to the UFP participants.

This year's UFP instructor and coordinator was Thomas Garrity, the William R. Kenan, Jr., Professor of Mathematics at Williams College. The centerpiece of the UFP this year was a compressed introductory lecture course on algebraic geometry, but every lecture was followed by a discussion of teaching techniques. Professor Garrity also met with the participants in a seminar setting every day to discuss the context and breadth of the subject. In addition, the participants of the UFP are producing a manuscript on "Problems in Algebraic Geometry," which they hope to publish. Perhaps more importantly, several of the UFP faculty plan to teach seminars in algebraic geometry in this academic year, buoyed by the support of their fellow participants. "I gained a lot from networking with peers at other undergraduate institutions," said UFP participant Shawn Robinson, an Assistant Professor at the University of Maine at Presque Isle. "We shared ideas on practical matters ranging from productive use of class meetings to conducting effective hiring searches, and we began a professional collaboration that I'm sure will prove to be productive."

In keeping with PCMI's focus on crossprogram participation, the UFP reached out to several of its peer programs at the Summer Session. In addition to the sixteen UFP participants, a group of seven secondary-school mathematics teachers led by James King of the University of Washington created a working group on "Algebraic and Analytic Geometry" and attended the three weeks of the UFP class. Based on their experiences in the class, the group had many discussions about new ideas presented in the class (especially the role of complex numbers and the concept of conics and cubics in the projective plane). The group also created two projects inspired by the class on (1) the real projective line and (2) projections of the sphere onto the plane. The UFP also attracted approximately twenty undergraduate and graduate students; many of the students were entranced by Professor Garrity's flair and enthusiasm for the subject.

The Secondary-School Teachers Program

Fifty-three middle school and high school teachers spent a challenging three weeks learning mathematics, reflecting on what it means to teach mathematics, and working together to create a product to share with their colleagues both at PCMI and more broadly through the PCMI website. The Secondary-School Teachers Program (SSTP) was also delivered electronically via video-conference to additional teachers in Texas as part of the NSF-funded Math Science Partnership project known as PD³ (PCMI and Districts Partner to Develop Professional Development).

Of the fifty-three teacher participants, twenty had returned for a second or third year of participation in the SSTP; twenty-two were teachers from the PD³ project; the other participants represented PCMI's Professional Development and Outreach groups from California, Minnesota, New Jersey, New Mexico, New York, Utah, and Washington; the remaining teachers came as individuals from a variety of geographic locations including Alaska, Illinois, Maryland, and Ohio. A special component of this year's program was the attendance of one high school teacher from Namibia, who had been part of the PCMI International Seminar in 2007. The range of teaching experience among the SSTP participants ran from one year of teaching to seasoned veterans.

The mathematics session, "Developing Mathematics: Applications of Algebra and Geometry to the Craft of Teaching," used materials created by a team from the Educational Development Center and the PROMYS for Teachers program at Boston University; the team, which has created these materials for PCMI for the past seven years, was led by Al Cuoco and Bowin Kerins. The delivery of the course materials to the SSTP participants was facilitated by Darryl Yong from Harvey Mudd College and Ben Sinwell, a teacher from Washington, D.C. Together, the participants explored questions such as generating Pythagorean triples, cubic polynomials with integer zeros, and extreme points and triangles in the Cartesian plane whose vertices have integer coordinates and whose side length are integers, and these ideas became a springboard into investigations into the structure of different algebraic systems and geometric curves.

In the daily "Reflecting on Practice" session the participants considered what it means to observe a mathematics classroom in order to assess student learning. They then collaboratively designed lessons around a given content area, submitted the lessons to a team of lesson study experts who provided feedback on the lessons, made revisions, and taught a portion of the lesson to their peers again, seeking feedback and input on how to improve.

For two hours each afternoon, participants took part in one of seven working groups on data analysis, functions, geometry, discrete mathematics, observation of teaching, teacher professional continuum, and a group that took part in the mathematics course given as part of PCMI's UFP. The working groups explored technology, developed lessons and classroom activities, and created drafts of potential articles on interesting and useful mathematics that will be tested in classrooms when appropriate, reviewed during the coming year, revised as necessary, and posted on the PCMI website.

Several visitors attended at various times throughout the three weeks, including Jennifer Mossgrove, a program officer from the Knowles Science Teaching Foundation. Also visiting was Henry Kepner, current President of the National Council of Teachers of Mathematics, who found the program stimulating and a rich resource for teachers.

Overall the summer was very successful, with high ratings from the participants on nearly every element of the program. The participation of the PD³ teachers was in keeping with that project's goals, and interaction with the other PCMI programs continues to grow. A hallmark of the three weeks is the increasingly successful interaction between the mathematicians and the secondary-school teachers, with the Clay Senior Scholars-in-Residence and other speakers providing focused sessions around their work as mathematicians or some aspect of secondary-school mathematics in which they are interested.

Challenges remain in finding exactly the right focus for the "Reflecting on Practice" course and in getting the working group products revised and made public in a timely manner.

DESIGNING AND DELIVERING PROFESSIONAL DEVELOPMENT

During the second week of the SSTP program, twenty-two mathematics supervisors and university faculty attended the one-week workshop on Designing and Delivering Professional Development (DDPD). The participants were from California, Colorado, Hawaii, Michigan, Minnesota, New Jersey, New Mexico, Texas, and Washington. They included leaders from the PCMI Professional Development and Outreach (PDO) Groups, the three PD³ sites, and others involved in teacher professional development in a variety of ways.

The DDPD participants attended the SSTP sessions and, under the leadership of Johnny Lott from the University of Mississippi, spent time considering the role of problem-solving and its treatment in secondary mathematics and in professional development programs. Roger Knobel from The University of Texas–Pan American and Susana Salamanca from New Mexico State University each shared the work they do during the academic year with their PD³ groups. In the other sessions, participants solved problems that introduced concepts and then discussed the process of finding solutions, the reasoning used, and the role of problem-solving in secondary schools. Daily comment cards were used for formative feedback during the week. Lott also provided individual and small-group discussion sessions for those with particular interests or challenges. After several years of struggling to shape the focus of DDPD, this year's program was again very well received, and participants left with new ways of thinking about aspects of their own work.

International Seminar on Mathematics Education: Bridging Policy and Practice

The International Seminar on Mathematics Education, established by PCMI in 2001, was not convened at PCMI in 2008 due to the participation by so many at the 11th International Congress on Mathematics Education (ICME-11) in Monterrey, Mexico, in early July. The International Seminar participants from PCMI gave a presentation to the larger international mathematics education community at ICME, organized by Johnny Lott of the University of Mississippi. They also met together to continue discussions begun in 2007. The International Seminar will reconvene at PCMI in 2009.

Crossprogram Activities

Crossprogram Activities take many forms and are a defining feature of PCMI, serving to build understanding, professional respect, and a sense of shared purpose among all the constituents of the mathematical enterprise. Formal and informal Crossprogram Activities were held in the afternoons and evenings during the 2007 Summer Session.

Two evenings of "Pizza and Problem Solving" were organized and presented by Andrew Bernoff of Harvey Mudd College. On each of these two evenings between 130 and 160 participants were in attendance, representing all the programs at PCMI. The participants appreciated the opportunity to tackle brainteasers together and present solutions to each other at the end of the evening.

George Hart of Stony Brook University, The State University of New York, visited PCMI and gave a hands-on workshop and presentation on mathematical sculptures.

Liping Ma, a senior scholar at the Carnegie Foundation for the Advancement of Teaching, gave a presentation on the teaching of fractions in the United States.

Other evening activities included the opening and closing dinners for participants and their families, an ice-cream social hosted by the SSTP, the PCMI Film Festival, and a session of building structures with Zometools (also hosted by the SSTP).

The full listing of formal Crossprogram Activities is as follows:

Address of Welcome by the Honorable Jon Huntsman, Jr., Governor of the State of Utah

Using Mathematical Maturity to Shape Our Courses, Our Curriculum, and Our Careers; Thomas Garrity, Williams College

Pizza and Problem Solving (2 sessions); Andrew Bernoff, Harvey Mudd College

Geometric Sculptures; George Hart, Stony Brook University, The State University of New York

Math for America; Irwin Kra, Math for America

Teaching Fractions: Comparing Two Different Conceptual Frameworks; Liping Ma, Carnegie Foundation for the Advancement of Teaching

Film Presentations:

Hard Problems: The Road to the World's Toughest Math Contest

Julia Robinson and Hilbert's Tenth Problem

The Great Pi/e Debate; with an introduction by Tom Garrity

As the Summer Session progressed, many participants organized sightseeing trips on weekends and sports activities on weekday evenings, such activities being open to anyone who wished to be involved.

CLAY SENIOR SCHOLAR-IN-RESIDENCE LECTURES:

The Clay Senior Scholars-in-Residence gave two public lectures.

How Many Times Does a Polynomial Vanish at a Point?; Robert Lazarsfeld, University of Michigan

From Integrating Square Roots of Polynomials of Degree at Least 3; Yum-Tong Siu, Harvard University

PD³: PCMI and Districts Partner to Design Professional Development

PCMI received a three-year Math Science Partnership (MSP) award from the NSF in 2003, the prototype "Institutes award" for the nationwide MSP project at that time. With that award, professional-development partnerships in three diverse school districts were created as part of PD³; Cincinnati (Ohio), McAllen (Texas), and Seattle (Washington) were the initial project sites. In the summer of 2006, PCMI received a two-year continuation of that funding from the NSF, ensuring that the PD³ project will continue through the summer of 2008. In the fall of 2006, the Las Cruces and Gadsden school districts in New Mexico took the place of the Cincinnati project schools; the Cincinnati project was lost through a major change in district personnel and district policy in 2005–06. The Seattle project and the McAllen project will continue to be part of the PD³ program.

The PD³ project supports the participation of teachers and district administrators working in concert with university mathematicians and mathematics educators to design professional-development offerings based on PCMI's three-fold model: 1) continuing to do mathematics, 2) reflection on teaching practice, and 3) becoming and serving as a resource to one's colleagues. Activities at the sites are unique to the needs of each school's teachers and curriculum, with a core group of teachers expected to attend the PCMI Summer Session each year, either in Park City or via the "e-table" format. The anticipated unit of change is the individual school, with the long-term goal of infusing this process of improvement to other schools and eventually to the entire district.

In each of the three school districts, PCMI strives to attain three goals that will bring improvement in teaching and learning mathematics in the school: a) teachers open their doors (to colleagues, administrators, and parents) and make teaching public; b) district and building administrators support the PD³ professional development program; c) teachers serve as leaders in developing and modeling ways to improve mathematics teaching and learning in their buildings and districts.

The overall project is currently in its final year of funding from the NSF. A supplemental award, received from the NSF in 2008, will enable PCMI to award significant salary supplements to teachers who are part of the PD³ project in 2008 and 2009. The other components of the project, including the summer SSTP of PCMI, are currently seeking continuation funding in order to go on with their programs after the summer of 2009.

Teacher Professional Continuum (TPC) Project

Since 2001, PCMI has offered a problem-based mathematics course to the SSTP participants at the annual Summer Session based on a mathematical theme related in some way to the PCMI mathematical topic. The NSF in 2006 awarded a grant to PCMI whereby this mathematical course is being developed into a published series of professional-development materials suitable for use by universities as undergraduate courses, by professional-development organizations, and by other programs and organizations, including in-service teachers. The materials, created and implemented at PCMI by the Education Development Center (EDC) of Newton, Massachusetts, are unique in their approach to mathematics-based professional development for teachers, requiring group work and offering multiple points of access to accommodate the varying education levels of participants.

Through 2009, EDC will continue creating the mathematics course each year around a different mathematical theme. The courses from prior years, beginning from 2001, will be refined by teams of PCMI teacher-participants working with the EDC staff. In preparation for publication, facilitator guides are being created and refined by the EDC staff with the input of PCMI teacher participants.

The development process of the materials for publication has included the use of the Summer 2001 and Summer 2004 problem sets in two different settings: a five-day residential institute for teachers of the PCMI Professional Development and Outreach Group in New Jersey and as a course given at the annual Northwest Mathematics Interaction in Seattle, Washington (long a PCMI Professional Development and Outreach Group summer activity).

In 2008 there was significant progress toward the publication of the materials, anticipated in 2011.

Publication Series

PCMI is very pleased to make the proceedings of its Summer Session available to the public. The full series, which comprises nearly all of the lectures ever given in PCMI's Graduate Summer School, includes the following titles:

- Volume 1: *Geometry and Quantum Field Theory*
- Volume 2: *Nonlinear Partial Differential Equations in Differential Geometry*
- Volume 3: *Complex Algebraic Geometry*
- Volume 4: *Gauge Theory and Four Manifolds*
- Volume 5: *Hyperbolic Equations and Frequency Interactions*
- Volume 6: *Probability Theory and Applications*
- Volume 7: *Symplectic Geometry and Topology*
- Volume 8: *Representation Theory of Lie Groups*
- Volume 9: *Arithmetic Algebraic Geometry*
- Volume 10: *Computational Complexity Theory*
- Volume 11: *Quantum Field Theory, Supersymmetry, and Enumerative Geometry*
- Volume 12: *Automorphic Form and Applications*
- Volume 13: *Geometric Combinatorics*

Volumes 14 and 15 are due by the end of 2008, with Volume 16 due in 2009.

Also published are five volumes in the *Park City Mathematics Institute Subseries*, which is a subsection of the American Mathematical Society (AMS) *Student Mathematics Series*. These volumes are aimed at undergraduate

students and are published independently of the Park City Mathematics Series mentioned above. Published thus far are:

Lectures on Contemporary Probability by Gregory F. Lawler and Lester N. Coyle

An Introduction to the Mathematical Theory of Waves by Roger Knobel

Codes and Curves by Judy L. Walker

Lectures in Geometric Combinatorics by Rekha Thomas

Enumerative Geometry and String Theory by Sheldon Katz

All published volumes are available either from the AMS or through popular national bookstores.

The SSTP disseminates its teacher-created materials and other resources via a special website created by the Math Forum at Drexel University.

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The Starr Foundation

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The National Security Agency

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The Wolfensohn Family Foundation

The Clay Mathematics Institute

Mathematical Sciences Research Institute

Appreciation is also extended to the Department of Mathematics at the University of Utah.

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The IAS/Park City Mathematics Institute is governed by an Oversight Board:

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Steering Committee

Members of the Steering Committee, who plan and manage the activities of the PCMI, are as follows:

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2008 Graduate Summer School/Research Program Organizers:

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Mircea Mustață, University of Michigan

Graduate Summer School:

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Lecture Series:

John Polking, Rice University

International Seminar on Mathematics Education:

Gail Burrill, Michigan State University

Johnny Lott, University of Mississippi

Research Program:

Karl Rubin, University of California, Irvine

Secondary-School Teachers Program:

Gail Burrill, Michigan State University

James R. King, University of Washington

Carol Hattan, Skyview High School

Undergraduate Faculty Program:

William Barker, Bowdoin College

Andrew Bernoff, Harvey Mudd College

Aaron Bertram, University of Utah

Undergraduate Summer School:

William Barker, Bowdoin College

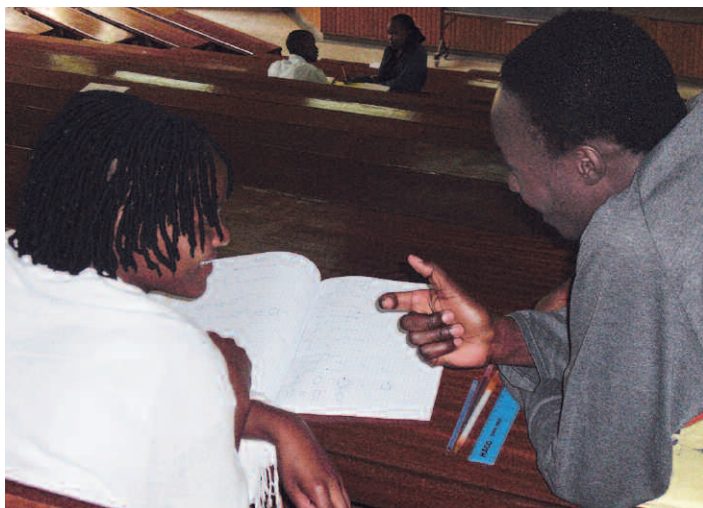
Andrew Bernoff, Harvey Mudd College

Aaron Bertram, University of Utah

The topic for the 2009 Summer Session will be “The Arithmetic of L-functions.” The organizers are Cristian Popescu of the University of California, San Diego; Karl Rubin of the University of California, Irvine; and Alice Silverberg of the University of California, Irvine. The Clay Senior Scholars-in-Residence will be Benedict Gross of Harvard University and John Tate of the University of Texas at Austin.

Science Initiative Group (SIG)

PHOTOS ARLEN HASTINGS



A new Science Initiative Group undertaking, the Regional Initiative in Science and Education (RISE), will provide Ph.D. training in selected areas of science and engineering through university-based research and training networks in sub-Saharan Africa.

The 2007–08 academic year marked SIG's tenth as an outreach program of the Institute for Advanced Study dedicated to building science capacity in the developing world. SIG was created in 1998 to provide scientific guidance for the Millennium Science Initiative, a project inspired by the vision of James D. Wolfensohn, then Chairman of the Institute's Board of Trustees, and developed jointly with the World Bank to support centers of scientific excellence in the developing world.

The year saw the beginning of a new SIG initiative inspired by another Institute trustee, Vartan Gregorian, President of Carnegie Corporation of New York. The Regional Initiative in Science and Education (RISE) will provide Ph.D. training in selected areas of science and engineering through university-based research and training networks in sub-Saharan Africa. Each RISE network will comprise universities and research institutes in at least three countries. The program's primary goals are to prepare new faculty to teach in Africa's universities and to help existing faculty members upgrade their qualifications, thereby helping to strengthen the universities that make up the networks. RISE is funded by a grant from Carnegie Corporation of New York.

Faculty development was identified in a survey of African university leaders as the single most pressing need in higher education in their countries. Throughout sub-Saharan Africa, the shortage of qualified faculty is acute, especially in the sciences. RISE networks will provide comprehensive graduate training programs, where students and faculty seeking Ph.D.s can take advantage of the complementary instruction and research opportunities available at each institution within the network. Networks also will enable researchers from multiple universities to use specialized scientific instrumentation that may be available at only one of the sites, or to pool resources to obtain new equipment.

The network structure will benefit not only the individual researchers, but the universities as well, as each will stand to gain through affiliation with the others. In the words of one of the successful applicants, "The principle to be employed is to exploit the respective strengths of individual partner institutions for the collective benefit to build capacity."

Three networks were selected in a competition that attracted forty-eight proposals involving twenty-nine African countries. Scheduled to begin work in late 2008 or early 2009, the new RISE networks are:

African Materials Science and Engineering Network (AMSEN)

Academic Director: **L. A. Cornish**, Director, DST/NRF Centre of Excellence in Strong Materials, University of the Witwatersrand, Johannesburg, South Africa

Other participating institutions:

University of Nairobi, Kenya

University of Namibia

Federal University of Technology, Akure, Nigeria

University of Botswana

Southern African Biochemistry and Informatics for Natural Products (SABINA)

Academic Director: **John D. Kalenga Saka**, Professor of Chemistry, Chancellor College, University of Malawi

Other participating institutions:

University of Namibia

University of Dar es Salaam, Tanzania

University of Pretoria, South Africa

University of the Witwatersrand, South Africa

CSIR (Council for Scientific and Industrial Research), South Africa

Tea Research Foundation of Central Africa, Malawi

Western Indian Ocean Regional Initiative in Marine Science and Education (WIO-RISE)

Academic Director: **Alfonse M. Dubi**, Associate Professor and Director, University of Dar es Salaam Institute of Marine Sciences, Zanzibar, Tanzania

Other participating institutions:

Eduardo Mondlane University, Mozambique

University of Cape Town, South Africa

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Harold Varmus, President, Memorial Sloan-Kettering Cancer Center, New York, New York



The Libraries

The Historical Studies–Social Science Library (Marcia Tucker, Librarian) contains some 120,000 volumes and has subscriptions to over 1,200 journals. The Library is strongest in classical studies, ancient history, and archaeology, but it contains basic document collections, reference works, and important secondary works of scholarship in most fields of history and the social sciences. The journal collection is extensive, and fairly complete back runs exist to the founding of the Institute. The HS-SS Library has occupied its present building since 1964.

The Institute's rare-book collection, the gift of Lessing J. Rosenwald, consists of about 2,000 volumes on the history of science and was compiled by Herbert M. Evans in the 1930s. The collection, which is housed in a special room, includes numerous first editions of important scientific works in mathematics, astronomy, physics, and the life sciences. Additional volumes have been added through various gifts, most notably through the Leon Levy Fund, expanding the subject scope of the collection. The HS-SS Library continues to process books from the library of Walther Heissig, a noted scholar in Central Asian studies. Heissig's library came to the Institute partly as a gift and partly on deposit from Princeton University's Department of East Asian Studies and Princeton University Library. The gift of Giorgio Tonelli's library further expands the Institute's holdings in the history of ideas and philosophy.

The HS-SS Library has an extensive collection of offprints including those received by Professors Andrew E. Z. Alföldi, Kurt Gödel, Ernst H. Kantorowicz, Elias Avery Lowe, Millard Meiss, Erwin Panofsky, Marshall Clagett, and Harry Woolf and former Members Robert Huygens and Walther Kirchner.

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The Mathematics–Natural Sciences Library (Momota Ganguli, Librarian) is based in Fuld Hall, with smaller departmental branches in Bloomberg Hall, and compact shelving spread across campus. The collection, which includes about 30,000 volumes of monographs and bound periodicals as well as 160 print and electronic subscriptions, spans pure and applied mathematics, astrophysics, theoretical and mathematical physics, and biology. The M-NS Library has an extensive collection of the collected works of mathematicians including those of Cauchy, Descartes, Fermat, Gauss, Hardy, and Poincaré. Each year, the M-NS Library adds about 300 books to its collection.

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The HS-SS Library maintains a computer center with access to scanners and a variety of software packages for both PCs and Macintoshes, and access to databases in the fields of classical studies, the history of science, and Islamic and French studies. The M-NS Library's electronic resources include access to Math-SciNet, an online catalog, a variety of indexes, and a growing collection of full-text journals. All scholars affiliated with the Institute enjoy the same privileges as Princeton University faculty in the Princeton University Library system. All scholars also have privileges in the Robert E. Speer Library of the Princeton Theological Seminary. The Librarians and the Faculty of all four Schools at the Institute warmly appreciate gifts of books and publications from former and current Members of the Institute.

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Institute for Advanced Study—
Louis Bamberger and Mrs. Felix Fuld Foundation

Financial Statements
June 30, 2008 and 2007
(With Independent Auditors' Report Thereon)

Independent Auditors' Report

The Board of Trustees

Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation:

We have audited the accompanying statements of financial position of Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation (the Institute) as of June 30, 2008 and 2007, and the related statements of activities and cash flows for the years then ended. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audits.

We conducted our audits in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Institute's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audits provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation as of June 30, 2008 and 2007, and the changes in its net assets and its cash flows for the years then ended in conformity with U.S. generally accepted accounting principles.

KPMG LLP

October 28, 2008

STATEMENTS OF FINANCIAL POSITION
JUNE 30, 2008 AND 2007

Assets	2008	2007
Cash	\$ 954,245	2,544,402
Accounts receivable	905,024	653,763
Government grants and contracts receivable	2,780,100	3,627,985
Accrued investment income	53,056	423,549
Prepaid and other assets	630,393	481,156
Contributions receivable—net	3,558,944	925,155
Unamortized debt issuance costs—net	695,483	930,599
Funds held by trustee	10,864,390	17,313,225
Beneficial interest in remainder trust	3,350,996	3,775,288
Land, buildings and improvements, equipment and rare book collection—net	60,465,060	52,377,778
Investments	666,901,593	686,367,878
Total assets	\$ 751,159,284	769,420,778
Liabilities and Net Assets		
Liabilities:		
Accounts payable and accrued expenses	\$ 7,049,395	5,602,870
Refundable advances	6,704,673	5,965,077
Liabilities under split-interest agreements	2,387,758	2,725,667
Accrued benefit obligation	9,089,256	12,004,751
Asset retirement obligation	874,438	845,598
Bond swap liability	1,874,573	77,865
Note payable	621,402	683,825
Long-term debt	62,458,856	64,571,136
Total liabilities	91,060,351	92,476,789
Net assets:		
Unrestricted	423,316,404	443,473,344
Temporarily restricted	165,627,184	172,861,706
Permanently restricted	71,155,345	60,608,939
Total net assets	660,098,933	676,943,989
Total liabilities and net assets	\$ 751,159,284	769,420,778

See accompanying notes to financial statements.

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2008

	Unrestricted	Temporarily restricted	Permanently restricted	Total
Operating revenues, gains and other support:				
Private contributions and grants	\$ —	4,912,365	—	4,912,365
Government grants	—	6,669,653	—	6,669,653
Endowment spending policy	22,341,145	9,528,355	—	31,869,500
Auxiliary activity	4,736,416	—	—	4,736,416
Net assets released from restrictions— satisfaction of program restrictions	21,110,373	(21,110,373)	—	—
Total operating revenues, gains and other support	48,187,934	—	—	48,187,934
Expenses:				
School of Mathematics	8,694,889	—	—	8,694,889
School of Natural Sciences	9,596,216	—	—	9,596,216
School of Historical Studies	5,699,130	—	—	5,699,130
School of Social Science	3,208,209	—	—	3,208,209
Libraries and other academic	5,300,486	—	—	5,300,486
Administration and general	11,178,375	—	—	11,178,375
Auxiliary activity	5,186,983	—	—	5,186,983
Total expenses	48,864,288	—	—	48,864,288
Change in net assets from operations, including depreciation	(676,354)	—	—	(676,354)
Other revenues, gains and other support:				
Private contributions and grants to endowment	2,709,349	1,725,690	10,546,406	14,981,445
Endowment change after applying spending policy	(20,411,124)	(8,960,212)	—	(29,371,336)
Change in fair value of bond swap liability	(1,796,708)	—	—	(1,796,708)
Gain on sale of plant assets	9,200	—	—	9,200
Gain on defeasance of debt	8,697	—	—	8,697
Change in net assets	(20,156,940)	(7,234,522)	10,546,406	(16,845,056)
Net assets—beginning of year	443,473,344	172,861,706	60,608,939	676,943,989
Net assets—end of year	\$ 423,316,404	165,627,184	71,155,345	660,098,933

See accompanying notes to financial statements.

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2007

	Unrestricted	Temporarily restricted	Permanently restricted	Total
Operating revenues, gains and other support:				
Private contributions and grants	\$ —	4,138,281	—	4,138,281
Government grants	—	6,388,967	—	6,388,967
Endowment spending policy	21,195,708	8,137,692	—	29,333,400
Auxiliary activity	4,792,841	—	—	4,792,841
Net assets released from restrictions— satisfaction of program restrictions	18,664,940	(18,664,940)	—	—
Total operating revenues, gains and other support	44,653,489	—	—	44,653,489
Expenses:				
School of Mathematics	8,185,826	—	—	8,185,826
School of Natural Sciences	8,108,222	—	—	8,108,222
School of Historical Studies	5,654,350	—	—	5,654,350
School of Social Science	3,120,815	—	—	3,120,815
Libraries and other academic	5,775,886	—	—	5,775,886
Administration and general	9,147,227	—	—	9,147,227
Auxiliary activity	5,120,920	—	—	5,120,920
Total expenses	45,113,246	—	—	45,113,246
Change in net assets from operations, including depreciation	(459,757)	—	—	(459,757)
Other revenues, gains and other support:				
Private contributions and grants to endowment	7,081,605	247,818	4,135,948	11,465,371
Endowment returns in excess of spending policy	52,439,638	30,625,070	—	83,064,708
Change in fair value of bond swap liability	(77,865)	—	—	(77,865)
Gain on sale of plant assets	11,086	—	—	11,086
Loss on defeasance of debt	(1,270,741)	—	—	(1,270,741)
Change in net assets	57,723,966	30,872,888	4,135,948	92,732,802
Net assets—beginning of year	385,749,378	141,988,818	56,472,991	584,211,187
Net assets—end of year	\$ 443,473,344	172,861,706	60,608,939	676,943,989

See accompanying notes to financial statements.

STATEMENTS OF CASH FLOWS
YEARS ENDED JUNE 30, 2008 AND 2007

	2008	2007
Cash flows from operating activities:		
Change in net assets	\$ (16,845,056)	92,732,802
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation	3,644,140	3,168,893
Contributions restricted for endowment and plant	(9,527,236)	(3,994,212)
Net depreciation (appreciation) in fair value of investments	5,694,264	(110,607,503)
Change in fair value of bond swap liability	1,796,708	77,865
Gain on sale of plant assets	(9,200)	(11,086)
(Gain) loss on defeasance of debt	(8,697)	1,270,741
Amortization of debt issuance costs	103,660	96,625
Amortization of bond discount	26,742	8,542
Changes in assets/liabilities:		
Accounts receivable and government grants and contracts receivable	596,624	(170)
Accrued investment income	370,493	54,567
Prepaid and other assets	(149,237)	221,748
Contributions receivable	(2,633,789)	(266,842)
Beneficial interest in remainder trust	424,292	(424,837)
Accounts payable and accrued expenses	1,446,525	(1,482,730)
Refundable advances	739,596	1,343,348
Accrued benefit obligation	(2,915,495)	(1,915,007)
Asset retirement obligation	28,840	24,138
Net cash used in operating activities	(17,216,826)	(19,703,118)
Cash flows from investing activities:		
Proceeds from sale of plant assets	537,774	353,561
Purchase of plant assets	(12,259,996)	(5,980,541)
Proceeds from sale of investments	727,962,734	849,454,169
Purchase of investments	(714,190,713)	(831,057,547)
Net cash provided by investing activities	2,049,799	12,769,642
Cash flows from financing activities:		
Contributions restricted for endowment and plant	9,527,236	3,994,212
(Decrease) increase in liabilities under split-interest agreements	(337,909)	96,733
Increase in unamortized debt issuance costs	(138,737)	(631,047)
Increase in bond discount on long-term debt	(94,253)	(177,464)
Repayment of long-term debt	(2,015,000)	(925,000)
Defeasance of long-term debt	(11,295,000)	(28,260,000)
Proceeds from issuance of long-term debt	11,544,121	48,814,261
Repayments of note payable	(62,423)	(61,193)
Decrease (increase) in funds held by trustee	6,448,835	(14,496,901)
Net cash provided by financing activities	13,576,870	8,353,601
Net (decrease) increase in cash	(1,590,157)	1,420,125
Cash—beginning of year	2,544,402	1,124,277
Cash—end of year	\$ 954,245	2,544,402
Supplemental data:		
Interest paid	\$ 1,740,125	2,071,234

See accompanying notes to financial statements.

NOTES TO FINANCIAL STATEMENTS
JUNE 30, 2008 AND 2007

(1) **Organization and Summary of Significant Accounting Policies**

Organization

The Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation (the Institute), an independent, private institution devoted to the encouragement, support and patronage of learning, was founded in 1930 as a community of scholars where intellectual inquiry could be carried out in the most favorable circumstances.

Focused on mathematics and classical studies at the outset, the Institute today consists of the School of Historical Studies, the School of Mathematics, the School of Natural Sciences and the School of Social Science. Each school has a small permanent faculty, and some 190 fellowships are awarded annually to visiting members from other research institutions and universities throughout the world.

The objectives of the Institute were described as follows in the Founders' original letter to the first Trustees: "The primary purpose is the pursuit of advanced learning and exploration in fields of pure science and high scholarship to the utmost degree that the facilities of the institution and the ability of the faculty and students will permit."

Summary of Significant Accounting Policies

Basis of Presentation

The accompanying financial statements, which are presented on the accrual basis of accounting, have been prepared to focus on the Institute as a whole and to present net assets and revenues, expenses, gains, and losses based on the existence or absence of donor-imposed restrictions. Accordingly, net assets and changes therein are classified as follows:

- Permanently restricted net assets—net assets subject to donor-imposed stipulations that they be maintained permanently by the Institute. Generally, the donors of these assets permit the Institute to use all or part of the income earned on related investments for general or specific purposes.
- Temporarily restricted net assets—net assets subject to donor-imposed stipulations that will be met by actions of the Institute and/or by the passage of time.
- Unrestricted net assets—net assets not subject to donor-imposed stipulations. Unrestricted net assets may be designated for specific purposes by action of the board of trustees.

Revenues are reported as increases in unrestricted net assets unless use of the related asset is limited by donor-imposed restrictions. Expenses are reported as decreases in unrestricted net assets. Expiration of donor-imposed stipulations that simultaneously increase unrestricted net assets and decrease temporarily restricted net assets are reported as net assets released from restrictions. Temporarily restricted revenues received and expended during the same fiscal year are recorded as unrestricted revenues and expenses in the statements of activities.

Contributions and investment returns with donor-imposed restrictions are reported as temporarily restricted revenues and are reclassified to unrestricted net assets when an expense is incurred that satisfies the donor-imposed restriction.

Contributions of long-lived assets are reported as unrestricted revenue. Contributions restricted for the acquisition of grounds, buildings, and equipment are reported as temporarily restricted revenues. These contributions are reclassified to unrestricted net assets upon acquisition of the assets.

(a) **Contributions**

Contributions, including unconditional promises to give, are recognized as revenues in the period received. Conditional promises to give are not recognized until they become unconditional, that is when the conditions on which they depend are substantially met. Contributions of assets other than cash are recorded at their estimated fair value. Pledges of contributions to be received after one year are discounted at a risk-

free rate. The discount rates range from 2.36% to 3.34%. Amortization of discount is recorded as additional contribution revenue in accordance with donor-imposed restrictions, if any, on the contributions.

(b) *Investments*

All investments, including short-term investments, investments in marketable securities, limited partnerships and hedge and offshore funds, are reported in the financial statements at fair value, based upon values provided by external investment managers, general partners or quoted market value. The Institute reviews and evaluates the values provided by external investment managers and general partners and agrees with the valuation methods and assumptions used in determining the fair value of funds. These estimated fair values may differ significantly from the values that would have been used had a ready market for these securities existed.

The statements of activities recognize unrealized gains and losses on investments as increases and decreases, respectively, in unrestricted net assets unless their use is temporarily or permanently restricted by explicit donor stipulation. Purchase and sale transactions are recorded on a settlement-date basis. Gains and losses on the sale of investment securities are calculated using the specific identification method.

The Institute regularly offers first mortgages on primary residences to full-time faculty and senior administrative employees who have met certain requirements stipulated by the board of trustees.

(c) *Plant Assets and Depreciation*

Proceeds from the sale of plant assets, if unrestricted, are transferred to operating funds, or, if restricted, to amounts temporarily restricted for plant acquisitions. Depreciation is provided over the estimated useful lives of the respective assets on a straight-line basis (buildings and capital improvements 20–40 years, equipment 3–6 years).

(d) *Refundable Advances*

Conditional amounts are recorded initially as deferred restricted revenue, and are reported as revenues when expended in accordance with the terms of the condition.

(e) *Split Interest Agreements*

The Institute is the beneficiary of various unitrusts, pooled income funds and a gift annuity fund. The Institute's interest in these split interest agreements is reported as a contribution in the year received and is calculated as the difference between the fair value of the assets contributed to the Institute, and the estimated liability to the beneficiary. This liability is computed using actuarially determined rates and is adjusted annually. The assets held by the Institute under these arrangements are recorded at fair value as determined by quoted market price and are included as a component of investments. Changes in the life expectancy of the donor or annuitant, amortization of the discount and other changes in the estimates of future payments are reported as endowment change after applying spending policy in the accompanying statements of activities.

(f) *Unamortized Debt Issuance Costs*

Debt issuance costs represent costs incurred in connection with debt financing. Amortization of these costs is provided on the effective interest method extending over the remaining term of the applicable indebtedness. Debt issuance costs at June 30, 2008 and 2007 were net of accumulated amortization of \$634,270 and \$530,610, respectively.

(g) *Other Revenues, Gains and Other Support*

A portion of long-term investment income and gains and losses is allocated to operating revenue each year in accordance with the Institute's spending policy for investments held for endowment and similar purposes, as more fully discussed in note 4. All other investment income earned and gains and losses on investments held for long-term purposes and nonrecurring revenue and expenses are considered other revenues, gains and other support in the statements of activities.

(h) *Asset Retirement Obligation*

The Institute recognizes the fair value of a liability for legal obligations associated with asset retirements in the period in which the obligation is incurred, in accordance with Financial Accounting Standards

Board (FASB) No. 143, *Asset Retirement Obligations* and FASB Interpretation (FIN) 47, *Accounting for Conditional Asset Retirement Obligations*, if a reasonable estimate of the fair value of the obligation can be made. When the liability is initially recorded, the Institute capitalizes the cost of the asset retirement obligation by increasing the carrying amount of the related long-lived asset. The liability is accreted to its present value each period, and the capitalized cost associated with the retirement obligation is depreciated over the useful life of the related asset. Upon settlement of the obligation, any difference between the cost to settle the asset retirement obligation and the liability recorded is recognized as a gain or loss in the statements of activities.

(i) ***Fund Raising Expenses***

Fund raising expenses incurred by the Institute amounted to \$1,473,629 and \$1,259,139 for the years ended June 30, 2008 and 2007, respectively. This amount is included in administration and general expenses in the accompanying statements of activities.

(j) ***Functional Allocation of Expenses***

The costs of providing program services and support services of the Institute have been summarized on a functional basis in the statements of activities. Accordingly, certain operating costs have been allocated among the functional categories.

(k) ***Tax Status***

The Institute is exempt from federal income taxes pursuant to Section 501(c)(3) of the Internal Revenue Code (the Code) and is listed in the Internal Revenue Service Publication 78. The Institute has been classified as a public charity under Section 509(a) of the Code.

(l) ***Use of Estimates***

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements. Estimates also affect the reported amounts of revenues and expenses during the reported period. Actual results could differ from those estimates.

(m) ***Reclassifications***

Certain reclassifications have been made to the prior year balances to conform to the current year presentation.

(n) ***Recently Adopted Accounting Standards***

In June 2006, the Financial Accounting Standards Board (FASB) issued FASB Interpretation No. 48, *Accounting for Uncertainty in Income Taxes, an interpretation of FASB Statement No. 109* (FIN 48). FIN 48 addresses the accounting for uncertainties in income taxes recognized in an organization's financial statements and prescribes a threshold of more-likely-than-not for recognition and de-recognition of tax positions taken or expected to be taken in a tax return. FIN 48 also provides related guidance on measurement, classification, interest and penalties, and disclosures. There was no significant impact to the Institute's financial statements as a result of the adoption of FIN 48.

(2) **Contributions Receivable**

Unconditional promises to give at June 30, 2008 and 2007 were as follows:

	2008	2007
Unconditional promises to give:		
Less than one year	\$ 1,221,749	658,996
One to five years	2,739,667	343,572
	3,961,416	1,002,568
Discount on promises to give	(402,472)	(77,413)
Total	\$ 3,558,944	925,155

(3) Investments and Funds Held by Trustee

Investments

Endowment and similar funds investments at June 30, 2008 and 2007 are comprised of the following:

	2008	2007
Limited partnerships	\$ 78,420,024	87,779,723
Hedge and offshore funds	526,658,352	519,097,590
Debt securities	50,777,001	68,436,537
Mortgages from faculty and staff	6,566,023	6,287,373
	662,421,400	681,601,223
Funds invested separately:		
Charitable remainder and pooled income funds:		
Cash and cash equivalents	4,046,496	290,327
Fixed income securities	433,697	4,358,645
Stocks	—	117,683
	4,480,193	4,766,655
Total	\$ 666,901,593	686,367,878

The Institute's interests in limited partnerships and offshore funds represent 12% and 79%, respectively, and 91% collectively, of total investments held by the Institute at June 30, 2008 and 13% and 76%, respectively, and 89% collectively, of total investments held by the Institute at June 30, 2007. These instruments may contain elements of both credit and market risk. Such risks include, but are not limited to, limited liquidity, absence of regulatory oversight, dependence upon key individuals, emphasis on speculative investments (both derivatives and nonmarketable investments) and nondisclosure of portfolio composition.

The Institute has committed to invest \$46,663,167 to its limited partnerships at June 30, 2008.

Substantially all of the investments are pooled with each individual fund subscribing to or disposing of units on the basis of the market value per unit, determined on a quarterly basis.

Funds Held by Trustee

Funds held by trustee represent the balance of the proceeds from the 2001, 2006 and 2008 New Jersey Educational Facilities Authority (the Authority) bonds that have not yet been expended for construction purposes or debt service payments. These funds are being held in trust by The Bank of New York. Such funds are invested in U.S. Government obligations with maturities of less than one year. At June 30, 2008 and 2007, the market value of such securities approximates their carrying value.

(4) Investment Return and Endowment Spending Policy

Investment return consists of interest, dividends, and realized and unrealized gains and losses on investments. Each year, the Institute includes a portion of its endowment return in its operating budget, with the amount of such planned support determined using its spending policy. The policy of the Institute is to distribute for current spending a percentage of the fair value of pooled investments which is determined by the Board of Trustees annually.

The following tables summarize the investment return and its classification in the statements of activities for the years ended June 30, 2008 and 2007:

	2008		
	Unrestricted	Temporarily restricted	Total
Dividends and interest	\$ 5,309,488	2,882,940	8,192,428
Realized (loss) gain	(1,191,899)	4,392,667	3,200,768
Unrealized loss	(2,187,568)	(6,707,464)	(8,895,032)
Net depreciation in fair value of investments	(3,379,467)	(2,314,797)	(5,694,264)
Total investment return	1,930,021	568,143	2,498,164
Endowment spending policy for use in operations	22,341,145	9,528,355	31,869,500
Endowment change after applying spending policy	\$ (20,411,124)	(8,960,212)	(29,371,336)

	2007		
	Unrestricted	Temporarily restricted	Total
Dividends and interest	\$ 1,302,958	487,647	1,790,605
Realized gain	24,629,416	14,518,600	39,148,016
Unrealized gain	47,702,972	23,756,515	71,459,487
Net appreciation in fair value of investments	72,332,388	38,275,115	110,607,503
Total investment return	73,635,346	38,762,762	112,398,108
Endowment spending policy for use in operations	21,195,708	8,137,692	29,333,400
Endowment returns in excess of spending policy	\$ 52,439,638	30,625,070	83,064,708

(5) Physical Plant

Physical plant and equipment are stated at cost at date of acquisition, less accumulated depreciation. Library books, other than rare books, are not capitalized.

A summary of plant assets at June 30, 2008 and 2007 follows:

	2008	2007
Land	\$ 377,470	377,470
Land improvements	1,169,517	1,063,469
Buildings and improvements	88,472,102	74,545,515
Equipment	24,158,152	22,049,349
Construction in progress	100,049	4,736,458
Rare book collection	203,508	203,508
Joint ownership property	2,381,472	2,378,346
	116,862,270	105,354,115
Less accumulated depreciation	(56,397,210)	(52,976,337)
Net book value	\$ 60,465,060	52,377,778

The Institute has capitalized interest income of \$467,246 and \$120,751 and interest expense of \$411,610 and \$223,139 in construction in progress for the years ended June 30, 2008 and 2007, respectively.

(6) Long-Term Debt

A summary of long-term debt at June 30, 2008 and 2007 follows:

	2008	2007
1997 Series F & G—NJEFA	\$ —	12,210,000
2001 Series A—NJEFA	2,980,000	2,980,000
2006 Series B—NJEFA	28,900,000	29,600,000
2006 Series C—NJEFA	19,600,000	20,000,000
2008 Series C—NJEFA	11,255,000	—
Less unamortized bond discount	(276,144)	(218,864)
Total long-term debt	\$ 62,458,856	64,571,136

Interest expense on long-term debt for the years ended June 30, 2008 and 2007 was \$1,870,101 and \$1,965,524, respectively.

1997 Series F & G

In November 1997, the Institute received proceeds of the Authority offering of \$16,310,000 Revenue Bonds, 1997 Series F and \$26,565,000 Revenue Bonds, 1997 Series G of the Institute for Advanced Study Issue. A portion of the proceeds (\$16,969,355) was used to retire the existing Revenue Bonds, 1991 Series. The remainder of the proceeds was used for renovations of members housing. These bonds were refunded through the 2006 Series B and 2008 Series C Revenue Bonds detailed below.

2001 Series A

In May 2001, the Institute received proceeds of the Authority offering of \$11,000,000 Revenue Bonds, 2001 Series A of the Institute for Advanced Study Issue. Proceeds were used for the construction of Bloomberg Hall and additional capital projects. These bonds were partially refunded through the 2006 Series B Revenue bonds detailed below.

2006 Series B

In July 2006, the Institute received proceeds of the Authority offering of \$29,600,000 Revenue Bonds, 2006 Series B of the Institute for Advanced Study Issue. The 2006 Series B Bonds were issued to finance the advance refunding of the outstanding 1997 Series G Bonds, the partial advance refunding of the 2001 Series A Bonds, and to pay a portion of certain costs incidental to the sale and issuance of the 2006 Series B Bonds.

2006 Series C

In March 2007, the Institute received proceeds of the Authority offering of \$20,000,000 Revenue Bonds, 2006 Series C of the Institute for Advanced Study Issue. Proceeds are being used to finance the costs of construction, renovating and equipping certain educational facilities of the Institute, to fund capitalized interest on the 2006 Series C Bonds during the renovation and construction and to pay certain costs incidental to the sale and issuance of the 2006 Series C Bonds.

2008 Series C

In March 2008, the Institute received proceeds of the Authority offering of \$11,255,000 Revenue Bonds, 2008 Series C of the Institute for Advanced Study Issue. The 2008 Series C Bonds were issued to finance the advance refunding of outstanding 1997 Series F Bonds, the advance refunding of outstanding 1997 Series G, and to pay a portion of certain costs incidental to the sale and issuance of the 2008 Series C Bonds.

Interest Rates

The 1997 Series F, 1997 Series G, 2001 Series A, and 2008 Series C Bonds bear interest at rates ranging from 3% to 5%, payable semi-annually, are subject to redemption at various prices and require principal payments and sinking fund installments through July 1, 2021. The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute.

The 2006 Series B and C Bonds bear interest at variable rates. The bonds were issued in the Weekly Mode with weekly rates determined by Lehman Brothers Inc, as Remarketing Agent and paid monthly. The maximum interest rate on the 2006 Bonds shall be twelve percent (12%) per annum. The 2006 bonds are subject to redemption at various prices and require principal payments and sinking fund installments through July 1, 2036. The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute. On September 18, 2008 the Institute entered into a contract with JPMorgan Chase Bank to take over as Remarketing Agent, replacing Lehman Brothers Inc.

Bond Swap Agreement

On April 18, 2006, the Institute entered into a swap agreement with Lehman Brothers Commercial Bank covering \$29,600,000 of outstanding 2006 Series B Bonds that required the Institute to pay a fixed rate of 3.7702% to Lehman Brothers Commercial Bank in exchange for Lehman Brothers Commercial Bank agreeing to pay the Institute a variable rate equal to 67% of the USD-LIBOR-BBA rate with a term of three months, payable monthly, on an identical notional amount. The effective date of the swap was July 19, 2006 and the termination date of the swap agreement coincides with the maturity of the bonds, which is July 1, 2031.

In September 2008, the filing of a petition in bankruptcy by Lehman Brothers Holdings Inc. constituted an "Event of Default," giving the Institute the right to terminate the swap and designate an Early Termination Date on notice to Lehman Brothers Commercial Bank. Management is in the process of identifying a new counterparty.

The accounting for this transaction has been made in accordance with Statement of Financial Accounting Standard (SFAS) No. 133, *Accounting for Derivative Instruments and Hedging Activities*. The Institute entered into this swap agreement with the intention of lowering its effective interest rate. At June 30, 2008 and 2007, the fair value of the derivative was (\$1,874,573) and (\$77,865), respectively. The unrealized loss recognized during the year ended June 30, 2008 and 2007 in the amount of \$1,796,708 and \$77,865, respectively, is reported in the statements of activities in change in fair value of bond swap liability.

The bonds are repayable as follows at June 30, 2008:

	<u>Amount</u>
Year ending June 30:	
2009	\$ 2,425,000
2010	2,615,000
2011	2,725,000
2012	2,055,000
2013	2,290,000
2014 through 2036	50,625,000
Total	<u>\$ 62,735,000</u>

(7) Pension Plans and Other Postretirement Benefits

Separate voluntary defined contribution retirement plans are in effect for faculty members and eligible staff personnel, both of which provide for annuities, which are funded, to the Teachers Insurance and Annuity Association and/or the College Retirement Equities Fund. Contributions are based on the individual participant's compensation in accordance with the formula set forth in the plan documents on a nondiscriminatory basis. Contributions for the years ended June 30, 2008 and 2007 totaled approximately \$1,917,516 and \$1,741,000, respectively.

In addition to providing pension benefits, the Institute provides certain health care and life insurance benefits for retired employees and faculty. Substantially, all of the Institute's employees may become eligible for these benefits if they meet minimum age and service requirements. The Institute accrues these benefits over a period in which active employees become eligible under existing benefit plans.

Effective June 30, 2007, the Institute adopted the recognition and disclosure provisions of FASB Statement No. 158, *Employers' Accounting for Defined Benefit Pension and Other Postretirement Plans* (Statement 158). Statement 158 requires organizations to recognize the funded status of defined benefit pension and other postretirement plans as a net asset or liability and to recognize changes in that funded status in the year in which the changes occur through a separate line within the change in unrestricted net assets, apart from expenses, to the extent those changes are not included in the net periodic cost. The implementation of Statement 158 did not have an impact on the accompanying financial statements.

The following table provides a reconciliation of the change in benefit obligation and the funded status of the plan at June 30, 2008 and 2007:

	2008	2007
Postretirement benefit obligation:		
Retirees	\$ 4,639,239	6,227,490
Fully eligible active plan participants	1,487,313	1,674,685
Other active plan participants	2,962,704	4,102,576
Postretirement benefit obligation	<u>\$ 9,089,256</u>	<u>12,004,751</u>
Change in benefit obligation:		
Benefit obligation at beginning of year	\$ 12,004,751	13,919,758
Service cost	389,693	407,843
Interest cost	731,672	850,963
Benefits paid	(554,454)	(464,681)
Actuarial gain	(3,482,406)	(2,709,132)
Benefit obligation at end of year (funded status)	<u>\$ 9,089,256</u>	<u>12,004,751</u>
Components of net periodic benefit cost:		
Service cost	\$ 389,693	407,843
Interest cost	731,672	850,963
Amortization of transition obligation	(3,482,406)	(2,709,132)
Net periodic postretirement benefit cost	<u>\$ (2,361,041)</u>	<u>(1,450,326)</u>
	2008	2007
Benefit obligation weighted average assumptions at June 30, 2008 and 2007:		
Discount rate	6.50%	6.25%
Periodic benefit cost weighted average assumptions for the years ended June 30, 2008 and 2007:		
Discount rate	6.25%	6.25%

At June 30, 2008 and 2007, a 10.0% trend rate was used for health care costs, with the rate decreasing ratably until the year 2015, and then remaining constant at 5.0% thereafter.

The effects of a 1% increase or decrease in trend rates on total service and interest cost and the postretirement benefit obligation are as follows:

	2008		2007	
	Increase	Decrease	Increase	Decrease
Effect on total service and interest cost	\$ 203,384	(161,678)	234,394	(185,806)
Effect on the postretirement benefit obligation	1,077,744	(892,256)	1,602,249	(1,323,751)

Projected payments for each of the next five fiscal years and thereafter are as follows:

	Amount
Year ending June 30:	
2009	\$ 686,000
2010	514,000
2011	545,000
2012	555,000
2013	569,000
2014 through 2017	3,130,000

(8) Temporarily and Permanently Restricted Assets

Restricted net assets are available for the following purposes at June 30, 2008 and 2007:

	2008	2007
Temporarily restricted net assets are restricted to:		
School of Mathematics	\$ 39,536,754	42,533,500
School of Natural Sciences	11,925,902	13,646,782
School of Historical Studies	39,708,158	38,052,148
School of Social Science	63,781,459	67,018,770
Libraries and other academic	4,208,312	4,384,848
Administration and general	6,466,599	7,225,658
	<u>\$ 165,627,184</u>	<u>172,861,706</u>
Permanently restricted net assets are restricted to:		
Investments to be held in perpetuity, the income from which is expendable to support academic services	\$ <u>71,155,345</u>	<u>60,608,939</u>

(9) Disclosures About Fair Value of Financial Instruments

The Institute is required by SFAS No. 107, *Disclosure About Fair Value of Financial Instruments*, to disclose the estimated fair value of financial instruments, both assets and liabilities recognized and not recognized in the statement of financial position, for which it is practicable to estimate fair value.

The estimated fair value amounts in the following disclosure have been determined by the Institute using available market information and appropriate valuation methodologies. The estimates are not necessarily indicative of the amounts the Institute could realize in a current market exchange, and the use of different market assumptions or methodologies could have a material effect on the estimated fair value amounts at June 30, 2008 and 2007.

	2008	2007
Assets:		
Cash	\$ 954,245	2,544,402
Government grants and contracts receivable	2,780,100	3,627,985
Funds held by trustee	10,864,390	17,313,225
Beneficial interest in remainder trust	3,350,996	3,775,288
Investments	666,901,593	686,367,878
Liabilities:		
Note payable	621,402	683,825
Long-term debt	64,329,256	64,969,924

The fair value estimates presented are based on information available to the Institute as of June 30, 2008 and 2007, and have not been revalued since that date. While the Institute is not aware of any significant factors that would affect the estimates since that date, current estimates of fair value could differ significantly from the amounts disclosed.



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