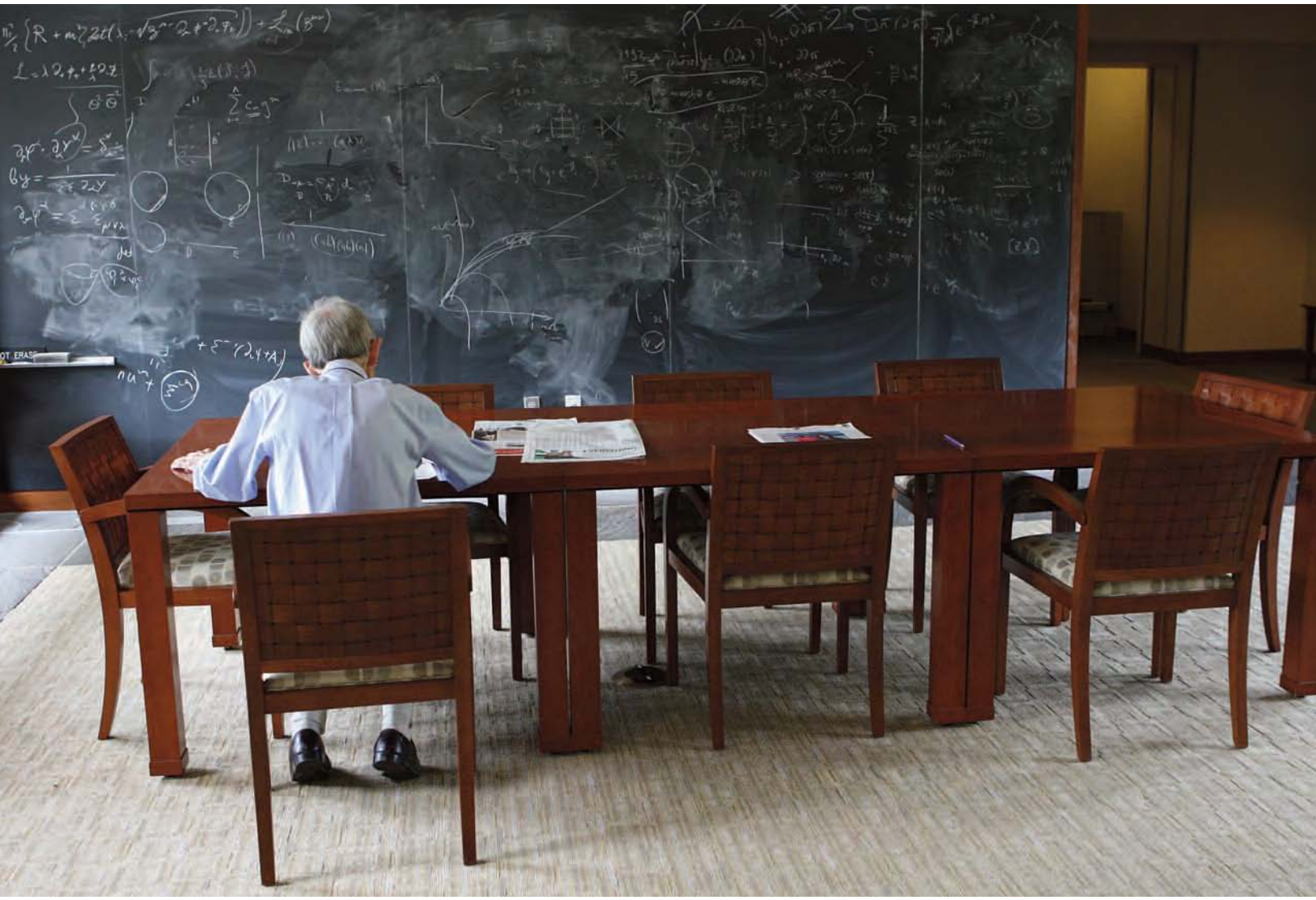
IAS

# Institute for Advanced Study



## Report for the Academic Year 2010–2011

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*

Cover: Freeman Dyson, Professor Emeritus in the School of Natural Sciences, Bloomberg Hall  Photo: Andrea Kane

*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 in the School, which today 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.

# IAS Institute for Advanced Study

## Contents

ANDREA KANE

The Institute for Advanced Study is a community of scholars whose purpose is the pursuit of advanced learning and scholarly exploration. Here, scholars converse outside of Fuld Hall during teatime.

# 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, 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-eight 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 scholars.

The Faculty defines the major themes and questions that become the focus of each School's seminars and other activities, and selects and works closely with visiting Members. Organized in four Schools (Historical Studies, Mathematics, Natural Sciences, and Social Science), the Faculty and Members 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 six thousand former Members hold positions of intellectual and scientific leadership in the United States and abroad. Some twenty-seven Nobel Laureates and thirty-eight out of fifty-two 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

The founding of the Institute for Advanced Study originated in part with a question: "Have you ever dreamed a dream?" Abraham Flexner, an expert on higher education, posed it to Samuel Leidesdorf, an accountant and business adviser, and Herbert Maass, an attorney, who had approached Flexner on behalf of philanthropists Louis Bamberger and his sister Caroline Bamberger Fuld. Flexner's dream of establishing an institution dedicated to the pursuit of curiosity-driven research prompted the Bambergers to donate $5 million to establish the Institute in 1930.

The Institute's role in promoting and cultivating original scholarship in the sciences and humanities has been unparalleled for more than eighty years. Today, it is of the utmost importance to sustain the work of the Institute whose renown and reach draws leading scholars from around the world, providing them with the freedom to pursue their research in an environment dedicated to the advancement of ideas and knowledge.

My wife Lisa and I, together with James Simons, a Vice Chairman of the Board, and his wife Marilyn, are honored to play a role in contributing to the strong foundation for the Institute's future with a $100 million unrestricted challenge grant from the Simons Foundation and the Charles and Lisa Simonyi Fund for Arts and Sciences. This donation will serve as the basis for a $200 million campaign to strengthen the Institute's endowment. The Institute must raise the remaining $100 million from other sources within the next four years, with all donations matched dollar for dollar by the Simons Foundation and the Simonyi Fund.

CLIFF MOORE

The $200 million campaign will ensure that the Institute is able to continue its essential role in fostering fundamental research that advances our understanding of the world. The main goal of the campaign is to raise new endowment funds that will allow the Institute to keep its draw on the endowment at an acceptable level over the long term. The stability and health of the Institute's endowment is essential because the institution relies on endowment income for approximately three-quarters of its operating expenses. It is the endowment that provides the Institute with the financial independence necessary to guarantee academic freedom and flexibility when it comes to choosing which lines of research to pursue, whatever the changing priorities of governmental and other outside funding—an independence that is becoming increasingly rare.

In the past year, the Board welcomed three new Trustees: Bruce Kovner, Founder and Chairman of Caxton Associates; Cynthia Carroll, Chief Executive of Anglo American; and Carmela Vircillo Franklin, Professor of Classics at Columbia University, who was nominated by the School of Historical Studies. Carmela succeeds David Hollinger, Preston Hotchkis Professor of American History at the University of California, Berkeley, who served a five-year term as Trustee for the School. We are grateful to David for his enduring contribution to the Institute's work and purpose.

Flexner's dream for the Institute was not modest. "I am not unaware of the fact that I have sketched an educational Utopia," Flexner, as founding Director of the Institute, wrote in a 1931 confidential memorandum to the Institute's Board of Trustees, which included the Bambergers, Leidesdorf, and Maass. "I have deliberately hitched the Institute to a star; it would be wrong to begin with any other ambition or aspiration." This elevated objective has led to cultural and practical benefits for humankind and continues to produce astounding advances in fundamental research—as evidenced by the talks and events held in honor of the Institute's eightieth anniversary last fall and as articulated in the academic reports of the Schools in the following pages.

We are immensely grateful to the Centennial Council, the Institute's most generous individual contributors, as well as the Friends of the Institute, who provide the Institute with its largest source of unrestricted income; the Association of Members of the Institute for Advanced Study; and foundations, corporations, and other benefactors who support the Institute's mission.

Flexner's immodest ambition set the Institute on an intellectual course that is still in process, providing direction for the decades ahead. It is with a great sense of purpose and dedication that the Board, the Director, Faculty, Staff, and the Institute's many other supporters continue to work to realize the dreams of our founders—in Flexner's words, to attempt "something much higher than is now attained."

Charles Simonyi
*Chairman*

# Report of the Director

In the fall of 2010, the Institute commemorated the eightieth anniversary of its founding by welcoming back past Members on two weekends—the first on September 24–25, primarily for the Schools of Mathematics and of Natural Sciences, and the second on November 12–13, for the Schools of Historical Studies and of Social Science—for programs of lectures, seminars, and celebratory dinners. Illustrating well both the breadth and the engagement of current research at the Institute, the topics covered the geometry of growth, the expanding universe, the possible inconsistency of the foundations of mathematics, the influence of gender on the reinterpretation of the fields of history and social science, the relevance of the classical world to current political phenomena, secularism, and human rights.

This fall, following on from our anniversary year, Princeton University Press will publish *A Community of Scholars: Impressions of the Institute for Advanced Study*, a collection of photographs that give a snapshot of a year, 2009–10, and essays by scholars who, collectively, have known the Institute over seven of its eight decades. Michael Atiyah, who initially came as a Member in 1955–56 and has returned many times since, spending 1969–72 as a Professor in the School of Mathematics, reflected that on his first visit, "Among the young, there was a heady mixture of new ideas, energy, and camaraderie. Friendships were formed and collaborations established that were to last a lifetime and survived geographical dispersion."

It is such long-term assessments of the research done at the Institute and the impact that it has had on those who have spent time here that provide the ultimate means of judging its success. An institution such as the Institute depends for its reputation in large part on the esteem in which it is held by its former Members. The increasing annual levels of donations made by former Members testify to the value many of them place on their time at the Institute. Similarly, donations from the Friends of the Institute have also attained record levels. Together, these two groups contributed nearly $1 million in the year that has just ended.

CLIFF MOORE

Such support, largely unrestricted as to purpose, is of vital importance to the Institute, and the generosity of the donors, when all of us are feeling the effects of the global financial situation, is deeply appreciated. To meet the financial challenges of the last three years, the Institute has reduced expenditure wherever possible, while maintaining the essential quality of its academic life, and it has received extremely generous budgetary support from its Trustees. These measures have protected the Institute's endowment, on which its ability to fulfill its mission depends, but they can only provide a temporary respite. It is essential that we strengthen the Institute's endowment for the longer term so that it can continue its work with confidence in a less certain financial future.

To this end, the Institute has launched a $200 million campaign, and we are immensely thankful to James Simons, a Vice Chairman of the Institute's Board of Trustees and a former Member of the Institute, and Charles Simonyi, Chairman of the Board, who have pledged a $100 million challenge grant, the largest gift in real terms since the founders' gifts establishing the Institute in the 1930s. To secure the grant, the Institute must match it with other gifts within four years. All donations and pledges will count toward this end, including those from Friends and former Members.

This year also brought sadness with the death on January 8 of a much-loved member of the Institute community, Oleg Grabar, Professor Emeritus in the School of Historical Studies. His research and teaching have had profound impact on the study of Islamic art and architecture, and his generosity of spirit, enthusiasm, and playful humor are greatly missed.

Four members of the Faculty retired in June: Enrico Bombieri, IBM von Neumann Professor of Mathematics, after thirty-four years on the Faculty; Arnold Levine, the Institute's first Professor of Biology; Caroline Bynum, Professor of European Medieval History; and Avishai Margalit, George F. Kennan Professor in the School of Historical Studies. All of them have contributed greatly to the life and work of the Institute, and we look forward to their continued involvement.

I am deeply grateful for the support that our Trustees, Faculty, Members, Friends, and Staff give to the Institute. Thank you for your friendship, for enriching the Institute community, and for helping to secure its future and broaden its horizons.

Peter Goddard
*Director*

BENTLEY DREZNER

Lothar von Falkenhausen of the University of California, Los Angeles, spoke about archaeological perspectives on ethnicity in ancient China as part of "DNA, History and Archaeology," a workshop organized by Professor Nicola Di Cosmo. The workshop aimed to understand how historians can profit from a closer collaboration with biologists, anthropologists, and archaeologists.

# School of Historical Studies

Faculty

**Yve-Alain Bois**

**Caroline Walker Bynum**

**Angelos Chaniotis**

**Patricia Crone**, Andrew W. Mellon Professor

**Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies

**Jonathan Israel**

**Avishai Margalit**, George F. Kennan Professor

Professors Emeriti

**Glen W. Bowersock**

**Giles Constable**

**Oleg Grabar**

**Christian Habicht**

**Irving Lavin**

**Peter Paret**

**Heinrich von Staden**

**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 been traditionally on Greek and Roman civilization, medieval, early modern and modern European history, history of art, and the history of science, but over time the School's interests have been 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 in these and other areas of research regularly has 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 Members and thirteen Visitors who joined the School for the academic year 2010–11. Their research spanned a diverse range of historical subjects, including French opera, temples in India, and monks in Korea, as well as the history of race and hunger in America and the portrayal of youth in the ancient novel. The periods studied ranged from as far back as the second millennium B.C.E. to the late twentieth century. Research carried out in the School also extended over a wide geographic range, including Europe, North America, the Middle East, and East and South Asia. Individual Members received support both from the Institute's own funds and from a variety of external sources, including the Andrew W. Mellon Foundation, the Gerda Henkel Stiftung, the Gladys Kriebel Delmas Foundation, and the National Endowment for the Humanities.

Beyond the individual research projects pursued, 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 Lunchtime Colloquia, as well as invited lectures, seminars, and a number of smaller groups that met on a regular basis to present and discuss topics of mutual interest. (See the list of events at the end of this section.)

## ACADEMIC ACTIVITIES

In 2010–11, Professor **Yve-Alain Bois** stayed almost entirely focused on his long-term project, the catalogue raisonné of the paintings and sculpture of the American artist Ellsworth Kelly, which he hopes to complete by the end of the next academic year. As a result, he published only an essay on the Russian painter Kasimir Malevich and his American legacy for the catalogue of an exhibition on this topic at the Larry Gagosian Gallery in New York, as well as an essay on Robert Rauschenberg's gigantic print from 1970, *Current*, for the Art Unlimited Project in Basel. He also edited a group of essays on Julian Schnabel's most recent film *Miral*, for the journal *October*, to which he contributed an introduction. The book he coauthored in 1996 with Rosalind Krauss, *Formless: A User's Guide*, appeared in Japanese.

In early fall, he gave a series of lectures in Japan: one on Barnett Newman at the Kawamura Museum of Art, one on Matisse and Cézanne at the Institute of Technology of the University of Tokyo, and one on pseudomorphism at the University of Tokyo, followed there by a graduate seminar at the Center for Philosophy. In December, he gave a lecture on the state of art history in the United States at the three-day symposium on the humanities organized by the Université de Paris Ouest Nanterre La Défense. In February, he participated in a daylong colloquium on abstraction at the Museum of Modern Art in New York in preparation for an exhibition on the topic curated by Leah Dickerman, scheduled for fall 2012. He continued to work with Harvard University graduate students and served on several dissertation committees at Princeton University. At the Institute, he organized a series of art-history seminars (either at lunch and reserved to Members or in the evening and open to scholars from neighboring institutions.) He also gave a presentation on "materiality" in Professor Caroline Bynum's Medieval Table.

BENTLEY DREZNER

Professor Angelos Chaniotis (right) gave an informal talk "From Achilles' Rage to 'No Drama Obama': Emotions and the Historian," as part of After Hours Conversations, a program held in Harry's Bar to encourage inter-School conversations.

In April 2011, Professor **Caroline Bynum**'s book *Wonderful Blood* (University of Pennsylvania Press, 2007), which explores late medieval conceptions of sacrifice, won the Haskins Medal given by the Medieval Academy of America for the best book in medieval studies. Also in April, her book *Christian Materiality: An Essay on Religion in Late Medieval Europe* appeared from Zone Books. Her current research builds on this study of Christian devotional objects in the Middle Ages and Reformation to raise the larger question, why do certain objects become holy? In thinking about an answer, she not only analyzes ritual performance and the social, economic, and political setting of Christian phenomena but also tries to carry further the sort of cross-cultural comparison she began during her trip to India in 2009 and continued in the workshop on relics she organized last summer with Julia Smith of the University of Glasgow; in a course she taught at the Princeton Theological

Seminary in the fall of 2010 on iconoclasm and "holy things"; and in a paper for a workshop on "divine materiality" held at the Institute for the Study of the Ancient World at New York University in spring 2011.

CLIFF MOORE

Member Padma Kaimal (right), a historian of South Asian art, participated in a Medieval Table lunchtime colloquium organized by Professor Caroline Bynum (left).

Because she served as the Executive Officer of the School in 2010–11, Bynum traveled less than in previous years. She gave public lectures at Princeton, Columbia University, and the Princeton Theological Seminary and spoke about miracles as part of the Columbia Society of Fellows' series on the nature of evidence. In May 2011, she lectured at the Institute for Cultural Inquiry in Berlin and at Ben-Gurion University in Israel. She also conducted a workshop for graduate students at the Israel Historical Society in Jerusalem and, in June, she spoke to the medieval seminar at the University of Glasgow, which gave her an honorary degree. She continued to serve as cochair of the Humanities Commission in Israel. At the Institute, she ran the Wednesday Medieval Table and chaired the program "After Hours Conversations" with colleagues Piet Hut of the Program in Interdisciplinary Studies and Helmut Hofer of the School of Mathematics. She retired on June 30 and moved to New York City, but she hopes to stay in touch with her many friends in Princeton. She is grateful for the seven-and-a-half years she spent among them and for both the quiet research time and the stimulating conversations that the Institute provides.

Professor **Angelos Chaniotis** edited the collective volume *Ritual Dynamics in the Ancient Mediterranean: Agency, Emotion, Gender, Representation* (Stuttgart, 2011) and coedited *Supplementum Epigraphicum Graecum* LVI (Leiden, 2010) and the conference proceedings *Ritual Dynamics and the Science of Ritual: Volume II: Body, Performance, Agency, and Experience* (Wiesbaden, 2010). He also completed the study *Festivals and Contests in the Greek World* for the series *Thesaurus Cultus et Rituum Antiquorum* (Los Angeles, forthcoming) and the editorial work for the *Encyclopedia of Ancient History*, in which he was responsible for the Hellenistic World. His book *Theatricality and Public Life in the Hellenistic World* (in Greek) received in Greece the National Literature Award 2010.

Most of his time was devoted to *The Social and Cultural Construction of Emotions: The Greek Paradigm*, a project funded by the European Research Council. The work of his research team in Oxford involves the collection and analysis of Greek sources that reveal how social and cultural parameters determine manifestations of emotions. A database will be launched in the fall of 2011 and the collective volume *Unveiling Emotion: Sources and Methods for the Study of Emotions in the Greek World* is expected to be published in 2011. During the Twenty-first International Congress of Historical Sciences (Amsterdam, August 2010) Chaniotis co-organized (with Pierre Ducrey) the round table "Emotions as Historical Factor."

In August 2010, Chaniotis participated in the excavation at Aphrodisias (Asia Minor), studying new epigraphic finds and working on two book manuscripts

(*Epigraphic Research at Aphrodisias, 1995–2010* and *From the City of Aphrodite to the City of the Cross: Constructions and Transformations of Identity in Aphrodisias*).

*Historians normally do interdisciplinary work by presenting syntheses to each other. Although this conveys a good sense of how things look in foreign fields, one cannot work with other people's syntheses unless one knows the raw evidence, and one cannot work with other people's raw evidence without some knowledge of its context, biases, allusions, and current views on its proper interpretation.*

At the Institute, Chaniotis organized together with Danielle Allen, UPS Foundation Professor in the School of Social Science, the seminar "The Relevance of the Classical World for Current Political Phenomena" (November 2010) and gave a Faculty lecture on "The Fear of God: An Emotion and its Contexts" (December 2010). With the Ancient Studies Seminar, he gave Members the opportunity to present their ongoing research (March 2010). Together with Anton Bierl, a Member in 2010–11, Chaniotis organized the workshop "Sacred Space" (April 2011), with the participation of Members and scholars from Spain. At Columbia University, he taught the graduate seminar "Emotions in Texts and Images in the Greek World" (September–December 2010) with Ioannis Mylonopoulos. He also lectured in Athens, Berlin, Columbia University, Heidelberg, Mannheim, Münster, Oxford, Paris, Rome, and Toulouse.

**Patricia Crone**, Andrew W. Mellon Professor, finished her book about the Iranian revolts of the eighth to ninth centuries and the light they throw on some persistent features of Iranian religion. She also reworked her Oxford conference paper on Zoroastrian, Christian, and Jewish notions of pre-existence for publication, and three of her articles appeared in print, one written with Masoud Jafarijaze, another with Adam Silverstein, and a third on her own. These activities apart, her year was dominated by a project regarding the transmission of subversive ideas from the Islamic world to Europe. Historians normally do interdisciplinary work by presenting syntheses to each other. Although this conveys a good sense of how things look in foreign fields, one cannot work with other people's syntheses unless one knows the raw evidence, and one cannot work with other people's raw evi-

ANDREA KANE

Professor Patricia Crone (far left) organized a workshop on the transmission of subversive ideas from the Islamic world to Europe.

dence without some knowledge of its context, biases, allusions, and current views on its proper interpretation. Accordingly, the seminars relating to this project dispensed with synthetic papers. Instead, the participants were asked to compile dossiers of all the evidence they could find on their particular, sharply defined questions. These were circulated in advance. In the daylong sessions, each dossier was introduced by a specialist who provided context and answered questions in the general discussion that followed. This took all of the morning and sometimes part of the afternoon as well. Thereafter, the discussion moved on to the relationship between the ideas on the Muslim and the European sides and the possible routes of transmission. The number of participants was deliberately kept small, and the discussion flowed easily, without the need for chairmen or moderators. Each day was devoted to just one idea likely to have migrated from the East. There were some electric moments when participants saw things that none could have seen on his or her own. One further session, perhaps two, will take place next year, when it is hoped that the group will be ready for joint publication.

CLIFF MOORE

Visitor Carolyn Abbate (right), seen with Member Gabriel Gorodetsky, led a discussion during a modern history workshop, which focused on aspects of eighteenth- and nineteenth-century history. Abbate's project concerned the presence and influence of French *opéra-comique* and *opéra-bouffe* in the construction of German modernism from 1890 to 1933.

Crone also ran two of her normal groups at the Institute. One was the Islamicist seminar, which met whenever a Member felt moved to give a paper. The other was the Qur'an reading group, of which the core group has now been so decimated that sadly, it may have reached its end, at least for a while. In addition, Crone presented lectures and seminars at the University of California, Los Angeles, Santa Barbara, and Davis, and the University of North Carolina at Asheville.

In October 2010, **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, spoke at a conference on the Liao empire (New Haven/New York), presented a paper on legal pluralism in Chinese history (Rome), and participated in a conference on "Nomads and Plagues" (Leipzig). He also convened a workshop at the Institute on "DNA, History, and Archaeology." The goal was to gather specialists from all three fields to discuss how archaeology and history may make use of ancient DNA studies and, vice versa, how biologists treat historical evidence. From a methodological viewpoint, it aimed to understand how historians can profit from a closer collaboration with biologists, anthropologists, and archaeologists when formulating hypotheses on the formation and evolution of ancient societies.

The East Asian Seminar, which he convenes every year, comprised three talks in the fall and seven in the spring. In addition to Members in historical studies, some social scientists also participated. His research activity focused on three different projects: the translation and edition of a Manchu grammar from Japanese to English; a new study of ancient nomads that combines material, textual, and scientific evidence; and the study of Manchu political culture and institutions. The first should be completed during the coming year, the second will result in a short monograph, and the last will require some more time to reach completion.

Publications that appeared in the course of the year include an article and

several Chinese translations of his works: "Nurhaci's Names," in *Representing Power in Ancient Inner Asia: Legitimacy, Transmission and the Sacred*, edited by Isabelle Charleux (2010); *Gudai Zhongguo yu qi qiang lin* 古代中国与其强邻 (Beijing, 2010, translation of *Ancient China and Its Neighbors*); "Neiya shi shang de guojia xingxheng yu jieduanhua 内亚史上的国家形成与阶段划" (translation of "State Formation and Periodization in Inner Asian History") in *Xifang Zhongguo shi yanjiu* (Western Studies on Chinese History), edited by Leo K. Shin (2011); and "Yu qiangpao he gan? Huoqi yu Qing diguo de xingcheng 与枪炮何干？火器和清帝国的形成 (translation of "Did Guns Matter? Firearms and the Qing Formation") in *Shijie shijian yu Dongya shijian zhong de Ming Qing bianqian* 世界时间与东亚时间中的明清变迁 (World Historical and East Asian Times in the Ming-Qing Transition), edited by Lynn Struve (2009).

During 2010–11, Professor **Jonathan Israel** finalized the text for *Democratic Enlightenment: Philosophy, Revolution, and Human Rights, 1750–1790*, the third part of his general reinterpretation of the Enlightenment, which Oxford University Press will publish in September 2011. The five-part work covers the history of the Western Enlightenment from the battle over the *Encyclopédie*, in the 1750s, to the outbreak of the French Revolution. He also began the research and writing for his next book, on the role of new philosophical principles and ideas in the French Revolution, commissioned by Princeton University Press.

RANDALL HAGADORN

Visitor Stephen Tracy (left) and Professor Christian Habicht (right) examine a squeeze (an impression of an inscription) in the Institute's collection, one of the largest in the world. The study of Greek and Roman inscriptions has been a primary focus of historians at the Institute since the appointment of Benjamin Meritt in 1935.

At the Institute, with the help of Member Thomas Kühne, he ran the Modern History Workshop focusing on aspects of eighteenth- and nineteenth-century history. He also began a collaboration with Linda Colley and David Bell of the history department at Princeton, jointly organizing the first four sessions of the new Eighteenth-Century Seminar, attracting scholars from Princeton and neighboring universities. The organizers agreed to continue this collaboration over the next several years.

On December 15, Israel was awarded the Franklin Medal, an award made annually by the London Royal Society of Arts (founded 1754), for his work on the Enlightenment. He delivered lectures abroad on various aspects of the Western Enlightenment in Copenhagen, Frankfurt, Bordeaux, Brussels, Leiden, Madrid, and Toledo and twice in London. In the United States, he gave lectures at Holy Cross College, Harvard University, Middlebury College, and on two occasions at the University of Notre Dame as well as at a Liberty Fund Conference on Montesquieu and Rousseau at Hermosa Beach, Los Angeles.

Besides book reviews, his publications this year were "De twee gezichten van de Republiek en haar koloniaal imperium als positief en negatief model van vooruitgang" in *Neerlandistische Ontmoetingen Trefpunt Olomouc*,

edited by Wilken Engelbrecht and B. Hamers (Olomouc, Czech Republic, 2010); "Le contexte philosophique du criticisme biblique radical de Hermann Samuel Reimarus" in *Orthodoxie et héterodoxie. Libertinage et religion en Europe au temps des Lumières*, edited by Marie-Hélène Queval (Saint-Étienne, 2010); and "Tolerancia e intolerancia en los escritos de los Antiphilosophos franceses (1750–1780)" in *Forjadores de la tolerancia*, edited by Maria José Villaverde Rico and J. C. Laursen (Madrid, 2011). His *A Revolution of the Mind: Radical Enlightenment and the Intellectual Origins of Modern Democracy* (Princeton, 2010) appeared in Italian translation under the title *Una Rivoluzione della mente* (Turin, 2011).

CLIFF MOORE

Member Peter Campbell (center; with Professor Avishai Margalit, left, and Professor Jonathan Israel, right) studied the relationship between ideology and politics in France from Louis XIV to the Revolution.

**Avishai Margalit**, George F. Kennan Professor, conducted in the second term of the year a research seminar for Members in the School of Historical Studies on twentieth-century history. In May, Margalit received the Leopold Lucas Prize at the University of Tubingen in Germany. The jury report stated: "he sheds a profound light on important conditions of human life … thereby helping to increase our powers of political decision-making." Margalit's prize lecture was on apostasy.

Margalit was made an honorary fellow of the Queen's College, Oxford, and in May he delivered the Pears Lecture at St Antony's College, Oxford. The title of the lecture was "Reflection on the Arab Revolution."

Professor Emeritus **Glen W. Bowersock** went to Brussels four times in the second half of 2010 to chair a humanities panel of the European Research Council for awarding "advanced grants" to senior scholars. In addition, he continued his service as Presidente of the Consiglio Scientifico of the Istituto Italiano di Studi Umanistici in Florence, but in March 2011 he decided that the time had come to vacate this position after many years. He remained, however, on the Advisory Committee of the Institute for the Study of the Ancient World at New York University and agreed to serve as a Senior Fellow. He similarly remained on the Advisory Board of Jaakko Frösen's Center of Excellence in Helsinki, funded by the Finnish Academy, and he attended a meeting in Helsinki to review the progress of the publication of the Petra Papyri and the excavation at the Jebel Haroun in Petra. In late November, he returned to Jordan to visit the excavations at Umm al-jimal, Petra, and Humeima.

*Among Professor Bowersock's scholarly contributions were an analysis of the terrorist charity known as Parabalani that murdered the mathematician Hypatia in the fifth century and a paper on iatrosophists, who were doctors that gave virtuoso public demonstrations of their skills.*

In April 2011, Bowersock spent two weeks in Jerusalem as a guest of the Historical Society of Israel to deliver three lectures in memory of Menahem Stern on "Collision of Empires in Late Antiquity: 1) Byzantium, Ethiopia, and the Jewish Kingdom of South Arabia; 2) The Capture of Jerusalem; and 3) Heraclius' Gift to Islam—the Death of the Persian Empire." During the academic year, Bowersock published reviews in the *New York Review of Books*, the *Times Literary Supplement*, and the *London Review of Books*, as well as an illustrated homage to the great French epigraphist Louis Robert in the *Comptes Rendus* of the Académie des

Inscriptions et Belles-Lettres. He wrote a memoir about the late Bernard Knox for the *New Republic*. Among his scholarly contributions were an analysis of the terrorist charity known as Parabalani that murdered the mathematician Hypatia in the fifth century and a paper on iatrosophists, who were doctors that gave virtuoso public demonstrations of their skills. His paper on a funerary epigram inscribed on a stone from Laodicea in Turkey was based on a squeeze of the inscription in the archive given to the Institute by Jeanne Robert.

During the academic year 2010–11, Professor Emeritus **Giles Constable** published one book, one article, and one review. A previously published article was reprinted. Three books are in course of publication. In addition to attending several conferences, he gave a lecture at Harvard University and spoke at the meeting in honor of the eleven hundredth anniversary of the foundation of Cluny (September 2010) and at the meeting of the International Congress of Medieval Studies in Kalamazoo (May 2011). He presided at sessions of meetings at Ohio State University and Princeton University. He was a member of the Advisory Board of *The Oxford Dictionary of the Middle Ages*, which was published this year. He continues to serve on the editorial boards of several book series and scholarly journals, as a reviewer for the American Philosophical Society, and on the selection committee of the Delmas Foundation.

The late Professor Emeritus **Oleg Grabar** was presented with the Aga Khan Award for Architecture in Doha, Qatar, in November 2010. He was also the winner of the World Book Prize for the Book of the Year of the Islamic Republic of Iran for his book *Images en terre d'Islam*. The book was published in English in 2009 as *Masterpieces of Islamic Art: The Decorated Page*. The School mourns the passing of Professor Grabar, who died on January 8, 2011.

Professor Emeritus **Christian Habicht** read proofs for volumes three and four of the new edition of Polybius and for an edition in modern Greek of his 1985 book on Pausanias. He continued his work on Ancient Cyzicus and participated in an international colloquium on Cyzicus in Antiquity held in March 2011 at the University of Metz, where he spoke on "Cyzicus: The Epigraphic Evidence."

Most of Professor Heinrich von Staden's (left) research remained focused on the role of animals in the development of ancient science and medicine.

KATE ABLUTZ

His publications were volume 3 (books 5–8) of the Loeb Polybius, published in April, and the Greek edition of his *Pausanias and His Guide to Greece*, published in Athens in January. Other publications were: "Zum Problem thessalischer Phratrien" in *Onomatologos: Studies in Greek Personal Names Presented to Elaine Matthews* (Oxford 2010); "Stephen Tracy the Epigraphist" and "The City of Kyzikos, Client of Oracles" in *Studies in Greek Epigraphy and History in Honor of Stephen V. Tracy* (Bordeaux 2010); and a Greek translation of his

paper "Ambrakia and the Thessalian League in the Time of the War against Perseus," in *Thessaliko Hemerologio* 59, 2011. Other papers were accepted for publication.

Professor Emeritus **Irving Lavin** gave his annual seminar in Italian at the Istituto Italiano per gli Studi Filosofici in Naples, Italy. He participated in a spring seminar with the architect Frank Gehry and Arnold Levine, Professor in the School of Natural Sciences, sponsored by the Institute's Simons Center for Systems Biology, which explored the striking similarities frequently found between architectural forms and biological structures on the molecular level. He presented a paper devoted to structures consisting of interlacing linear components. In a month-long program centered on Gehry's visit to the Institute, Lavin lectured on the phenomenon of movement in Gehry's architecture, and he and Marilyn Aronberg Lavin together gave a lecture on the Institute's seal, "Truth and Beauty at the Institute for Advanced Study." In a series inaugurating the new Mandel Center for the Humanities at Brandeis University, he lectured on the provocative and enigmatic pedestals of Bernini's famous baldachin over the high altar of St. Peter's in Rome. A major monograph on Bernini's work at St. Peter's is in course of publication. There appeared a new Italian edition of a book edited by Lavin, *Erwin Panofsky: Three Essays on Style* (Milan, 2011).

CLIFF MOORE

Member Menachem Fisch, who studies major upheavals in science and mathematics, joined a discussion about Platonic philosophy during a Historical Studies lunchtime colloquium.

On October 15, Professor Emeritus **Peter Paret** opened a conference at the Humboldt University in Berlin on the intellectual and political history of military education in the Western world with a talk on the course of lectures Clausewitz began at the Berlin War Academy on October 15, 1810. An expanded version of his talk, "Clausewitz' Vorlesungen über den kleinen Krieg," was published in the *Jahrbuch der Clausewitz-Gesellschaft* VI (2010), and in English translation, "Clausewitz: 'Half against my will, I have become a Professor,'" in the *Journal of Military History* LXXV (April 2011). Paret's essay "Internationalism for the Nation: Max Liebermann as Cultural Politician" in imperial and Weimar Germany, appeared in *Max Liebermann*, edited by Marion Deshmukh, et al. (Berghahn Books, 2011), and his essay "Aufklärung und Preussische Reform" appeared in the *Festschrift für Herfried Münkler*, edited by Marcus Llanque, et al. (Akademie-Verlag, 2011). Paret also revised and expanded his article "Clausewitz" for the 2011 edition of *The Oxford Companion to Politics in the World*, and wrote reviews in the *Journal of Interdisciplinary History and Central European History*. He was awarded the Historical Society's Jack Miller Center Prize for his essay on Marc Bloch and Clausewitz, "Two Historians on Defeat in War and its Causes," in *Historically Speaking* XI (June 2010). A German text will appear in the 2011 *Jahrbuch der Clausewitz-Gesellschaft*. Under license of Princeton University Press, the Folio Society published a luxury edition of his and Michael Howard's translation of Clausewitz's *On War* and World Affairs Press, Beijing, published a Chinese translation, supplementing its 2001 English language edition, of *Makers of Modern Strategy*, a collection of twenty-nine essays, three by Paret, on strategic thinkers, first published in 1986. Paret is now preparing lectures for the coming academic year, beginning this Octo-

ber with the keynote address on the place of Frederick the Great in the history of ideas, politics, and war at the German Historical Institute in London, part of the 2011 International Colloquium on the monarch.

In July 2010, Professor Emeritus **Heinrich von Staden** contributed a keynote address to the annual meeting of the Society for the Social History of Medicine in England, and in September, he gave a paper in Oslo at a conference on the genres and purposes of medical texts in antiquity. In early October, he participated in a colloquium on René Chartier (1572–1654) in Paris, organized by former Institute Member Jacques Jouanna and by Véronique Boudon-Millot, in collaboration with the Académie des Inscriptions et Belles-Lettres and the Bibliothèques Interuniversitaires de Médecine (Université Paris Descartes). From the beginning of November to mid-December 2010, he served as a visiting professor in the Faculty of Arts and Letters at the University of Lausanne in Switzerland, where he taught a course and a seminar on ancient Greek and Roman biology and medicine. In addition, he gave several public lectures in Lausanne, including two in the Faculty of Biology and Medicine and two at the École Polytechnique Fédérale de Lausanne. In November, he also gave a lecture at the Fondation Martin Bodmer in Geneva, at a colloquium organized in conjunction with an exhibition of medieval manuscripts ("Ancient Medicine, from the Body to the Stars"). In the spring, he taught a graduate seminar at Princeton University on animals in ancient science, natural history, and medicine. From January to April, he also gave lectures at the University of Nebraska in Lincoln (Departments of Classics and Religious Studies), University of South Florida (Interdisciplinary Center for Hellenic Studies and American Foundation for Greek Language and Culture), University of Notre Dame (Institute for Advanced Study), Tulane University (Department of Classical Studies), and Oregon State University (at a workshop on "Experimenting with Animals from Antiquity to the Enlightenment").

In June 2011, the Université Paris-Sorbonne awarded von Staden an honorary doctorate at a ceremony in the Grand Amphithéâtre of the Sorbonne. During his brief stay in Paris, he also gave a lecture at a meeting of the École Doctorale Mondes Anciens et Médiévaux. In addition to some book reviews, he published several articles during the academic year, most recently "How Greek was the Latin Body? The Parts and the Whole in Celsus' *Medicina*," in *Body, Disease and Treatment in a Changing World: Latin Texts and Contexts in Ancient and Medieval Medicine*, edited by David Langslow and Brigitte Maire (Lausanne, 2010). Most of his research remained focused on the role of animals in the development of ancient science and medicine.

Professor **Morton White** has been revising the manuscript of a book that now bears the title "Reflections on the Roots of Rationalism," a critical exposition of views on necessary truth in the writings of Descartes, Hobbes, Leibniz, and Kant. When completed it will be submitted to a publisher. Furthermore, a book he first published in 1962 with the late Lucia Perry White—*The Intellectual versus The City: From Thomas Jefferson to Frank Lloyd Wright*—may soon be republished with a new introductory essay by N. S. Slabbert.

## MEMBERS AND VISITORS

*f* First Term ✦ *s* Second Term ✦ *v* Visitor ✦ *a* Research Assistant

**Carolyn Abbate**
*Music History* ✦ University of Pennsylvania ✦ *v*

**Asad Q. Ahmed**
*Islamic Studies* ✦ Washington University in St. Louis
*Funding provided by The Andrew W. Mellon Foundation Fellowships for Assistant Professors*

**Juhn Ahn**
*East Asian Studies* ✦ University of Toronto
*Funding provided by The Andrew W. Mellon Foundation Fellowships for Assistant Professors*

**Thomas Ahnert**
*Early Modern Intellectual History* ✦ The University of Edinburgh
*Rosanna and Charles Jaffin Founders' Circle Member; additional funding provided by The Herodotus Fund*

**Abdulrahman al-Salimi**
*Islamic Studies* ✦ Ministry of Endowments and Religious Affairs, Sultanate of Oman ✦ *s*
*Funding provided by The Patrons Endowment Fund*

**Mehmet-Ali Ataç**
*Art of the Ancient Near East and Egypt* ✦ Bryn Mawr College
*Hetty Goldman Member*

**Dirk Baltzly**
*Ancient Greek Philosophy* ✦ Monash University
*Funding provided by the National Endowment for the Humanities*

**Yelena Baraz**
*Classics* ✦ Princeton University ✦ *v*

**Anton Bierl**
*Classics* ✦ Universität Basel
*Gerda Henkel Stiftung Member*

**Constance Brittain Bouchard**
*Medieval History* ✦ The University of Akron ✦ *v*

**Daniela L. Caglioti**
*Modern Sociopolitical History* ✦ Università degli Studi di Napoli Federico II ✦ *s*
*Elizabeth and J. Richardson Dilworth Fellow in Historical Studies*

**Peter R. Campbell**
*Early Modern French History* ✦ Institut d'Études Culturelles, Université de Versailles Saint-Quentin-en-Yvelines ✦ *f*
*Elizabeth and J. Richardson Dilworth Fellow in Historical Studies*

**Joan Breton Connelly**
*Classical Archaeology* ✦ New York University
*Hetty Goldman Member; additional funding provided by The Andrew W. Mellon Foundation*

**François de Blois**
*History of the Near East and Central Asia* ✦ School of Oriental and African Studies, University of London ✦ *s*
*The Gladys Krieble Delmas Foundation Member*

**Janet Downie**
*Classics* ✦ Princeton University ✦ *v*

**Glenn Dynner**
*Early Modern European History* ✦ Sarah Lawrence College
*Hans Kohn Member*

**Darby English**
*Art History* ✦ The University of Chicago
*Funding provided by the National Endowment for the Humanities*

**Menachem Fisch**
*History and Philosophy of Science* ✦ Tel Aviv University
*Friends of the Institute for Advanced Study Member; additional funding provided by The Andrew W. Mellon Foundation*

**Sharon E. J. Gerstel**
*Medieval History, Art History* ✦ University of California, Los Angeles
*Funding provided by the Fund for Historical Studies and The Andrew W. Mellon Foundation*

**Jessica L. Goldberg**
*Medieval History* ✦ University of Pennsylvania ✦ *v, f*

**Jack Goody**
*Social Anthropology* ✦ University of Cambridge ✦ *v, s*

**Gabriel Gorodetsky**
*Russian and British History* ✦ All Souls College, University of Oxford
*Funding provided by The Andrew W. Mellon Foundation Fund*

**Laurie Green**
*Modern U.S. History* ✦ The University of Texas at Austin
*Martin L. and Sarah F. Leibowitz Member*

**John Herman**
*Late Imperial China* ✦ Virginia Commonwealth University
*The Starr Foundation East Asian Studies Endowment Fund Member*

**Regina Höschele**
*Classics* ✦ University of Toronto ✦ *s*
*Funding provided by The Andrew W. Mellon Foundation Fellowships for Assistant Professors*

**Padma Kaimal**
*History of South Asian Art* ✦ Colgate University
*Louise and John Steffens Founders' Circle Member; additional funding provided by The Starr Foundation East Asian Studies Endowment Fund*

**Katrin Kogman-Appel**
*Art History* ✦ Ben-Gurion University of the Negev ✦ *v*

**Denis Kozlov**
*Russian History* ✦ Dalhousie University
*Funding provided by The Andrew W. Mellon Foundation Fellowships for Assistant Professors*

**Thomas Kühne**
*Cultural History* ✦ Clark University ✦ *v*

**Norman Kutcher**
*Late Imperial China* ✦ Syracuse University
*Funding provided by the Fund for Historical Studies*

**Margaret Larkin**
*Arabic Literary History* ✦ University of California, Berkeley
*The Gladys Krieble Delmas Foundation Member; additional funding provided by the Elizabeth and J. Richardson Dilworth Fund*

**Eléonore Le Jallé**
*Philosophy* ✦ Université Lille 3 ✦ *v, f*

**Wilferd Madelung**
*Islamic Studies* ✦ University of Oxford ✦ *s*
*Funding provided by The Andrew W. Mellon Foundation Fund*

**Stephen Menn**
*Ancient and Medieval Philosophy and Science* ✦ McGill University ✦ *v, f*

**Micah S. Muscolino**
*Chinese History* ✦ Georgetown University
*Funding provided by The Andrew W. Mellon Foundation Fellowships for Assistant Professors and the National Endowment for the Humanities*

**Stefania Pastore**
*Early Modern History* ✦ Scuola Normale Superiore di Pisa ✦ *f*
*Funding provided by The Herodotus Fund*

**Susan Pedersen**
*Modern International History* ✦ Columbia University ✦ *s*
*Funding provided by the Association of Members of the Institute for Advanced Study (AMIAS); additional funding provided by The Andrew W. Mellon Foundation*

**Marcus Plested**
*Medieval History and Theology* ✦ University of Cambridge
*George William Cottrell, Jr. Member*

**Alessio Ponzio**
*Modern European History* ✦ Università degli Studi Roma Tre ✦ *s*
*Funding provided by The Herodotus Fund*

**Himanshu Prabha Ray**
*Ancient Indian History and Archaeology* ✦ Jawaharlal Nehru University
*Felix Gilbert Member*

**Ricardo Salles**
*Ancient Greek Philosophy* ✦ Instituto de Investigaciones Filosóficas, Universidad Nacional Autónoma de México
*Funding provided by the Willis F. Doney Membership*

**Martha A. (Marni) Sandweiss**
*American History and Visual Culture* ✦ Princeton University ✦ *v, f*

**Paul Schubert**
*Classics, Papyrology* ✦ Université de Genève ✦ *v, f*

**Justin E. H. Smith**
*History of Early Modern Philosophy* ✦ Concordia University, Montreal ✦ *s*
*Funding provided by the Willis F. Doney Membership and The Herodotus Fund*

**Kirill Solonin**
*Buddhism, East Asian Studies* ✦ Fo Guang University ✦ *s*
*The Starr Foundation East Asian Studies Endowment Fund Member*

**Rachel St. John**
*North American History* ✦ Harvard University ✦ *f*
*Agnes Gund and Daniel Shapiro Member*

**Dimitris Stamatopoulos**
*Balkan History, Late Ottoman History* ✦ University of Macedonia

**Richard Taws**
*Art History* ✦ University College London ✦ *f*
*Funding provided by The Herodotus Fund*

**Stephen V. Tracy**
*Greek History, Epigraphy* ✦ The American School of Classical Studies at Athens ✦ *v*

**Karl Ubl**
*Medieval History* ✦ Eberhard Karls Universität Tübingen
*Edwin C. and Elizabeth A. Whitehead Fellow; additional funding provided by The Herodotus Fund*

**Peter Urquhart**
*Renaissance Music* ✦ University of New Hampshire ✦ *f*
*Edward T. Cone Member in Music Studies*

**Peter van Alfen**
*Numismatics, Ancient Monetary Systems* ✦ American Numismatic Society ✦ *s*
*Agnes Gund and Daniel Shapiro Member; additional funding provided by the Elizabeth and J. Richardson Dilworth Fund*

**Joseph Witztum**
*Islamic History* ✦ Princeton University ✦ *a*

**Andrea Worm**
*Art History, Visual Studies* ✦ Universität Augsburg ✦ *s*
*Funding provided by the Willis F. Doney Membership*

## RECORD OF EVENTS

### October 6
Medieval Table Lunchtime Colloquium ✦ *General Discussion of Approaches to Medieval Studies at IAS* ✦ **Padma Kaimal**, Colgate University; Member, School of Historical Studies, and **Caroline Walker Bynum**, Professor, School of Historical Studies

### October 11
Historical Studies Lunchtime Colloquia Series ✦ *Writing History under a Fatwa: Stalin a Tsar Reincarnated or a Prophet Armed?* ✦ **Gabriel Gorodetsky**, All Souls College, University of Oxford; Member, School of Historical Studies

### October 12
Art History Lunch Seminar ✦ *General Discussion* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies

### October 13
Medieval Table Lunchtime Colloquium ✦ *Sacred Space and Time in Byzantine and Roman Churches* ✦ **Sharon E. J. Gerstel**, University of California, Los Angeles; Member, School of Historical Studies, and **Erik Thunø**, Rutgers, The State University of New Jersey

### October 18
Historical Studies Lunchtime Colloquia Series ✦ *The Marrano, the Philosopho, and the Culture of Skepticism: Spain and Italy through the Eyes of Diego Hurtado de Mendoza* ✦ **Stefania Pastore**, Scuola Normale Superiore di Pisa; Member, School of Historical Studies

### October 19
Art History Lunch Seminar ✦ *Social Experiments with Modernism* ✦ **Darby English**, The University of Chicago; Member, School of Historical Studies

### October 20
Medieval Table Lunchtime Colloquium ✦ *"Quota Generatione Christiani cum Propinquis in Coniugium Convenire Possint": A Hitherto Unknown Text by Hrabanus Maurus?* ✦ **Karl Ubl**, Eberhard Karls Universität Tübingen; Member, School of Historical Studies

Modern History Workshop ✦ *Rethinking the Origins of the French Revolution* ✦ **Peter R. Campbell**, Institut d'Études Culturelles, Université de Versailles Saint-Quentin-en-Yvelines; Member, School of Historical Studies

### October 22
Workshop: DNA, History, and Archaeology ✦ *The First Emperor's Home Base: Archaeological Perspectives on Ethnicity in Ancient China* ✦ **Lothar von Falkenhausen**, University of California, Los Angeles

### October 23
Workshop: DNA, History, and Archaeology ✦ *Introduction* ✦ **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, School of Historical Studies ✦ *Archaeological DNA Studies in the Old World* ✦ **David Anthony**, Hartwick College ✦ *Nomads and Sedentaries of Iran in the First Millennium B.C.: Identifying Persians, Medes, Dahae, Sagartians, Mardians, Derbikes, Tapyrians, and Cadusians in the Historical, Archaeological, and Biological Record* ✦ **Dan Potts**, The University of Sydney ✦ *Reconstructing Prehistory Using DNA: Population Movement Into and Around the Americas* ✦ **Frederika Kaestle**, Indiana University ✦ *High-Resolution Y Chromosome Analysis: A Genetic Tool for History and Archaeology* ✦ **Paolo Francalacci**, Università degli Studi di Sassari ✦ *Genetic History and Migrations in Western Eurasia: 500–1000* ✦ **Patrick Geary**, University of California, Los Angeles ✦ *Migrations into Western Europe: Two Examples from ca. 3000 B.C. and 500 A.D. Genetic Evidence* ✦ **Nick Patterson**, Massachusetts Institute of Technology and Harvard University ✦ *Working with Geneticists: A Historian's Comments on Genomic Archaeology and Archaeoscience in 2010* ✦ **Michael McCormick**, Harvard University ✦ *General Discussion* ✦ **Lothar von Falkenhausen**, University of California, Los Angeles ✦ **Nino Luraghi**, Princeton University ✦ **Arnold J. Levine**, Professor, School of Natural Sciences

### October 25
Historical Studies Lunchtime Colloquia Series ✦ *Jews in the Polish Liquor Trade* ✦ **Glenn Dynner**, Sarah Lawrence College; Member, School of Historical Studies

### November 1
Historical Studies Lunchtime Colloquia Series ✦ *Religious Intolerance and the Secular State in the Early German Enlightenment: The Case of Samuel Pufendorf* ✦ **Thomas Ahnert**, The University of Edinburgh; Member, School of Historical Studies

### November 3
Medieval Table Lunchtime Colloquium ✦ *Rituals and (Art) History* ✦ **Katrin Kogman-Appel**, Ben-Gurion University of the Negev; Visitor, School of Historical Studies

November 8
Historical Studies Lunchtime Colloquia Series ✦ *The Theme (Skopos) of a Platonic Dialogue and the Maintenance of Textual Communities in Late Antique Platonism* ✦ **Dirk Baltzly**, Monash University; Member, School of Historical Studies

November 9
East Asian Studies Seminar ✦ *Ortai and the Qing State's Land Reclamation Program in Southwest China: 1725–35* ✦ **John Herman**, Virginia Commonwealth University; Member, School of Historical Studies

November 10
Art History Lunch Seminar ✦ *Seeing Outside Time: The Goddess Durga in the Eighth Century Temple* ✦ **Padma Kaimal**, Colgate University; Member, School of Historical Studies

Art History Seminar ✦ *Barnett Newman's Jewishness* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies

Modern History Workshop ✦ *Protest and Modernization: The Urban Jewish Liquor Traders* ✦ **Glenn Dynner**, Sarah Lawrence College; Member, School of Historical Studies

November 15
Historical Studies Lunchtime Colloquia Series ✦ *A Promiscuous Eunuch in Eighteenth-Century China* ✦ **Norman Kutcher**, Syracuse University; Member, School of Historical Studies

November 16
Art History Lunch Seminar ✦ *The Exotic Sanctuary: The Tile Decoration in St. Nicholas, Fountoukli, Rhodes (1497–98)* ✦ **Sharon E. J. Gerstel**, University of California, Los Angeles; Member, School of Historical Studies

November 17
Medieval Table Lunchtime Colloquium ✦ *Buddhist Goddess Tara: Context, Concept, and Community* ✦ **Himanshu Prabha Ray**, Jawaharlal Nehru University; Member, School of Historical Studies

November 22
Historical Studies Lunchtime Colloquia Series ✦ *From Mystery to Initiation: A Mytho-Ritual Poetics of Love and Sex in the Ancient Novel —Even in Apuleius's Golden Ass?* ✦ **Anton Bierl**, Universität Basel; Member, School of Historical Studies

November 23
Art History Lunch Seminar ✦ *Performing the Bastille: Pierre-François Palloy and the Memory Work of the French Revolution* ✦ **Richard Taws**, University College London; Member, School of Historical Studies

November 29
Historical Studies Lunchtime Colloquia Series ✦ *Struggling for Beauty: Body Aesthetics and Social Conflict in Modern History* ✦ **Thomas Kühne**, Clark University; Visitor, School of Historical Studies

November 30
Art History Lunch Seminar ✦ *"The Canticum Canticorum," a Dutch Blockbook, ca. 1465, Thirty-Two Woodcuts on the Song of Songs* ✦ **Marilyn Aronberg Lavin**, Princeton University

December 1
Medieval Table Lunchtime Colloquium ✦ *Seeing Time and Escaping It with the Help of the Goddess* ✦ **Padma Kaimal**, Colgate University; Member, School of Historical Studies

December 6
Historical Studies Lunchtime Colloquia Series ✦ *Necessity and Alternative Actions in Aristotle: A Study of Metaphysics, Book 9, Chapter 5* ✦ **Ricardo Salles**, Instituto de Investigaciones Filosóficas, Universidad Nacional Autónoma de México; Member, School of Historical Studies

December 7
East Asian Studies Seminar ✦ *Military Metabolism: The Ecology of War and China's Henan Famine of 1942–43* ✦ **Micah S. Muscolino**, Georgetown University; Member, School of Historical Studies

Art History Lunch Seminar ✦ *Archaeologies of Performance: Ritual Movement through Greek Sacred Space* ✦ **Joan Breton Connelly**, New York University; Member, School of Historical Studies

December 8
Medieval Table Lunchtime Colloquium ✦ *Drogo Magnus, or Don't Be the Older Brother* ✦ **Constance Brittain Bouchard**, The University of Akron; Visitor, School of Historical Studies

December 13
Historical Studies Lunchtime Colloquia Series ✦ *Financing Empire in Southwest China: Land, State-Building, and Local Society, 1650–1750* ✦ **John Herman**, Virginia Commonwealth University; Member, School of Historical Studies

December 15
Modern History Workshop ✦ *Overlooking the Ephemeral* ✦ **Carolyn Abbate**, University of Pennsylvania; Visitor, School of Historical Studies

January 10
Historical Studies Lunchtime Colloquia Series ✦ *Introductions* ✦ **Caroline Walker Bynum**, Professor, School of Historical Studies

January 12
Medieval Table Lunchtime Colloquium ✦ *The Byzantine Icon and Models of Text Reception* ✦ **Marcus Plested**, University of Cambridge; Member, School of Historical Studies

January 17
Historical Studies Lunchtime Colloquia Series ✦ *The Damnation of Mignon* ✦ **Carolyn Abbate**, University of Pennsylvania; Visitor, School of Historical Studies

January 18
East Asian Studies Seminar ✦ *Facets of Tangut Buddhism* ✦ **Kirill Solonin**, Fo Guang University; Member, School of Historical Studies

January 19
Medieval Table Lunchtime Colloquium ✦ *Putting Medieval Korean Temples on the Map* ✦ **Juhn Ahn**, University of Toronto; Member, School of Historical Studies

Art History Seminar ✦ *Approaching the Meaning of the Investiture Painting from the Palace at Mari* ✦ **Mehmet-Ali Ataç**, Byrn Mawr College; Member, School of Historical Studies

Modern History Workshop ✦ *The Radical Enlightenment Critique of the American Revolution* ✦ **Jonathan Israel**, Professor, School of Historical Studies

January 20
The Twentieth-Century Discussion Group ✦ *Introductory Session* ✦ **Avishai Margalit**, George F. Kennan Professor, School of Historical Studies

January 24
Historical Studies Lunchtime Colloquia Series ✦ *Charlemagne and the "Mystical Authority" of the Frankish Law Code* ✦ **Karl Ubl**, Eberhard Karls Universität Tübingen; Member, School of Historical Studies

January 25
East Asian Studies Seminar ✦ *From the Media to the Clinic: The Production of Desire in Urban Beijing* ✦ **Everett Yuehong Zhang**, Princeton University

January 31
Historical Studies Lunchtime Colloquia Series ✦ *Language and Longitude: Leibniz's Map of the Russian Empire* ✦ **Justin E. H. Smith**, Concordia University, Montreal; Member, School of Historical Studies

February 2
Medieval Table Lunchtime Colloquium ✦ *Visualizing Time at the Kailasanatha Table in Eighth-Century Kanchipuram* ✦ **Padma Kaimal**, Colgate University; Member, School of Historical Studies

### February 3

The Twentieth-Century Discussion Group ✦ *Mussolini's and Hitler's Youths: How Fascist Italy and Nazi Germany Tried to Create a Society of "Obedient Fighters" and "Blind Believers"* ✦ **Alessio Ponzio**, Università degli Studi Roma Tre; Member, School of Historical Studies

### February 7

Historical Studies Lunchtime Colloquia Series ✦ *Expelling, Denaturalizing, Interning: Enemy Civilians, Emergency Powers, and Public Options in Europe and the United States during World War I* ✦ **Daniela L. Caglioti**, Università degli Studi di Napoli Federico II; Member, School of Historical Studies

### February 8

East Asian Studies Seminar ✦ *Temples for Dragons and Other Wild Things: Buddhism and Urbanization in Premodern Korea* ✦ **Juhn Ahn**, University of Toronto; Member, School of Historical Studies

Islamicists Seminar ✦ *The Kalam of Abdallah b. Yazid al-Fazari* ✦ **Wilfred Madelung**, University of Oxford; Member, School of Historical Studies, and **Abdulrahman al-Salimi**, Ministry of Endowments and Religious Affairs, Sultanate of Oman; Member, School of Historical Studies

### February 9

Medieval Table Lunchtime Colloquium ✦ *Material Culture and "Thing-Theory"* ✦ General discussion led by **Sharon E. J. Gerstel**, University of California, Los Angeles; Member, School of Historical Studies, and **Yve-Alain Bois**, Professor, School of Historical Studies

### February 14

Historical Studies Lunchtime Colloquia Series ✦ *War, Environment, and Displacement in North China, 1937–45* ✦ **Micah S. Muscolino**, Georgetown University; Member, School of Historical Studies

Workshop: The Transmission of Subversive Ideas from the Islamic World to Europe, ca. 1200–1650; The Impostor Theme ✦ *The Late Antique and Muslim Material* ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ✦ *The Medieval European Cases* ✦ **Robert Lerner**, Northwestern University ✦ *The Jewish Material* ✦ **James Robinson**, The University of Chicago ✦ *The Category "Averroism"* ✦ **Luca Bianchi**, Università degli Studi del Piemonte Orientale ✦ *Views and Discussion* ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ✦ **Robert Lerner**, Northwestern University ✦ **James Robinson**, The University of Chicago ✦ **Luca Bianchi**, Università degli Studi del Piemonte Orientale

### February 15

Workshop: The Transmission of Subversive Ideas from the Islamic World to Europe, ca. 1200–1650; Historical Astrology and Pre-Adamites ✦ *The Muslim Material* ✦ **Kevin van Bladel**, University of Southern California ✦ *The Late Medieval and Renaissance Material* ✦ **Martin Mulsow**, University of Oxford ✦ *The Jewish Material* ✦ **Reimund Leicht**, The Hebrew University of Jerusalem ✦ *The Arabic Material in Latin Translation* ✦ **Charles Burnett**, The Warburg Institute, University of London ✦ *Views and Discussion* ✦ **Kevin van Bladel**, University of Southern California ✦ **Martin Mulsow**, University of Oxford ✦ **Reimund Leicht**, The Hebrew University of Jerusalem

### February 16

Medieval Table Lunchtime Colloquium ✦ *Memory* ✦ **Constance Brittain Bouchard**, The University of Akron; Visitor, School of Historical Studies ✦ **Karl Ubl**, Eberhard Karls Universität Tübingen; Member, School of Historical Studies ✦ **Margaret Larkin**, University of California, Berkeley; Member, School of Historical Studies

### February 17

The Twentieth-Century Discussion Group ✦ *Enemy Aliens in World War I and the Problem of Making Transnational History* ✦ **Daniela L. Caglioti**, Università degli Studi di Napoli Federico II; Member, School of Historical Studies

### February 22

East Asian Studies Seminar ✦ *Toward a Reconstruction of Tantric Buddhism in Tenth-Century Dunhuang* ✦ **Amanda Goodman**, University of Toronto

### February 23

Medieval Table Lunchtime Colloquium ✦ *Some Thoughts on the Learned Practices of Chinese Buddhist Ritual Texts from Tenth-Century Dunhuang* ✦ **Amanda Goodman**, University of Toronto

Art History Seminar ✦ *Medieval Jewish Approaches to the Image: Examples from the Leipzig Mahzor* ✦ **Katrin Kogman-Appel**, Ben-Gurion University of the Negev; Visitor, School of Historical Studies

Modern History Workshop ✦ *Orthodox Church and Secularization in the Balkans* ✦ **Dimitris Stamatopoulos**, University of Macedonia; Member, School of Historical Studies

### February 28

Historical Studies Lunchtime Colloquia Series ✦ *Believe. Obey. Fight. How Fascism Worked to Create a New Italian* ✦ **Alessio Ponzio**, Università degli Studi Roma Tre; Member, School of Historical Studies

### March 1

Ancient Studies Seminar ✦ *Honestus's Heliconian Flowers: Epigrammatic Offerings to the Muses of Thespiae* ✦ **Regina Höschele**, University of Toronto; Member, School of Historical Studies

Islamicists Seminar ✦ *al-Biruni's Chronology: A Report on Work in Progress* ✦ **François de Blois**, School of Oriental and African Studies, University of London; Member, School of Historical Studies

### March 2

Medieval Table Lunchtime Colloquium ✦ *Art, Ritual, and Civic Identity in Medieval South Italy* ✦ **Nino Zchomelidse**, Princeton University

Eighteenth-Century Seminar ✦ *Saving Grace: Religion and Virtue in Enlightenment Scotland* ✦ **Thomas Ahnert**, The University of Edinburg; Member, School of Historical Studies

### March 3

The Twentieth-Century Discussion Group ✦ *Discovering Hunger in America: The Politics of Race, Poverty, and Malnutrition after the Fall of Jim Crow* ✦ **Laurie Green**, The University of Texas at Austin; Member, School of Historical Studies

### March 7

Historical Studies Lunchtime Colloquia Series ✦ *Patronage, Debate Culture, and Muslim Intellectual History in India* ✦ **Asad Q. Ahmed**, Washington University in St. Louis; Member, School of Historical Studies

### March 8

Islamicists Seminar ✦ *Defending Muhammad's Finality: Preliminary Reflections on Theological Discourse and Sectarian Identity in Nineteenth-Century India* ✦ **Asad Q. Ahmed**, Washington University in St. Louis; Member, School of Historical Studies

### March 9

Medieval Table Lunchtime Colloquium ✦ *Visualizing in the Twelfth Century: Hugh of Santi Victor's "Chronicon" and Peter of Poitiers' "Compendium Historiae in Genealogia Christ"* ✦ **Andrea Worm**, Universität Augsburg; Member, School of Historical Studies

### March 14

Historical Studies Lunchtime Colloquia Series ✦ *Joel ben Simeon: A Scribe-Artist as an Agent of Cultural Exchange* ✦ **Katrin Kogman-Appel**, Ben-Gurion University of the Negev; Visitor, School of Historical Studies

### March 15

Ancient Studies Seminar ✦ *Problems in the Monopolization of Archaic Coin Production* ✦ **Peter van Alfen**, American Numismatic Society; Member, School of Historical Studies

East Asian Studies Seminar ✦ *Moral Politics in the Mencius* ✦ **Yang Xiao**, Kenyon College; Visitor, School of Social Science

The Twentieth-Century Discussion Group ✦ *Diary of Ivan Maisky, A Red Ambassador to the Court of St. James's* ✦ **Gabriel Gorodetsky**, All Souls College, University of Oxford; Member, School of Historical Studies

### March 21

Historical Studies Lunchtime Colloquia Series ✦ *Parthenon Revisited: Daughters, Democracy, and the Ultimate Sacrifice* ✦ **Joan Breton Connelly**, New York University; Member, School of Historical Studies

### March 22

Ancient Studies Seminar ✦ *Discourse of Kingship in Late Republican Invective* ✦ **Yelena Baraz**, Princeton University; Visitor, School of Historical Studies

East Asian Studies Seminar ✦ *Revisiting the Manchu Conquest: A Work in Progress* ✦ **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, School of Historical Studies

Islamicists Seminar ✦ *The Poetics of Cultural Identity: al-Mutanabbi among the Buyids* ✦ **Margaret Larkin**, University of California, Berkeley; Member, School of Historical Studies

### March 23

Medieval Table Lunchtime Colloquium ✦ *The Royal Destiny: Conceptions of Power in Ashurbanipal's "Garden Party" Reconsidered* ✦ **Mehmet-Ali Ataç**, Byrn Mawr College; Member, School of Historical Studies

Art History Seminar ✦ *Many Paths to the Divine: Dynamics of Vision in a Hindu Temple* ✦ **Padma Kaimal**, Colgate University; Member, School of Historical Studies

Modern History Workshop ✦ *Newton in the German-Speaking Lands* ✦ **Thomas Ahnert**, The University of Edinburg; Member, School of Historical Studies

### March 28

Historical Studies Lunchtime Colloquia Series ✦ *Archaeology and Empire: Buddhist Monuments in Colonial India* ✦ **Himanshu Prabha Ray**, Jawaharlal Nehru University; Member, School of Historical Studies

### March 29

Ancient Studies Seminar ✦ *Agroikos Sophia: The Mythic Landscape of Philostratus's Heroicus* ✦ **Janet Downie**, Princeton University; Visitor, School of Historical Studies

### March 30

Medieval Table Lunchtime Colloquium ✦ *The Poetics of Cultural Identity: al-Mutanabbi among the Buyids* ✦ **Margaret Larkin**, University of California, Berkeley; Member, School of Historical Studies

### March 31

The Twentieth-Century Discussion Group ✦ *A New History of the Mandates System of the League of Nations* ✦ **Susan Pedersen**, Columbia University; Member, School of Historical Studies

### April 4

Workshop: The Transmission of Subversive Ideas from the Islamic World to Europe, ca. 1200–1650; The Origin of Government ✦ *The Muslim Material* ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ✦ *Marsiglio* ✦ **Gianluca Briguglia**, Centre National de la Recherche Scientifique, Paris ✦ *The Byzantine Material* ✦ **Maria Mavroudi**, University of California, Berkeley ✦ *The Latin Medical Material* ✦ **Marco Viniegra**, Harvard University ✦ *Views on Transmission* ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ✦ **Gianluca Briguglia**, Centre National de la Recherche Scientifique, Paris ✦ **Maria Mavroudi**, University of California, Berkeley ✦ **Marco Viniegra**, Harvard University

### April 5

Workshop: The Transmission of Subversive Ideas from the Islamic World to Europe, ca. 1200–1650; The Social Utility of Religion ✦ *The Muslim Material* ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ✦ *John of Salisbury* ✦ **Quentin Taylor**, Rogers State University ✦ *The Jewish Material* ✦ **James Robinson**, The University of Chicago ✦ *Marsiglio* ✦ **Gianluca Briguglia**, Centre National de la Recherche Scientifique, Paris ✦ *Views on Transmission* ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies ✦ **Gianluca Briguglia**, Centre National de la Recherche Scientifique, Paris ✦ **Quentin Taylor**, Rogers State University ✦ **James Robinson**, The University of Chicago

### April 7

Workshop: Sacred Space ✦ *Introduction: Ritual Dynamics and the Shaping of Sacred Space* ✦ **Joan Breton Connelly**, New York University; Member, School of Historical Studies ✦ *Itinerant Sacred Places: Wanderers as Creators of Personal Religious Space in Classical Greece* ✦ **Miguel Herrero de Jáuregui**, Universidad Complutense de Madrid ✦ *The "Space of Death" in the Family Rituals of the Mediterranean World* ✦ **Paola Corrente**, Universidad Complutense de Madrid ✦ *The Geography of Paradise: Elysium, Isles of the Blest, and Hyperboreans* ✦ **Marco A. Santamaría**, Universidad de Salamanca ✦ *Spatial Ambiguity in Plutarch fr. 178 Sandbach and the Derveni Papyrus* ✦ **Alberto Bernabé**, Universidad Complutense de Madrid ✦ *Oreibasia: The Mountain as Sacred Space in Dionysian Cults* ✦ **Ana Jiménez**, Universidad Complutense de Madrid ✦ *Where Dionysus Dwells: Greek Vases as a Virtual Sacred Space* ✦ **Fátima Díez Platas**, Universidad de Santiago de Compostela ✦ *The Sacred Space of the Byzantine Church: Rites and Passage* ✦ **Sharon E. J. Gerstel**, University of California, Los Angeles; Member, School of Historical Studies ✦ *Women on the Acropolis and Mental Mapping: Comic Body-Politics, Ritual, and Metaphor in Aristophanes' "Lysistrata"* ✦ **Anton Bierl**, Universität Basel; Member, School of Historical Studies

### April 11

The Twentieth-Century Discussion Group ✦ *The Readers of "Novyi mir," 1945–70: Twentieth-Century Experience and Soviet Historical Consciousness* ✦ **Denis Kozlov**, Dalhousie University; Member, School of Historical Studies

### April 12

East Asian Studies Seminar ✦ *The Religious Ecology of Confucius Temples in Contemporary China: An Empirical Investigation* ✦ **Anna Sun**, Kenyon College; Member, School of Social Science

### April 13

Art History Seminar ✦ *Mapping the History of Salvation: The Map of the Holy Land in the "Rudimentum Novitiorum" of 1475* ✦ **Andrea Worm**, Universität Augsburg; Member, School of Historical Studies

Modern History Workshop ✦ *Hunger in America and the "Power of Television": Spring 1968* ✦ **Laurie Green**, The University of Texas at Austin; Member, School of Historical Studies

### May 3

Islamic Roundtable ✦ *Syriac Christian, Latin Christian, and Muslim Views of the Origin of Paganism* ✦ **Anna Akasoy**, University of Oxford ✦ **Kevin van Bladel**, University of Southern California ✦ **John Marenbon**, University of Cambridge ✦ **Richard Payne**, Mount Holyoke College ✦ **Patricia Crone**, Andrew W. Mellon Professor, School of Historical Studies

### May 4

Islamicists Seminar ✦ *The Problem of Paganism in the Middle Ages* ✦ **John Marenbon**, University of Cambridge

ANDREA KANE

Professor Enrico Bombieri (right), pictured with Nicholas Katz of Princeton University, is one of the world's leading authorities on number theory and analysis. In October, Bombieri gave a public lecture describing the difference between truth, proof, and verification in mathematics.

# School of Mathematics

Faculty

**Enrico Bombieri**, IBM von Neumann Professor

**Jean Bourgain**

**Helmut Hofer**

**Robert MacPherson**, Hermann Weyl Professor

**Peter Sarnak**

**Thomas Spencer**

**Vladimir Voevodsky**

**Avi Wigderson**, Herbert H. Maass Professor

Professors Emeriti

**Pierre Deligne**

**Phillip A. Griffiths**

**Robert P. Langlands**

During the 2010–11 academic year, the School of Mathematics held a special program on Galois representations and automorphic forms. The program was organized by the School's Distinguished Visiting Professor, Richard Taylor of Harvard University.

The program had about thirty-three School participants, and many other people visited for shorter periods. Six mini-courses, two weekly seminars, and a one-week workshop were organized. In addition, participants in the program took advantage of the joint Institute for Advanced Study/Princeton University number theory seminars and the Institute Members seminars. All these activities (except the workshop and Members seminars) took place on Wednesday afternoons and Thursdays. This allowed the participants to concentrate on their own work for the rest of the week and also made it easier for scholars from neighboring universities to attend the events.

Program participants included Taylor; von Neumann Fellows Francesco Calegari, Jean-Francois Dat, Thomas Haines, and Elena Mantovan; Veblen Research Instructors David Geraghty, Tasho Kaletha, Kai-Wen Lan, and Yichao Tian; Members Laurent Clozel, Pierre Colmez, Jean-Marc Fontaine, Michael Harris, Florian Herzig, Andrei Jorza, Chandrashekhar Khare, Ruochuan Liu, Tong Liu, Sophie Morel, James Newton, Yiannis Sakellaridis, Sug Woo Shin, Christopher Skinner, Eric Urban, and Jared Weinstein; and Visitors Abnik Ganguli, Wieslawa Niziol, and Andrew Wiles. In addition, both Matthew Emerton of Northwestern University and Peter Scholze of the University of Bonn made more than one visit, and there were several students from Princeton University who attended regularly. Students involved with program activities from Harvard University were Ana Caraiani, Lawrence Chung, Wushi Goldring, Bao Le Hung, and Jack Thorne.

In the fall, Colmez gave a mini-course on his work on the p-adic local Langlands correspondence, Calegari gave a mini-course on completed cohomology, and Emerton gave a mini-course on local-global compatibility in the p-adic Langlands program. In the spring, Skinner gave a mini-course on his work with Urban on the Iwasawa main conjecture for GL(2); **Phillip A. Griffiths**, Professor Emeritus, gave a mini-course on automorphic cohomology; and Geraghty and Taylor gave a mini-course on recent advances in automorphy/potential automorphy of Galois representations.

Of the thirty-four seminars given during the year, particular highlights of the seminar program were Weinstein's beautiful breakthrough on semistable models for modular curves of all levels and Scholze's exciting new take on the local Langlands conjecture for GL(n).

ANDREA KANE

Richard Taylor (right), Distinguished Visiting Professor, organized a special program on Galois representations and automorphic forms. Member Kai-Wen Lan (left) aimed to understand relations between automorphic forms coming from geometric objects of very different natures.

The talks in the workshop were of an extremely high standard, and there were well over a hundred attendees. Speakers were selected to ensure that the talks addressed what was thought to be the most interesting recent developments. Some of the most exciting advances reported were the work of Vincent Pilloni and Benoit Stroh, et al., on eigenvarieties for higher-dimensional Shimura varieties; Scholze's introduction of perfectoid spaces and his use of them to both re-prove p-adic comparison theorems and to attack the weight-monodromy conjecture; the ideas of Calegari and Geraghty on proving modularity lifting theorems over imaginary quadratic fields (and probably other settings, where the original approach seemed to break down); and Mahesh Kakde's proof of the non-abelian main conjecture for characters over totally real fields.

Some breakthroughs that were announced and discussed were Weinstein's initial breakthrough on the four-decades-old problem of finding semistable models for all modular curves. While this progress took place before the start of the special year, Weinstein had extensive discussions with other members of the program, and his results have taken on a more natural form (for example, more systematically passing to a limit over all level structures), and he has begun to generalize them beyond GL(2).

Calegari and Geraghty, who were here for the whole year, have announced a breakthrough on modularity lifting theorems. All modularity lifting theorems to date only work in the "regular, odd, conjugate self-dual" case, where the universal deformation ring and the Hecke algebras are as large as possible. This seemed to be a major restriction on the Taylor-Wiles method. (It is somehow easier to prove two things are equal when they are both as big as they can possibly be.) However, Calegari and Geraghty, working together during the special year, appear to have found a way to treat other cases. At the moment, their results are restricted to some important special cases, but it seems plausible that this is just the start.

In a smaller activity devoted to some very recent developments in symplectic geometry, Member Claude Viterbo of École Polytechnique gave a graduate course, "Introduction to Symplectic Topology through Sheaf Theory," and long-term Member Mark Goresky and Professor **Helmut Hofer** ran a working group on sheaf-theoretic methods in symplectic topology during the second term. In addition to the mini-course "Microlocal Theory of Sheaves and Applications to Non-Displaceability" by Pierre Schapira of the University of Paris VI (www.math.ias.edu/seminars/abstract?event=40585), there was a workshop on sheaf-theoretic methods in symplectic topology from May 9–12, organized by Hofer and Viterbo (www.math.ias.edu/workshop-stmst). The new ideas presented during these activities are potentially relevant for the program on symplectic dynamics in 2011–12, and the workshop served to

evaluate the feasibility of a larger program. Hofer also organized a weekly seminar on geometry and dynamical systems. In preparation for the 2011–12 academic year activity on symplectic dynamics, Hofer gave a graduate course on the same subject at Princeton University. Symplectic dynamics is an envisioned new field studying classes of (conservative) dynamical systems by highly integrated methods from symplectic geometry and dynamical systems. It is the hope that the new resulting methods should make it possible to attack problems that so far seem to be out of reach. Member Barney Bramham and Hofer wrote a paper, "First Steps in Symplectic Geometry," which describes some of the problems and ideas.

In 2010, it became clear that methods in symplectic geometry (holomorphic curve theories/symplectic field theory) can be used to obtain a deeper insight into problems in celestial mechanics that are, among other things, useful in fuel-efficient orbit designs for scientific space missions. Together with Peter Albers of Purdue University and Urs Frauenfelder of Seoul National University, Hofer started a research project to study the restricted three-body problem that is known to show chaotic behavior. This project grew and currently involves Joel Fish of Stanford University, Gabriel Paternain of the University of Cambridge, and Otto van Koert of Seoul National University. The results so far show precise organizing principles for the chaos, which is potentially useful since it is precisely this chaos that is responsible for the existence of fuel-efficient orbits. Frauenfelder will present some of the results at the NASA/ESA-sponsored conference, "New Trends in Astrodynamics and Applications VI," during an invited lecture. Hofer continued his work on symplectic field theory and polyfolds jointly with Krzysztof Wysocki of Pennsylvania State University and Eduard Zehnder of Eidgenössische Technische Hochschule Zürich.

*In 2010, it became clear that methods in symplectic geometry (holomorphic curve theories/ symplectic field theory) can be used to obtain a deeper insight into problems in celestial mechanics that are, among other things, useful in fuel-efficient orbit designs for scientific space missions.*

During the second term, Members Bramham, Larry Guth, Matthew Kahle, and Melissa Tacy initiated "Mathematical Conversations." This is a new idea for mathematical communication that we hope will broaden the mathematical horizons of all participants.

The program on computer science and discrete mathematics continued to flourish. Breakthroughs achieved by some former Members were highlighted in the one-day workshop on pseudorandomness in April. Speakers were current Members Guth and Swastik Kopparty, Visitor Zeev Dvir of Princeton University, Peter Varju of Princeton University, and former Member Alex Kontorovich of Stony Brook University, the State University of New York.

In December, Curtis McMullen of Harvard University delivered the Ruth and Irving Adler Expository Lecture, "Entropy, Algebraic Integers, and Moduli of Surfaces."

With **Pierre Deligne**, Professor Emeritus; **Robert MacPherson**, Hermann Weyl Professor; and Goresky in attendance, Nima Arkani-Hamed, Professor in the School of Natural Sciences, gave weekly seminars on some Feynman diagrams that arise in N=4SUSY gauge theories and reduce to just a few integrals on combinatorial spaces. These seminars often continued

Member Sophie Morel, seen here in the Common Room of Fuld Hall, studied the automorphic representations appearing in the intersection cohomology of the Baily-Borel compactification of Shimura varieties.

CLIFF MOORE

*Improvements in information technology have revolutionized the way scientists and engineers record and simulate complicated phenomena. The organization and understanding of this data requires new techniques. On the mathematical side, topology provides concepts and computational tools for studying nonlinear objects and transformations.*

for up to four hours. As a result of this activity, these four individuals have been able to make mathematical insights with potential applications to physics.

Guth and Nets Katz, who visited from Indiana University for a short time during the year, solved the long-standing (from 1946) Erdös distinct distance conjecture in the plane. Guth's lecture is available on the Institute website (http://video.ias.edu/csdm/guth), as are many other breakthroughs achieved by Members and Visitors in the School.

Member Igor Rivin has investigated the interesting concept and properties of random elements in lattices of Lie groups and applied this to deduce properties of random three manifolds.

Member Pierluigi Falco made important advances in proving universality of the low-density two-dimensional Coulomb gas. He developed a rigorous renormalization group technique to analyze the Kosterlitz-Thouless line that separates the dipole phase from the plasma phase. Although the existence of this transition has been known for some time, the behavior along the critical line had been an open problem for many years.

CLIFF MOORE

Professor Vladimir Voevodsky gave a seminar on the univalent foundations of mathematics, which involves new semantics for dependent type theories—the class of formal systems that are widely used in the theory of programming languages.

Nigel Pitt, a Member during the second term, made decisive progress on his long-term project on the behavior of coefficients of a modular form on the sequence p-1, p a prime, and he is in the process of preparing a paper regarding his progress.

Working with Professor **Peter Sarnak**, Peng Zhau, a National Science Foundation Mathematical Sciences Institutes Fellow, is completing the computing of the full variance for the quantization of the geodesic flow on the modular surface.

Professor **Jean Bourgain** and Sarnak together with former Members Alexander Gamburd of the University of California, Santa Cruz, and Kontorovich have completed a series of papers on "thin groups," the affine sieve, and expanders. These developments will be reported at conferences around the world (Bourbaki, American Mathematical Society, and Clay Mathematics Institute).

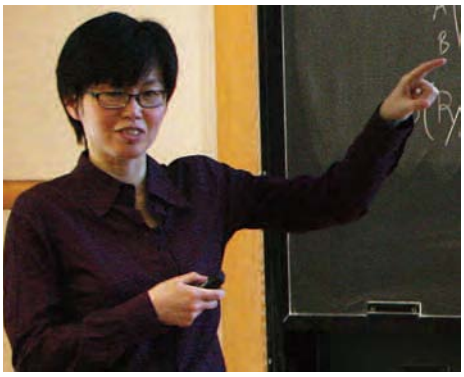
The topology program organized by MacPherson, Randall Kamien of the University of Pennsylvania, and Konstantin Mischaikow of Rutgers, the State University of New Jersey, continued with six workshops held during the year. Three workshops were held each term alternating between the campuses of the Institute, Rutgers, and the University of Pennsylvania. Improvements in information technology have revolutionized the way scientists and engineers record and simulate complicated phenomena. The organization and understanding of this data requires new techniques. On the mathematical side, topology provides concepts and computational tools for studying nonlinear objects and transformations. The goal of this seminar series was to direct and expand these concepts and tools toward the above-mentioned applications. There was a mix of lectures by topologists, by scientists in fields with topological applications, and by people doing topological computations. The talks were aimed at a broad interdisciplinary audience and were intended to provide a forum for discussing current and future applications of topological techniques, both theoretical and computational.

First-term talks were given by Frederick Cohen of the University of Rochester, Nigel Goldenfeld of the University of Illinois at Urbana-Champaign, Ali Jadbabaie of the University of Pennsylvania, Member Matthew Kahle, Eleni Katifori of the Rockefeller University, Member Jeremy Mason, Ivan Smalyukh of Rutgers, and Tanmay Vachaspati of Arizona State University.

Second-term lectures were given by Nima Arkani-Hamed, Professor in the School of Natural Sciences, Javier Arsuaga of San Francisco State University, Steve Ellis of Columbia University, Menachem Lazar of Princeton University, Andrea Liu of the University of Pennsylvania, Member Walter Neumann of Barnard College, Vin de Silva of Pomona College, Dennis Sullivan of Stony Brook University, and Mark Trodden of the University of Pennsylvania.

Bourgain was elected a foreign associate of the National Academy of Sciences and **Avi Wigderson**, Herbert H. Maass Professor, was elected to the American Academy of Arts and Sciences.

From left: Michael Atiyah, former Member and Professor, gave the seminar, "Beauty and Truth in Mathematics: A Tribute to Albert Einstein and Hermann Weyl"; Christine Taylor, Member, spoke on "Some Equations and Games in Evolutionary Biology"; and Jeremy Mason, Member, addressed "Fundamental Groups of Random Simplicial Complexes"


(L) CLIFF MOORE, (C) ANDREA KANE, (R) CLIFF MOORE

## MEMBERS AND VISITORS

*f* First Term ✦ *s* Second Term ✦ *m* Long-term Member ✦ *v* Visitor ✦ d*vp* Distinguished Visiting Professor ✦ *vp* Visiting Professor ✦ *j* Joint Member School of Natural Sciences ✦ *vri* Veblen Research Instructorship ✦ *vnf* von Neumann Fellowship

**Noga Alon**
*Combinatorics* ✦ Tel Aviv University ✦ *vp, f*
*Funding provided by the Bell Companies Fellowship and The Oswald Veblen Fund*

**John Arthur Baldwin**
*Knot Theory, Low-dimensional Topology* ✦ Institute for Advanced Study and Princeton University ✦ *vri*

**Paul Beame**
*Computational Complexity* ✦ University of Washington
*Funding provided by The Ellentuck Fund and the National Science Foundation*

**Jonathan William Bober**
*Number Theory* ✦ Institute for Advanced Study ✦ *f*
*Funding provided by the National Science Foundation*

**Barney Bramham**
*Symplectic Geometry* ✦ Institute for Advanced Study
*Funding provided by the National Science Foundation*

**Francesco Calegari**
*Number Theory* ✦ Northwestern University ✦ *vnf*
*Funding provided by the National Science Foundation and The James D. Wolfensohn Fund*

**Inna Capdeboscq**
*Group Theory* ✦ University of Warwick
*Funding provided by the National Science Foundation*

**Yves Capdeboscq**
*Partial Differential Equations* ✦ University of Oxford ✦ *vnf*
*Funding provided by the National Science Foundation*

**Laurent Clozel**
*Automorphic Forms, Galois Representations* ✦ Université Paris-Sud 11 ✦ *s*
*Neil Chriss and Natasha Herron Chriss Founders' Circle Member; additional funding provided by the Ellentuck Fund, the Florence Gould Foundation Fund, and The James D. Wolfensohn Fund*

**Frederick R. Cohen**
*Topology* ✦ University of Rochester • *s*

**Alina Cojocaru**
*Number Theory* ✦ University of Illinois at Chicago ✦ *f*
*Funding provided by the National Science Foundation*

**Pierre Colmez**
*Number Theory* ✦ CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot ✦ *f*
*Ralph E. and Doris M. Hansmann Member; additional funding provided by the Florence Gould Foundation Fund*

**Jean-Francois Dat**
*Arithmetic Geometry, Representation Theory* ✦ Université Pierre et Marie Curie ✦ *vnf, f*
*Funding provided by the National Science Foundation*

**Michael Davis**
*Topology, Geometric Group Theory* ✦ The Ohio State University

**Fred Diamond**
*Galois Representations, Automorphic Forms* ✦ King's College London ✦ *v, s*

**Dominic Dotterrer**
*Combinatorial Geometry* ✦ Institute for Advanced Study ✦ *v, s*
*Funding provided by the National Science Foundation*

**Zeev Dvir**
*Computer Science* ✦ Institute for Advanced Study ✦ *v*

**Richard Ehrenborg**
*Algebraic Combinatorics* ✦ University of Kentucky

**Pierluigi Falco**
*Mathematical Physics* ✦ Institute for Advanced Study
*Funding provided by the Giorgio and Elena Petronio Fellowship Fund*

**Jean-Marc Fontaine**
*Algebraic Geometry, Number Theory* ✦ Université Paris-Sud 11 ✦ *f*
*Funding provided by the Florence Gould Foundation Fund*

**Elena Fuchs**
*Number Theory* ✦ Institute for Advanced Study
*Funding provided by the National Science Foundation*

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**David Geraghty**
*Number Theory* ✦ Institute for Advanced Study and Princeton University ✦ *vri*
*Funding provided by the National Science Foundation*

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**Mark Goresky**
*Geometry, Automorphic Forms* ✦ Institute for Advanced Study ✦ *m*
*Funding provided by the Bell Companies Fellowship*

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*Funding provided by the National Science Foundation*

## RECORD OF EVENTS

### September 20

Computer Science and Discrete Mathematics Seminar I ✦ *Dependent Random Choice and Approximate Sidorenko's Conjecture* ✦ **Benny Sudakov**, University of California, Los Angeles

### September 21

Computer Science and Discrete Mathematics Seminar II ✦ *Invariance Principles in Theoretical Computer Science* ✦ **Ryan O'Donnell**, Carnegie Mellon University; von Neumann Fellowship, School of Mathematics

Short Talks by Postdoctoral Members ✦ *New Computations of the Riemann Zeta Functions* ✦ **Jonathan William Bober**, Member, School of Mathematics ✦ *New Tools for an Old Problem: the Dynamics of Area Preserving Disc Maps* ✦ **Barney Bramham**, Member, School of Mathematics ✦ *Extended Scaling Relations for Weak-Universal Models* ✦ **Pierluigi Falco**, Member, School of Mathematics ✦ *Automorphy of Galois Representations* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

### September 22

Special Mathematical Physics Seminar ✦ *The Nonlinear Schrödinger Equation (NLSE) with a Random Potential: Effective Noise and Scaling Theory* ✦ **Shmuel Fishman**, Technion–Israel Institute of Technology

### September 23

Short Talks by Postdoctoral Members ✦ *The Well-Posedness for the KdV and MKdV Equations* ✦ **Zihua Guo**, Member, School of Mathematics ✦ *Families and Congruences between Modular Forms* ✦ **Andrei Jorza**, Member, School of Mathematics ✦ *The Fundamental Group of Random 2-Complexes* ✦ **Matthew Kahle**, Member, School of Mathematics ✦ *L-Packets and Endoscopy for p-adic Groups* ✦ **Tasho Kaletha**, Princeton University; Veblen Research Instructorship, School of Mathematics ✦ *Topics in Randomness and Error-Correcting Codes* ✦ **Swastik Kopparty**, Member, School of Mathematics ✦ *Additive Structures in the Primes* ✦ **Thái Hoàng Lê**, Member, School of Mathematics

### September 27

Computer Science and Discrete Mathematics Seminar I ✦ *The Condition Number of a Random Matrix: from von Neumann–Goldstine to Spielman-Teng* ✦ **Van Vu**, Rutgers, The State University of New Jersey

Short Talks by Postdoctoral Members ✦ *Some Aspects in Time-Frequency Analysis* ✦ **Victor Daniel Lie**, Princeton University; Veblen Research Instructorship, School of Mathematics ✦ *p-adic Galois Representations and ($\varphi\Gamma$)-Modules* ✦ **Ruochuan Liu**, Member, School of Mathematics ✦ *Correlation Bounds for Polynomials* ✦ **Shachar Lovett**, Member, School of Mathematics ✦ *The Cohomology of Arithmetic Groups* ✦ **Simon Marshall**, Member, School of Mathematics ✦ *Resolution of Singularities on Shimura Varieties, and the Local Langlands Correspondence* ✦ **Jared Weinstein**, Member, School of Mathematics ✦ *The Structure of Materials* ✦ **Jeremy Mason**, Member, School of Mathematics

### September 28

Computer Science and Discrete Mathematics Seminar II ✦ *High-Rate Codes With Sublinear Time Decoding* ✦ **Swastik Kopparty**, Member, School of Mathematics

### September 29

Short Talks by Postdoctoral Members ✦ *The Spectrum of the Critical Almost Mathieu Operator* ✦ **Mira Shamis**, Member, School of Mathematics ✦ *Geometric Realization of the Local Langlands Correspondence* ✦ **Sug Woo Shin**, Member, School of Mathematics ✦ *Perturbation Series for Band Matrices and for the Anderson Model* ✦ **Alexander Sodin**, Member, School of Mathematics

### September 30

Short Talks by Postdoctoral Members ✦ *Some Questions Regarding Arithmetic Circuits* ✦ **Srikanth Srinavasan**, Member, School of Mathematics ✦ *Sparce Approximation of PSD Matrices* ✦ **Nikhil Srivastava**, Member, School of Mathematics ✦ *Torsion-Freeness of Certain Cohomology Groups of PEL-Type Shimura Varieties* ✦ **Junecue Suh**, Member, School of Mathematics ✦ *$L^p$ Concentration of Semiclassical Quasimodes* ✦ **Melissa Tacy**, Member, School of Mathematics

### October 4

Computer Science and Discrete Mathematics Seminar I ✦ *Super-Uniformity of the Typical Billiard Path (Proof Included)* ✦ **Jozsef Beck**, Rutgers, The State University of New Jersey

Members Seminar ✦ *Potential Automorphy* ✦ **Richard Taylor**, Harvard University; Distinguished Visiting Professor, School of Mathematics

### October 5

Computer Science and Discrete Mathematics Seminar II ✦ *Pseudorandom Generators for CCO[p] and the Fourier Spectrum of Low-Degree Polynomials over Finite Fields* ✦ **Shachar Lovett**, Member, School of Mathematics ✦ *Geometry and Cell Complexes: Topology of Random Simplicial Complexes* ✦ **Matthew Kahle**, Member, School of Mathematics

Workshop on Topology: Identifying Order in Complex Systems ✦ *Control of Liquid Crystal Defects Using Optical Phase Singularities* ✦ **Ivan Smalyukh**, University of Colorado ✦ *Loopy Network Topology and Leaf Vein Architecture* ✦ **Eleni Katifori**, The Rockefeller University ✦ *Configuration Spaces of Hard Disks* ✦ **Matthew Kahle**, Member, School of Mathematics

### October 7

Galois Representations and Automorphic Forms Seminar ✦ *Overview of the p-adic Local Langlands Correspondence for* $\mathrm{GL}(2,Q_p)$ ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *An Integral Eisenstein-Sczech Cocycle on* $\mathrm{GL}_n(Z)$ *and p-adic L-Functions of Totally Real Fields* ✦ **Samit Dasgupta**, University of California, Santa Cruz

### October 8

Analysis/Mathematical Physics Seminar ✦ *Imaging of Small Inhomogeneities, Homogenization and Super Resolution* ✦ **Yves Capdeboscq**, University of Oxford; von Neumann Fellowship, School of Mathematics

### October 11

Computer Science and Discrete Mathematics Seminar I ✦ *The Complexity of the Noncommutative Determinant* ✦ **Srikanth Srinivasan**, Member, School of Mathematics

Members Seminar ✦ *Symplectic Homogenization* ✦ **Claude Viterbo**, École Polytechnique, Palaiseau, France; Member, School of Mathematics

### October 12

Computer Science and Discrete Mathematics Seminar II ✦ *Approximating the Longest Increasing Subsequence in Polylogarithmic Time* ✦ **Michael Saks**, Rutgers, The State University of New Jersey

Geometry and Cell Complexes ✦ *Descriptions of the Grain-Growth Structure* ✦ **Jeremy Mason**, Member, School of Mathematics

### October 13

Galois Representations and Automorphic Forms Mini-Course ✦ *The Completed Cohomology of Arithmetic Groups* ✦ **Francesco Calegari**, Northwestern University; von Neumann Fellowship, School of Mathematics

### October 14

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 1* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *The Fundamental Curve of p-adic Theory* ✦ **Jean-Marc Fontaine**, Université Paris-Sud 11; Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Even Galois Representations and the Fontaine-Mazur Conjecture* ✦ **Francesco Calegari**, Northwestern University; von Neumann Fellowship, School of Mathematics

### October 18

Computer Science and Discrete Mathematics Seminar I ✦ *A Unified Framework for Testing Linear-Invariant Properties* ✦ **Arnab Bhattacharyya**, Massachusetts Institute of Technology

Members Seminar ✦ *Metaphors in Systolic Geometry* ✦ **Larry Guth**, University of Toronto; Member, School of Mathematics

### October 19

Computer Science and Discrete Mathematics Seminar II ✦ *Rank Bounds for Design Matrices With Applications to Combinatorial Geometry and Locally Correctable Codes* ✦ **Zeev Dvir**, Visitor, School of Mathematics

Geometry and Cell Complexes ✦ *Invariants of Graphs, Their Associated Clique Complexes and Right-Angled Coxeter Groups* ✦ **Michael Davis**, The Ohio State University; Member, School of Mathematics

### October 20

Galois Representations and Automorphic Forms Seminar ✦ *Splitting of Iwasawa Modules and Leopoldt Conjecture* ✦ **Jean-Pierre Wintenberger**, Université de Strasbourg

### October 21

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 2* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Non-Abelian Lubin-Tate Theory* ✦ **Jean-Francois Dat**, Université Pierre et Marie Curie; von Neumann Fellowship, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Expanding the Scope of Irreducibility* ✦ **Chris Hall**, University of Wyoming

### October 22

Geometry and Cell Complexes ✦ *Spectral Geometry of Random Graphs* ✦ **Igor Rivin**, Temple University; Member, School of Mathematics

Geometry/Dynamical Systems Seminar ✦ *Global Stringy Orbifold Cohomology, K-Theory, and de Rham Theory with Possible Applications to Landau-Ginzburg Theory* ✦ **Ralph Kaufmann**, Purdue University; Member, School of Mathematics

### October 25

Members Seminar ✦ *Values of L-Functions and Modular Forms* ✦ **Christopher Skinner**, Princeton University; Member, School of Mathematics

### October 26

Geometry and Cell Complexes ✦ *Toric Arrangements* ✦ **Margaret A. Readdy**, University of Kentucky; Member, School of Mathematics

Special Seminar ✦ *Nodal Lines of Random Waves* ✦ **Alexander Sodin**, Member, School of Mathematics

Special Mathematical Physics Seminar ✦ *A Stationary Phase Method for a Class of Nonlinear Equations* ✦ **Yen Do**, Georgia Institute of Technology

### October 27

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 3* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *A Semistable Model for the Tower of Modular Curves* ✦ **Jared Weinstein**, Member, School of Mathematics

### October 28

Galois Representations and Automorphic Forms Seminar ✦ *Explicit Serre Weight Conjectures* ✦ **Florian Herzig**, Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Constructing Abelian Varieties over Qbar Not Isogenous to a Jacobian* ✦ **Jacob Tsimerman**, Princeton University

### October 29

Analysis/Mathematical Physics Seminar ✦ *Semiclassical Eigenfunction Estimates* ✦ **Melissa Tacy**, Member, School of Mathematics

### November 1

Computer Science and Discrete Mathematics Seminar I ✦ *On the Structure of Cubic and Quartic Polynomials* ✦ **Elad Harmaty**, Technion–Israel Institute of Technology

Members Seminar ✦ *Shimura Varieties, Local Models, and Geometric Realizations of Langlands Correspondences* ✦ **Elena Mantovan**, California Institute of Technology; von Neumann Fellowship, School of Mathematics

### November 2

Computer Science and Discrete Mathematics Seminar II ✦ *Fourier Spectrum of Polynomials over Finite Fields* ✦ **Shachar Lovett**, Member, School of Mathematics

Computer Science and Discrete Mathematics Seminar II ✦ *3/2 Firefighters Are Not Enough* ✦ **Rani Hod**, Tel Aviv University

Geometry and Cell Complexes ✦ *The Topology of Restricted Partition Posets* ✦ **Richard Ehrenborg**, University of Kentucky; Member, School of Mathematics

Galois Representations and Automorphic Forms Mini-Course ✦ *Local-Global Compatibility in the p-adic Langlands Program for GL(2) over Q* ✦ **Matthew Emerton**, Northwestern University

### November 3

Galois Representations and Automorphic Forms Mini-Course ✦ *Local-Global Compatibility in the p-adic Langlands Program for GL(2) over Q* ✦ **Matthew Emerton**, Northwestern University

Workshop on Topology Identifying Order in Complex Systems ✦ *Defects and Topology in Liquid Crystals* ✦ **Gareth Alexander**, University of Pennsylvania ✦ *Topological Methods for Distributed Coverage Verification in Mobile Sensor Networks* ✦ **Ali Jadbadaie**, University of Pennsylvania ✦ *Spaces of Particles, Their Applications and Connections* ✦ **Frederick R. Cohen**, University of Rochester

### November 4

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 4* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *A Satake Isomorphism Mod.p* ✦ **Guy Henniart**, Université Paris-Sud 11

November 5

Analysis/Mathematical Physics Seminar ✦ *Ground States of the 2D Edwards-Anderson Spin Glass* ✦ **Michael Damron**, Princeton University

November 8

Computer Science and Discrete Mathematics Seminar I ✦ *The Graph Removal Lemma* ✦ **Jacob Fox**, Massachusetts Institute of Technology

Members Seminar ✦ *Beauty and Truth in Mathematics; A Tribute to Albert Einstein and Hermann Weyl* ✦ **Sir Michael Atiyah**, The University of Edinburgh

November 9

Computer Science and Discrete Mathematics Seminar II ✦ *An Elementary Proof of the Restricted Invertibility Theorem* ✦ **Nikhil Srivastava**, Member, School of Mathematics

November 10

Galois Representations and Automorphic Forms Seminar ✦ *On the Realization of Some Degenerate Automorphic Forms on Certain Griffiths-Schmid Varieties* ✦ **Henri Carayol**, Université de Strasbourg

November 11

Galois Representations and Automorphic Forms Seminar ✦ *Algebraic Cycles on Picard Moduli Spaces of Abelian Varieties* ✦ **Michael Rapoport**, Universität Bonn

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 5* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Periods of Special Cycles and Derivatives of L-Series* ✦ **Shou-Wu Zhang**, Columbia University

November 12

Analysis/Mathematical Physics Seminar ✦ *A Rigorous Renormalization Group Study of a p-adic Quantum Field Theory* ✦ **Abdelmalek Abdesselam**, University of Virginia

November 15

Computer Science and Discrete Mathematics Seminar I ✦ *Fractional Perfect Matchings in Hypergraphs* ✦ **Andrzej Rucinski**, Adam Mickiewicz University, Poznań, Poland, and Emory University

Members Seminar ✦ *Configuration Spaces of Hard Discs in a Box* ✦ **Matthew Kahle**, Member, School of Mathematics

November 16

Computer Science and Discrete Mathematics Seminar II ✦ *Planar Convexity, Infinite Perfect Graphs, and Lipschitz Continuity* ✦ **Menachem Kojman**, Ben Gurion University of the Negev; Member, School of Mathematics

November 17

Galois Representations and Automorphic Forms Seminar ✦ *A New Approach to the Local Langlands Correspondence for GLn over p-adic Fields* ✦ **Peter Schloze**, Universität Bonn

November 18

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 6* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Potential Automorphy for Compatible Systems of L-Adic Galois Representations* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Endoscopic Transfer of Depth-Zero Supercuspidal L-Packets* ✦ **Tasho Kaletha**, Princeton University; Veblen Research Instructorship, School of Mathematics

November 19

Analysis/Mathematical Physics Seminar ✦ *Perturbation Theory for Band Matrices* ✦ **Alexander Sodin**, Member, School of Mathematics

Geometry/Dynamical Systems Seminar ✦ *Implied Existence for 3D Dynamics* ✦ **Al Momin**, Purdue University

November 22

Computer Science and Discrete Mathematics Seminar I ✦ *Combinatorial Theorems in Random Sets* ✦ **David Conlon**, University of Cambridge

Members Seminar ✦ *Modularity of Galois Representations* ✦ **Chandrashekhar Khare**, University of California, Los Angeles

November 23

Computer Science and Discrete Mathematics Seminar II ✦ *Counting Pattern Avoiding Permutations via Integral Operators* ✦ **Richard Ehrenborg**, University of Kentucky; Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Special Gamma, Zeta, Multizeta Values, and Anderson T-Motives* ✦ **Dinesh Thakur**, The University of Arizona

November 29

Computer Science and Discrete Mathematics Seminar I ✦ *The Permanents of Gaussian Matrices* ✦ **Scott Aaronson**, Massachusetts Institute of Technology

Members Seminar ✦ *(Some) Generic Properties of (Some) Infinite Groups* ✦ **Igor Rivin**, Temple University; Member, School of Mathematics

Computer Science and Discrete Mathematics Seminar ✦ *Self-Correction, Distance Estimation, and Local Testing of Codes* ✦ **Dana Moshkovitz**, Massachusetts Institute of Technology

November 30

Computer Science and Discrete Mathematics Seminar II ✦ *Hardness Escalation and the Rank of Polynomial Threshold Proofs* ✦ **Paul Beame**, University of Washington; Member, School of Mathematics

December 1

Workshop on Topology: Identifying Order in Complex Systems ✦ *Characteristics of Coarsening Cellular Structures in 2D* ✦ **Jeremy Mason**, Member, School of Mathematics ✦ *Fundamental Groups of Random Simplicial Complexes* ✦ **Eric Babson**, University of California, Davis ✦ *Patterns, Universality, and Computational Algorithms* ✦ **Nigel Goldenfeld**, University of Illinois at Urbana-Champaign

December 2

Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 7* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Relative p-adic Hodge Theory* ✦ **Ruochuan Liu**, Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *The Iwasawa Main Conjectures for Modular Forms* ✦ **Christopher Skinner**, Princeton University; Member, School of Mathematics

December 3

Introduction to the Univalent Foundations of Mathematics ✦ *Constructive Type Theory and Homotopy* ✦ **Steve Awodey**, Carnegie Mellon University

Analysis/Mathematical Physics Seminar ✦ *Localization and Thermalization in Highly Excited Many-Body Quantum Systems* ✦ **David Huse**, Princeton University; Visitor, School of Mathematics

Geometry/Dynamical Systems Seminar ✦ *A Reidemeister-Singer Conjecture for Surface Diagrams* ✦ **Jonathan Williams**, University of California, Berkeley

December 6
Computer Science and Discrete Mathematics Seminar I ✦ *Nonlinear Dvoretzky Theory* ✦ **Assaf Naor**, Courant Institute of Mathematical Sciences, New York University

Members Seminar ✦ *Shimura Varieties and the Bernstein Center* ✦ **Thomas J. Haines**, University of Maryland; von Neumann Fellowship, School of Mathematics

December 7
Introduction to the Univalent Foundations of Mathematics/Computer Science and Discrete Mathematics Seminar II ✦ *Introduction to the Coq Proof Assistant* ✦ **Andrew Appel**, Princeton University

Fourth Ruth and Irving Adler Expository Lecture in Mathematics ✦ *Entropy, Algebraic Integers, and Moduli of Surfaces* ✦ **Curtis McMullen**, Harvard University

December 8
Lecture Series on Some Aspects of the p-adic Local Langlands Correspondence for GL(2,$Q_p$) ✦ *Lecture 8* ✦ **Pierre Colmez**, CNRS and Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *On Families of Filtered Phi Modules and Crystalline Representations* ✦ **Eugen Hellmann**, Universität Bonn

December 9
Galois Representations and Automorphic Forms Seminar ✦ *Vanishing Theorems for Torsion Automorphic Sheaves* ✦ **Kai-Wen Lan**, Princeton University; Veblen Research Instructorship, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Parahoric Subgroups and Supercuspidal Representations of p-adic Groups* ✦ **Dick Gross**, Harvard University

December 10
Introduction to the Univalent Foundations of Mathematics ✦ *Univalent Foundations of Mathematics* ✦ **Vladimir Voevodsky**, Professor, School of Mathematics

Analysis/Mathematical Physics Seminar: ✦ *A Classical Approximation Point of View on Some Results in the Spectral Theory of Jacobi Matrices* ✦ **Mira Shamis**, Member, School of Mathematics

Geometry/Dynamical Systems Seminar ✦ *Understanding Area Preserving Disk Maps Through Holomorphic Curves* ✦ **Barney Bramham**, Member, School of Mathematics

December 13
Computer Science and Discrete Mathematics Seminar I ✦ *Coloring Tournaments* ✦ **Paul Seymour**, Princeton University

Members Seminar ✦ *Questions about the Reductions Modulo Primes of an Elliptic Curve* ✦ **Alina Cojocaru**, University of Illinois at Chicago; Member, School of Mathematics

Special Lecture ✦ *Mathematical Foundations of Population Genetics* ✦ **Charles Epstein**, University of Pennsylvania

Special Members Seminar ✦ *Uniform Well-Posedness and Inviscid Limit for the Benjamin-Ono-Burgers Equation* ✦ **Zihua Guo**, Member, School of Mathematics

December 14
Computer Science and Discrete Mathematics Seminar II ✦ *Erdos Distinct Distance Problem in the Plane* ✦ **Larry Guth**, University of Toronto; Member, School of Mathematics

December 15
Galois Representations and Automorphic Forms Seminar ✦ *Ramification in Iwasawa Modules* ✦ **Chandrashekar Khare**, University of California, Los Angeles; Member, School of Mathematics

December 16
Galois Representations and Automorphic Forms Seminar ✦ *Two-Dimensional Galois Representations over Imaginary Quadratic Fields* ✦ **Andrei Jorza**, Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Weyl's Sums for Roots of Quadratic Congruences* ✦ **Henryk Iwaniec**, Rutgers, The State University of New Jersey

December 17
Analysis/Mathematical Physics Seminar ✦ *Universality and Chaos in Two-Dimensional Classical Ising Spin Glasses* ✦ **David Huse**, Princeton University; Visitor, School of Mathematics

January 10
Members Seminar ✦ *Moment-Angle Complexes, Spaces of Hard-Disks and Their Associated Stable Decompositions* ✦ **Frederick R. Cohen**, University of Rochester; Member, School of Mathematics

January 13
Galois Representations and Automorphic Forms Seminar ✦ *The Taylor-Wiles Method for Coherent Cohomology* ✦ **Michael Harris**, Université Paris Diderot; Member, School of Mathematics

January 17
Computer Science and Discrete Mathematics Seminar I ✦ *Cross-Validation and Mean-Square Stability* ✦ **Sergei Vassilvitskii**, Yahoo! Research, New York

January 18
Computer Science and Discrete Mathematics Seminar II ✦ *Efficiently Learning Mixtures of Gaussians* ✦ **Ankur Moitra**, Massachusetts Institute of Technology

January 19
Geometry/Dynamical Systems Seminar ✦ *Contacting the Moon* ✦ **Urs Frauenfelder**, Seoul National University ✦ *Weak Stability Boundary and Capture in the Three-Body Problem* ✦ **Edward Belbruno**, NASA Applied Information Systems Research and Innovative Orbital Design, Inc.

January 20
Analysis and Mathematical Physics Seminar ✦ *Fluctuations of the Nodal Line Length of Laplace Eigenfunctions on the Arithmetic Torus* ✦ **Igor Wigman**, KTH Royal Institute of Technology, Stockholm

Galois Representations and Automorphic Forms Seminar ✦ *Local-Global Compatibility and Monodromy* ✦ **Ana Caraiani**, Harvard University

Special Seminar ✦ *Mechanizing the Odd Order Theorem: Local Analysis* ✦ **Georges Gonthier**, Institut National de Recherche en Informatique et en Automatique

January 21
Geometry/Dynamical Systems Seminar ✦ *The Cartan Geometry of the Rotating Kepler Problem* ✦ **Otto Van Koert**, Seoul National University

January 24
Computer Science and Discrete Mathematics Seminar I ✦ *Universal One-Way Hash Functions via Inaccessible Entropy* ✦ **Hoeteck Wee**, Queens College, The City University of New York

Members Seminar ✦ *Groups of Even Type of Medium Size* ✦ **Inna Capdeboscq**, University of Warwick; von Neumann Fellowship, School of Mathematics

January 25
Computer Science and Discrete Mathematics Seminar II ✦ *Learning with Boolean Threshold Functions, a Statistical Physics Perspective* ✦ **Rémi Monasson**, Laboratoire de Physique Théorique, École Normale Supérieure, Paris; Member, School of Natural Sciences

January 26
Geometry/Dynamical Systems Seminar ✦ *Periodic Bounce Orbits of Prescribed Energy* ✦ **Peter Albers**, Purdue University

Geometry/Dynamical Systems Seminar ✦ *J-Curves in Degenerating Manifolds* ✦ **Joel Fish**, Stanford University

January 27

Galois Representations and Automorphic Forms Seminar ✦ *Presentation of an Iwasawa Algebra; The Case of the Level 1 Subgroup of* $SL(2, Z_p)$ ✦ **Laurent Clozel**, Université Paris-Sud 11; Member, School of Mathematics

January 28

Analysis/Mathematical Physics Seminar ✦ *Generic Local L-Bounds for Conformal Families of Laplace Operators* ✦ **John Toth**, McGill University

January 31

Computer Science and Discrete Mathematics Seminar I ✦ *Parsifying and Derandomizing the Johnson-Lindenstrauss Transform* ✦ **Jelani Nelson**, Massachusetts Institute of Technology

Members Seminar ✦ *Microlocal Theory of Sheaves and Applications to Nondisplaceability* ✦ **Pierre Schapira**, Université Paris 6

February 1

Computer Science and Discrete Mathematics Seminar II ✦ *On the Complexity of Computing Roots and Residuosity over Finite Fields* ✦ **Swastik Kopparty**, Member, School of Mathematics

Geometry and Cell Complexes ✦ *Topological Analysis of Grain Boundaries* ✦ **Srikanth Patala**, Masachusetts Institute of Technology

Special Lecture in Geometry/Topology ✦ *Microlocal Theory of Sheaves and Applications to Nondisplaceability II* ✦ **Pierre Schapira**, Université Pierre et Marie Curie

February 2

Special Lecture in Geometry/Topology ✦ *Microlocal Theory of Sheaves and Applications to Nondisplaceability III* ✦ **Pierre Schapira**, Université Pierre et Marie Curie

Mathematical Conversations ✦ *Randomness in Number Theory* ✦ **Peter Sarnak**, Professor, School of Mathematics

February 3

The Iwasawa Main Conjecture for GL(2) Mini-Course ✦ *Lecture 1* ✦ **Christopher Skinner**, Princeton University; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Automorphy Lifting for Galois Representations with Small Residual Image* ✦ **Jack Thorne**, Harvard University

February 4

Analysis/Mathematical Physics Seminar ✦ *Generalized Kepler Problems* ✦ **Guowu Meng**, The Hong Kong University of Science and Technology; Joint Member, Schools of Mathematics and Natural Sciences

February 7

Computer Science and Discrete Mathematics Seminar I ✦ *Fast Random Projections* ✦ **Edo Liberty**, Yahoo! Research, Haifa, Israel

Members Seminar ✦ *Recursively Applying Constructive Dense Model Theorems and Weak Regularity* ✦ **Russell Impagliazzo**, University of California, San Diego; Visiting Professor, School of Mathematics

February 8

Computer Science and Discrete Mathematics Seminar II ✦ *Bypassing UGC from Some Optimal Geometric Inapproximability Results* ✦ **Rishi Saket**, Princeton University

February 9

Workshop on Topology: Identifying Order in Complex Systems ✦ *Jamming in Sphere Packings* ✦ **Andrea Liu**, University of Pennsylvania ✦ *Topological Methods for Analyzing "Functional Connectivity" in Brain Activity Time Series* ✦ **Steve Ellis**, Columbia University ✦ *Computing Arithmetic Invariants of Hyperfolic 3-Manifolds* ✦ **Walter Neumann**, Barnard College; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Completed Cohomology of Shimura Curves and a p-adic Jacquet-Langlands Correspondence* ✦ **James Newton**, Member, School of Mathematics

Mathematical Conversations ✦ *The Isoperimetric Inequality* ✦ **Larry Guth**, University of Toronto; Member, School of Mathematics

February 10

The Iwasawa Main Conjecture for GL(2) Mini-Course ✦ *Lecture 2* ✦ **Christopher Skinner**, Princeton University; Member, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Eisenstein Congruences and Euler Systems* ✦ **Eric Jean-Paul Urban**, CNRS and Columbia University; Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Impossible Intersections for Elliptic Curves* ✦ **David Masser**, Universität Basel

February 11

Analysis/Mathematical Physics Seminar ✦ *The KPZ Universality Class and Equation* ✦ **Ivan Corwin**, Courant Institute of Mathematical Sciences, New York University

February 14

Computer Science and Discrete Mathematics Seminar I ✦ *An Elementary Proof of Anticoncentration of Polynomials in Gaussian Variables* ✦ **Shachar Lovett**, Member, School of Mathematics

Members Seminar ✦ *Some Equations and Games in Evolutionary Biology* ✦ **Christine J. Taylor**, Harvard University; Member, School of Mathematics

February 15

Computer Science and Discrete Mathematics Seminar II ✦ *Automatizability and Simple Stochastic Games* ✦ **Toniann Pitassi**, University of Toronto

February 16

Galois Representations and Automorphic Forms Seminar ✦ *Automorphic Cohomology I (General Theory)* ✦ **Phillip A. Griffiths**, Professor Emeritus, School of Mathematics

Mathematical Conversations ✦ *What We Can Do With Waves* ✦ **Melissa Tacy**, Member, School of Mathematics

February 17

The Iwasawa Main Conjecture for GL(2) Mini-Course ✦ *Lecture 3* ✦ **Christopher Skinner**, Princeton University; Member, School of Mathemtics

Galois Representations and Automorphic Forms Seminar ✦ *Automorphic Cohomology II (Carayol's Work and an Application)* ✦ **Phillip A. Griffiths**, Professor Emeritus, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Heuristics for Lambda Invariants* ✦ **Sonal Jain**, New York University

February 21

Computer Science and Discrete Mathematics Seminar I ✦ *Information Cost Tradeoffs for Augmented Index and Streaming Language Recognition* ✦ **Amit Chakrabarti**, Dartmouth College

February 22

Computer Science and Discrete Mathematics Seminar II ✦ *Local Testing and Decoding of Sparse Linear Codes* ✦ **Shubhangi Saraf**, Visitor, School of Mathematics

February 23

The Iwasawa Main Conjecture for GL(2) Mini-Course ✦ *Lecture 4* ✦ **Christopher Skinner**, Princeton University; Member, School of Mathemtics

Mathematical Conversations ✦ *Error-Correcting Codes* ✦ **Swastik Kopparty**, Member, School of Mathematics

### February 24

Mini-Course on Automorphy ✦ *Galois Representations Attached to Automorphic Forms* ✦ **Richard Taylor**, Harvard University; Distinguished Visiting Professor, School of Mathematics

Mini-Course on Automorphy ✦ *Deformations of Galois Representations* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *On Automorphy of Certain Galois Representations of* $GO_4$ ✦ **Tong Liu**, Purdue University; Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Whittaker Functions and Characters* ✦ **Daniel Bump**, Stanford University

### February 28

Computer Science and Discrete Mathematics Seminar I ✦ *A Completeness Theorem for Pseudolinear Functions with Applications to UC Security* ✦ **Charanjit Jutla**, IBM Thomas J. Watson Research Center, Hawthorne, New York

Members Seminar ✦ *Does Infinite Cardinal Arithmetic Resemble Number Theory?* ✦ **Menachem Kojman**, Ben-Gurion University of the Negev; Member, School of Mathematics

### March 1

Computer Science and Discrete Mathematics Seminar I ✦ *Property Testing Lower Bounds via Communication Complexity* ✦ **Eric Blais**, Carnegie Mellon University

### March 2

Workshop on Topology: Identifying Order in Complex Systems ✦ *Topological Defects in Cosmology* ✦ **Mark Trodden**, University of Pennsylvania ✦ *Grassmannians, Polytopes, and Quantum Field Theory* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences ✦ *Periodic Foams and Manifolds* ✦ **Frank Lutz**, Technische Universität Berlin

### March 3

Mini-Course on Automorphy ✦ *Deformations of Galois Representations (continued)* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

Mini-Course on Automorphy ✦ *Automorphy Lifting Theorems I* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Statistics for Families of Automorphic Representations* ✦ **Sug Woo Shin**, Member, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Periods of Quaternionic Shimura Varieties* ✦ **Kartik Prasanna**, University of Michigan

### March 7

Computer Science and Discrete Mathematics Seminar I ✦ *A Randomized Rounding Approach for Symmetric TSP* ✦ **Mohit Singh**, McGill University

Members Seminar ✦ *Self-Avoiding Walk and Branched Polymers* ✦ **John Z. Imbrie**, University of Virginia; Member, School of Mathematics

### March 8

Computer Science and Discrete Mathematics Seminar II ✦ *Relativized Separations of Worst-Case and Average-Case Complexities for NP* ✦ **Russell Impagliazzo**, University of California, San Diego; Visiting Professor, School of Mathematics

### March 9

Galois Representations and Automorphic Forms Seminar ✦ *Galois Representations Associated to Holomorphic Limits of Discrete Series* ✦ **Wushi Goldring**, Harvard University

### March 10

Mini-Course on Automorphy ✦ *Automorphy Lifting Theorems I (continued)* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

Mini-Course on Automorphy ✦ *Potential Automorphy Theorems I* ✦ **Richard Taylor**, Harvard University; Distinguished Visiting Professor, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *Analytic Geometry over* $F_1$ ✦ **Vladimir Berkovich**, Weizmann Institute of Science

Joint IAS/PU Number Theory Seminar ✦ *Affine Sieve and Expanders* ✦ **Alireza Golsefity**, Princeton University

### March 11

Working Group on Symplectic Topology

### March 14

Computer Science and Discrete Mathematics Seminar I ✦ *On the Fourier Spectrum of Symmetric Boolean Functions* ✦ **Amir Shpilka**, Technion–Israel Institute of Technology and Microsoft Research New England

Members Seminar ✦ *On Functoriality, on the Correspondence, and on Their Relation, Part 1* ✦ **Robert P. Langlands**, Professor Emeritus, School of Mathematics

### March 15

Computer Science and Discrete Mathematics Seminar II ✦ *A PRG for Gaussian Polynomial Threshold Functions* ✦ **Daniel Kane**, Harvard University

Question Session on Grassmannians, Polytopes, and Quantum Field Theory ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

### March 16

Galois Representations and Automorphic Forms Seminar ✦ *Periods over Spherical Subgroups: An Extension of Some of the Langlands Conjectures* ✦ **Yiannis Sakellaridis**, Member, School of Mathematics

Mathematical Conversations ✦ *The (Unreasonable) Effectiveness of (Hyperbolic) Geometry* ✦ **Igor Rivin**, Temple University; Member, School of Mathematics

### March 17

Mini-Course on Automorphy ✦ *Automorphy Theorems II* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics ✦ *Applications* ✦ **Richard Taylor**, Harvard University; Distinguished Visiting Professor, School of Mathematics

Galois Representations and Automorphic Forms Seminar ✦ *p-adic Analytic Continuation of Genus 2 Overconvergent Hilbert Eigenforms in the Inert Case* ✦ **Yichao Tian**, Princeton University; Veblen Research Instructorship, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Niebur Integrals and Mock Automorphic Forms* ✦ **Wladimir De Azevedo Pribitkin**, College of Staten Island, The City University of New York

### March 18

Analysis/Mathematical Physics Seminar ✦ *Shape Fluctuations of Growing Droplets and Random Matrix Theory* ✦ **Herbert Spohn**, Technische Universität München

Working Group on Symplectic Topology

Question Session on Grassmannians, Polytopes, and Quantum Field Theory ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

### March 21

Computer Science and Discrete Mathematics Seminar I ✦ *Pareto Optimal Solutions for Smooth Analysts* ✦ **Ryan O'Donnell**, Carnegie Mellon University; von Neumann Fellowship, School of Mathematics

Workshop on Galois Representations and Automorphic Forms ✦ *The Proof of the Burger-Sarnak Conjecture* ✦ **Laurent Clozel**, Université Paris-Sud 11; Member, School of Mathematics ✦ *Supercuspidal L-Packets* ✦ **Tasho**

**Kaletha**, Princeton University; Veblen Research Instructorship, School of Mathematics ✦ *Construction of Eigenvarieties and Coherent Cohomology* ✦ **Vincent Pilloni**, Columbia University ✦ *An Overconvergent Eichler-Shimura Map* ✦ **Adrian Iovita**, Corcordia University, Montreal

### March 22

Workshop on Galois Representations and Automorphic Forms ✦ *Local-Global Compatibility and Monodrom* ✦ **Ana Caraiani**, Harvard University ✦ *Intersection Cohomology Is Useless* ✦ **Sophie Morel**, Harvard University; Member, School of Mathematics ✦ *Perfectoid Spaces* ✦ **Peter Schloze**, Universität Bonn ✦ *A Semistable Model for the Tower of Modular Curves* ✦ **Jared Weinstein**, Member, School of Mathematics

### March 23

Workshop on Galois Representations and Automorphic Forms ✦ *Minimal Modularity Lifting Theorems for Imaginary Quadratic Fields* ✦ **Francesco Calegari**, Northwestern University; von Neumann Fellowship, School of Mathematics ✦ *p-adic Hodge-Theoretic Properties of Etale Cohomology with Mod P Coefficients and the Cohomology of Shimura Varieties I* ✦ **Matthew Emerton**, Northwestern University ✦ *p-adic Hodge-Theoretic Properties of Etale Cohomology with Mod P Coefficients and the Cohomology of Shimura Varieties II* ✦ **Toby Gee**, Northwestern University ✦ *Local-Global Compatibility at Primes Dividing 1* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

### March 24

Workshop on Galois Representations and Automorphic Forms ✦ *From General Etale (phi,Gamma)-Modules to Representations of* $G(Q_p)$ ✦ **Marie-France Vigneras**, Institut de Mathématiques de Jussieu, Université Paris Diderot ✦ *The Image of Colmez's Montreal Functor* ✦ **Vytautas Paskunas**, Universität Bielefeld ✦ *Locally Algebraic Vectors in the p-adic Langlands Correspondence* ✦ **Gabriel Dispinescu**, École Polytechnique, Palaiseau, France

Joint IAS/PU Number Theory Seminar ✦ *Random Maximal Isotropic Subspaces and Selmer Groups* ✦ **Bjorn Poonen**, Massachusetts Institute of Technology

### March 25

Workshop on Galois Representations and Automorphic Forms ✦ *Vanishing of the μ-Invariant of p-adic Hecke L Functions* ✦ **Haruzo Hida**, University of California, Los Angeles ✦ *Recent Developments in Noncommutative Iwasawa Theory II* ✦ **Mahesh Kakde**, University College London ✦ *Recent Developments in Noncommutative Iwasawa Theory I* ✦ **David Burns**, King's College London

Working Group on Symplectic Topology

### March 28

Computer Science and Discrete Mathematics Seminar I ✦ *Nonnegatively Weighted #CSPs: an Effective Complexity Dichotomy* ✦ **Xi Chen**, Columbia University

Members Seminar ✦ *Mumford-Tate Groups and Domains* ✦ **Phillip A. Griffiths**, Professor Emeritus, School of Mathematics

### March 29

Computer Science and Discrete Mathematics Seminar II ✦ *General Hardness Amplification of Predicates and Puzzles* ✦ **Grant Schoenbeck**, Princeton University

Special Lecture ✦ *Uniqueness of Enhancements for Categories* ✦ **Dmitry Orlov**, Steklov Mathematical Institute, Russian Academy of Sciences

Special Lecture ✦ *Limit Theorems for the Möbius Function and Statistical Mechanics* ✦ **Francesco Cellarosi**, Princeton University

### March 30

Galois Representations and Automorphic Forms Seminar ✦ *Reductions of Local Galois Representations Arising from Hilbert Modular Forms* ✦ **Fred Diamond**, King's College London; Visitor, School of Mathematics

Mathematical Conversations ✦ *Expander Graphs: Why Number Theorists Might Care about Network Optimization* ✦ **Elena Fuchs**, Member, School of Mathematics

### March 31

Galois Representations and Automorphic Forms Seminar ✦ *Local Universal Lifting Rings When* $l \neq p$ ✦ **Suh-Hyun Choi**, Korea Advanced Institute of Science and Technology

Question Session on Grassmannians, Polytopes, and Quantum Field Theory ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

### April 1

Working Group on Symplectic Topology

### April 4

Computer Science and Discrete Mathematics Seminar I ✦ *Improved Bounds for the Randomized Decision Tree Complexity of Recursive Majority* ✦ **Ashwin Nayak**, University of Waterloo

Members Seminar ✦ *Symplectic Dynamics of Integrable Hamiltonian Systems* ✦ **Alvaro Pelayo**, Member, School of Mathemtics

### April 5

Computer Science and Discrete Mathematics Seminar II ✦ *Zero-One Rounding of Singular Vectors* ✦ **Nikhil Srivastava**, Member, School of Mathematics

### April 6

Workshop on Topology: Identifying Order in Complex Systems ✦ *The Evolution of Cellular Structures via Mean Curvature Flow* ✦ **Menachem Lazar**, Princeton University ✦ *Using Computational Algebraic Topology to Characterize Chromosome Instability in Cancer* ✦ **Javier Arsuaga**, San Francisco State University ✦ *Persistent Cohomology and Circular Coordinates* ✦ **Vin De Silva**, Pomona College

Galois Representations and Automorphic Forms Seminar ✦ *Automorphic Cohomology II (Carayol's Work and an Application)* ✦ **Phillip A. Griffiths**, Professor Emeritus, School of Mathematics

Special Lecture ✦ *Infinite Generation of Noncocompact Lattices on Right-Angled Buildings* ✦ **Anne Thomas**, The University of Sydney

Mathematical Conversations ✦ *"We Know That God Exists Because Mathematics Is Consistent and We Know That the Devil Exists Because We Cannot Prove the Consistency." — André Weil* ✦ **Menachem Kojman**, Ben Gurion University of the Negev; Member, School of Mathematics

### April 7

Galois Representations and Automorphic Forms Seminar ✦ *Overconvergent Igusa Tower and Overconvergent Modular Forms* ✦ **Jacques Tilouine**, Université Paris 13; Visitor, School of Mathematics

Question Session on Grassmannians, Polytopes, and Quantum Field Theory ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

### April 8

Working Group on Symplectic Topology

Geometry/Dynamical Systems Seminar ✦ *The Dehn Function of SL(n;Z)* ✦ **Robert Young**, Courant Institute of Mathematical Sciences, New York University, and University of Toronto

### April 11

Computer Science and Discrete Mathematics Seminar I ✦ *Graph Sparsification by Edge-Connectivity and Random Spanning Trees* ✦ **Nick Harvey**, University of Waterloo

### April 13

Mathematical Conversations ✦ *Atiyah's Connectivity, Morse Theory, and Solution Sets* ✦ **Alvaro Pelayo**, Member, School of Mathematics

### April 14

Galois Representations and Automorphic Forms Seminar ✦ *The Bernstein Center of the Category of Smooth* $W(k)[GL_n(F)]$*-Modules* ✦ **David Helm**, The University of Texas at Austin

April 15
Working Group on Symplectic Topology

April 18
Computer Science and Discrete Mathematics Seminar I ✦ *Quantum Fingerprints That Keep Secrets* ✦ **Dmitry Gavinsky**, NEC Laboratories America, Princeton, New Jersey

April 19
Computer Science and Discrete Mathematics Seminar II ✦ *New Tools for Graph Coloring* ✦ **Rong Ge**, Princeton University

April 20
Special Mathematical Physics Seminar ✦ *Universality in the 2D Coulomb Gas* ✦ **Pierluigi Falco**, Member, School of Mathematics

Mathematical Conversations ✦ *The Unique Games Conjecture* ✦ **Ryan O'Donnell**, Carnegie Mellon University; von Neumann Fellowship, School of Mathematics

April 21
Joint IAS/PU Number Theory Seminar ✦ *Algebraic Cycles and Euler Systems for Real Quadratic Fields* ✦ **Henri Darmon**, McGill University

April 22
Mini-Workshop on Pseudorandomness ✦ *Random Walks in Linear Groups* ✦ **Peter Varju**, Princeton University ✦ *The Correlation of Multiplicative Characters with Polynomials over Finite Fields* ✦ **Swastik Kopparty**, Member, School of Mathematics ✦ *The Polynomial Method and Applications from Finite Field Kakeya to Distinct Distances* ✦ **Larry Guth**, University of Toronto; Member, School of Mathematics ✦ *Monotone Expanders—Constructions and Applications* ✦ **Zeev Dvir**, Princeton University; Visitor, School of Mathematics ✦ *On Zaremba's Conjecture* ✦ **Alex Kontorovich**, Stony Brook University, The State University of New York

Working Group on Symplectic Topology

April 25
Computer Science and Discrete Mathematics Seminar I ✦ *Learning and Testing K-Model Distributions* ✦ **Rocco Servidio**, Columbia University

April 26
Computer Science and Discrete Mathematics Seminar II ✦ *Quadratic Goldreich-Levin Theorems* ✦ **Madhur Tulsiani**, Visitor, School of Mathematics

April 27
Mathematical Conversations ✦ *Computer Science and Homotopy Theory* ✦ **Vladimir Voevodsky**, Professor, School of Mathematics

April 28
Galois Representations and Automorphic Forms Seminar ✦ *Classification of Representations* ✦ **Jim Arthur**, University of Toronto

Galois Representations and Automorphic Forms Seminar ✦ *On the Comparison of Trace Formulas* ✦ **Jim Arthur**, University of Toronto

Joint IAS/PU Number Theory Seminar ✦ *Serre's Conjectures on the Number of Rational Points of Bounded Height* ✦ **Per Salberger**, Chalmers University of Technology, Gothenburg, Sweden

April 29
Working Group on Symplectic Topology

May 3
Question Session on Grassmannians, Polytopes, and Quantum Field Theory ✦ *Informal Talk* ✦ **Sasha Goncharov**

May 4
Mathematical Conversations ✦ *"Mathemagical"* ✦ **Richard Ehrenborg**, University of Kentucky; Member, School of Mathematics, and **Christine Taylor**, Harvard University; Member, School of Mathematics

May 6
Working Group on Symplectic Topology

May 9
Workshop on Sheaf-Theoretic Methods in Symplectic Topology ✦ *Microlocal Theory of Sheaves and Link with Symplectic Geometry* ✦ **Stephane Guillermou**, Université de Grenoble ✦ *Quasimap Floer Cohomology and Singular Symplectic Quotients* ✦ **Chris Woodward**, Simons Center for Geometry and Physics, Stony Brook University, The State University of New York, and Rutgers, The State University of New Jersey ✦ *Wrapped Fukaya Categories of Punctured Spheres and Homological Mirror Symmetry* ✦ **Denis Aurous**, University of California, Berkeley

May 10
Workshop on Sheaf-Theoretic Methods in Symplectic Topology ✦ *Microlocal Theory of Sheaves and Link with Symplectic Geometry II* ✦ **Stephane Guillermou**, Université de Grenoble ✦ *A Stable Infinity-Category of Lagrangian Cobordisms* ✦ **David Nadler**, Northwestern University ✦ *Microlocal Category for a Closed Symplectic Manifold* ✦ **Dmitry Tamarkin**, Northwestern University ✦ *Microlocal Theory of Sheaves and Link with Symplectic Geometry III* ✦ **Stephane Guillermou**, Université de Grenoble

May 11
Workshop on Sheaf-Theoretic Methods in Symplectic Topology ✦ *Generation Criteria for the Fukaya Category* ✦ **Mohammed Abouzaid**, Massachusetts Institute of Technology ✦ *Microlocal Category for a Closed Symplectic Manifold II* ✦ **Dmitry Tamarkin**, Northwestern University ✦ *Coherent-Constructible Correspondence and Homological Mirror Symmetry I* ✦ **Bohan Fang**, Columbia University

May 12
Workshop on Sheaf-Theoretic Methods in Symplectic Topology ✦ *Coherent-Constructible Correspondence and Homological Mirror Symmetry II* ✦ **Melissa Liu**, Columbia University ✦ *Generation Criteria for the Fukaya Category II* ✦ **Mohammed Abouzaid**, Massachusetts Institute of Technology

Joint IAS/PU Number Theory Seminar ✦ *Relative Homotopy Type and Obstructions to the Existence of Rational Points* ✦ **Tomer Schlank**, The Hebrew University of Jerusalem

Question Session on Grassmannians, Polytopes, and Quantum Field Theory ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

# Program for Women and Mathematics

The eighteenth annual Program for Women and Mathematics was held at the Institute during May 16–27, 2011. Program activities were supported by the Institute, Princeton University, and the National Science Foundation.

The goal of the program is to encourage undergraduate and graduate students to continue their math education. The topic of this year's program was "Sparsity and Computation." The schedule consisted of lectures, seminars, problem-solving sessions, computer labs, mentoring, and networking discussions. An introduction to career opportunities was also offered.

This year's program attracted sixty-nine participants. Included in that number were four postdoctoral students, twenty-two graduate students, and thirty-two undergraduates. All participants were accommodated in the Institute's housing complex, giving them an opportunity to not only meet Institute math Members but Members from other Schools as well.

Organizers were Ingrid Daubechies of Duke University, Karen Uhlenbeck of the University of Texas at Austin, and Tanya Khovanova, research affiliate at the Massachusetts Institute of Technology.

ANDREA KANE

ANDREA KANE

Advanced course lectures were given by Anna Gilbert of the University of Michigan and Sofya Raskhodnikova of the Pennsylvania State University. Rachel Ward of New York University's Courant Institute of Mathematical Sciences and Rebecca Willett of Duke University gave the beginning course lectures.

Teaching assistants for the advanced course were Shubhangi Saraf, a Visitor in the School of Mathematics, and Mary Wooters of the University of Michigan. Assistants for the beginning course lectures were Sarah Constantin of Yale University and Kalyani Krishnamurthy of Duke University.

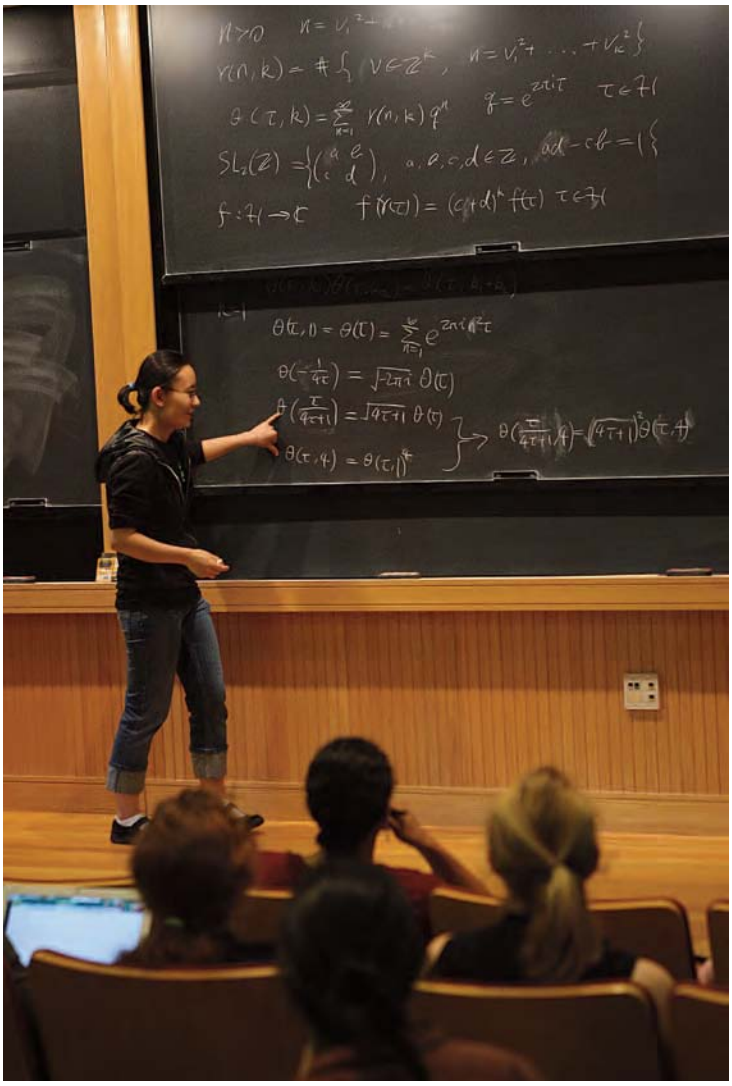
Research seminars were as follows: Po-Ling Loh, University of California, Berkeley, "Inverse Covariance Matrix Estimation for Gaussian Graphical Models in the

Some sixty-nine students and scholars participated in the Program for Women and Mathematics. This year's program on "Sparsity and Computation" included advanced course lectures by Anna Gilbert (bottom, right) of the University of Michigan.

Presence of Noise"; Anna Ayzenshtat, the Universtiy of Texas at Austin, "The Alternating Direction Method of Multipliers (ADMM)"; Carmeliza Navasca, Clarkson University, "Numerical Multilinear Algebra and Applications"; Yihe Dong, Princeton University, "Modular Forms"; and Maria Nastasescu, Princeton University, "Numerical Simulations of the Nodal Domains of Gaussian Spherical Harmonics."

During the program, there were seven Women-in-Science seminars. On the first full day there was an introductory seminar. On the following days Steven Miller of Williams College gave an "Introduction to Matlab"; Alexander Jones of New York University, talked about "Women of Ancient Mathematics"; and Deborah Lockhart of the National Science Foundation gave "An Introduction to the National Science Foundation and Funding Opportunities." There was "A Chat With Karen Uhlenbeck, Antonella Grassi [University of Pennsylvania] and Nancy Hingston [College of New Jersey]"; and two panel discussions, "A Day in the Life" and "The Next Step."

Two colloquia were given, one by Daubechies, "Finding (Dis)Similarities between Surfaces Using Conformal Geometry," and the second by David Brady of Duke University, "Forward Model Coding in Compressive Optical Imagers."



ANDREA KANE

Po-Ling Loh of the University of California, Berkeley, led the research seminar "Inverse Covariance Matrix Estimation for Gaussian Graphical Models in the Presence of Noise."

On the last day of the program, Richard Ehrenborg of the University of Kentucky, a Member in the School of Mathematics, gave a special talk on "Mathematical Magic."

On Monday, May 23, the program participants visited Princeton University, where they had lunch, dinner, and a tour of the campus. The highlights of the day's activities were talks by John Conway of Princeton University and Peter Sarnak, Professor in the School.

The Institute and the School of Mathematics appreciate the dedication of the senior women who graciously have given their time and talents since the inception of the program in 1994. Organizers, program committee members, lecturers, and Institute staff have all contributed to the growth and success of the women's program. In the past eighteen years, many women in the field of mathematics or contemplating entering the field have been encouraged and supported by Uhlenbeck, the program founder, and her collaborator and co-organizer Chuu-Lian Terng. Their commitment to the goals of the program has been unparalleled.

At the conclusion of the activities, participants were asked to complete a questionnaire regarding the material level of the lectures, the structure and organization of the program, and the quality of the facilities. Every response expressed appreciation for the opportunity to participate, the exceptional talks, and the fine facilities. One participant wrote, "The program allowed me to step back and put my life in perspective. It was really refreshing to meet people with similar goals, insecurities, and interests, and I [returned home] with a renewed desire to be a part of the mathematical community."

ANDREA KANE

The main interest of Professor Edward Witten (center) in 2010–11 was to develop a gauge theory approach to Khovanov homology of knots. In October, he gave a high-energy theory seminar on Chern-Simons theory from four dimensions.

# School of Natural Sciences

Faculty

**Nima Arkani-Hamed**

**Stanislas Leibler**

**Arnold J. Levine**

**Juan Maldacena**

**Nathan Seiberg**

**Scott Tremaine**, Richard Black Professor

**Edward Witten**, Charles Simonyi Professor

**Matias Zaldarriaga**

Professors Emeriti

**Stephen L. Adler**

**Freeman J. Dyson**

**Peter Goldreich**

In the past year, Professor **Nima Arkani-Hamed** continued his work on understanding the amazing structure of scattering amplitudes in gauge theories, a subject that holds the promise of transforming our understanding of quantum field theory. Over the past two years, he has been intensively exploring a remarkably simple mathematical structure—represented as a contour integral over the Grassmannian—that seems to lie at the heart of some of the physics, seen at first in a dual picture for all the "leading singularities" of the scattering amplitudes to loop orders. Last August, he found an explicit recursive formula for the all L-loop integrand for scattering amplitudes in N=4 SYM in the planar limit, manifesting an infinite-dimensional "Yangian" symmetry of the theory that is otherwise invisible. This also provides a new physical picture for the meaning of quantum "loop" corrections, which arise from the "entangled" removal of pairs of particles, and naturally represents loop amplitudes as integrals in twistor space. This research has stepped toward a long-standing goal of providing a completely new definition of the theory where words like "space-time," "Lagrangian," "path integral," and "gauge symmetry" do not make an appearance.

Arkani-Hamed further explored the systematics of these objects in a pair of December papers. The new methods have reduced the computation of multiloop integrands in the theory to a routine exercise. For instance, certain "2-loop" amplitudes were computed in August 2009 and written in terms of eight pages of complicated expressions, while the form obtained from the new methods represents this as essentially a single term. The simplicity of these results is very striking, and strongly suggests further deep organizing principles at work. A rough picture that is emerging is that the Grassmannian formulation itself has a dual description where amplitudes are "volumes" of "polytopes." To compute the volume, the polytope needs to be triangulated, and different triangulations make different physical properties manifest. For instance, space-time locality and quantum-mechanical unitarity are made manifest by different choices of triangulations.

During the 2010–11 academic year, Professor **Stanislas Leibler** continued to focus on studies of the functional constraints in protein families and associated "protein sectors," and on a study of error corrections in biological systems.

*During the 2010–11 academic year, Professor Leibler continued to focus on studies of the functional constraints in protein families and associated "protein sectors," and on a study of error corrections in biological systems.*

The latter topic was developed in collaboration with Member Arvind Murugan. In particular, Leibler and Murugan studied a kinetic proofreading scheme, proposed many years ago by John Hopfield, currently a Visiting Professor at the Institute. They obtained new insights about the interplay between error rate, reaction completion time, and energy consumption in these important biochemical phenomena.

Recent work of Hopfield on neurodynamics in the hippocampus has motivated Members Rémi Monasson and Simona Cocco to study statistical mechanics models of the so-called place cells. They also continued their theoretical work on inverse statistical problems, with applications to neurobiology and protein sectors.

Finally, Monasson, Cocco, Leibler, and Doeke Hekstra of the Rockefeller University collaborated to develop theoretical methods to analyze population time series from quantitative ecological experiments. These general statistical methods should be applicable to a wide range of biological data.

During the academic year 2010–11, Professor **Arnold J. Levine**'s research focused on areas in virology, immunology, cancer, and autism. A study, continuing collaboration with Member Benjamin Greenbaum and the laboratory of Nina Bhardwaj at New York University, predicted that the particular nucleotide phrases avoided by influenza viruses when they evolve in human cells stimulate the human immune system—likely through binding to a Toll-like receptor that can recognize single-stranded RNA. ("Oligonucleotide Motifs that Disappear during the Evolution of Influenza in Humans Increase IFN-1 Secretion by Plasmacytoid Dendritic Cells," *Journal of Virology*, in press). In further collaboration with Greenbaum and others, viruses were introduced to human dendritic cells containing these particular phrases (the dinucleotide CpG in an A/U context), and as predicted, they caused an aberrant immune response. This finding supports theories that the pathogenicity of many viruses stems from an abnormal amount of non-self-signaling when a virus changes host. A separate project with Greenbaum has

John Hopfield (center, left) and Albert Libchaber (center, right), Visiting Professors in biology, at teatime in the Common Room of Fuld Hall

KATE ABLUTZ

found that one HIV gene organizes its genome in an unusual fashion compared to other HIV genes and compared to most human genes. Further research will explore the hypothesis that the virus does so to control degradation of RNA associated with this gene. Another study with Greenbaum and Member Asad Naqvi has been looking at whether copy number variation in human genes has selected certain genes in the innate immune system for dosage effects.

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Professor Arnold Levine's research focused on areas in virology, immunology, cancer, and autism. A finding with Member Benjamin Greenbaum and others supports theories that the pathogenicity of many viruses stems from an abnormal amount of non-self-signaling when a virus changes host.

In the area of cancer research, a project with Member Elke Markert and Visitor and former Member Alexei Vazquez has been developing strategies to differentiate prostate cancer patients based on patterns of gene expression in prostate tumor tissue. A separate project with Vazquez and others is developing a methodology to identify chemical compounds with increased anticancer activity in tumors with p53 mutations, and validate those predictions in cell lines and mouse models.

Finally, projects in autism included a study of homozygotic twins discordant for autism to identify de novo copy number variations (CNVs) that are unique to each twin, with Members Chang Chan and Ning Lei, to be followed by whole-genome sequencing of the twins. Additional projects with Lei and others sought to identify small-scale and trans-acting mutations inherited or de novo in the NCAM2 gene, which is associated with autism, and to explore de novo copy number variation in the at-risk alleles of several single nucleotide polymorphisms (SNPs) in about twenty genes involved in DNA homologous repair pathways, whose frequency is significantly enriched in either maternal or paternal genomes of families in the Autism Genetic Research Exchange database.

During the past 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, with long-term Member Davide Gaiotto, studied the gravity description for a large class of N=2 supersymmetric quantum field theories. The complete set of equations and boundary conditions that determine a geometry dual to a given quantum field theory was given. Some special cases were constructed explicitly. This gravity description was in precise correspondence with the general construction of N=2 quantum field theories given by Gaiotto in a previous paper.

Maldacena, with Dario Martelli, explored a geometry related to an interesting confining supersymmetric quantum field theory. This geometry has also played an important role in recent string constructions. There are two geometries that are closely related, one introduced by Klebanov and Strassler and the other by Chamseddine-Volkov-Maldacena-Nuñez. The relation between the two was clarified by considering a general brane configuration in string theory that can give rise to the two geometries in two distinct limits.

*Member Tom Banks and Professor Seiberg argued that in models of quantum gravity, there are no global symmetries, all continuous gauge symmetries are compact, and all charges allowed by Dirac quantization are present in the spectrum. Their discussion led to a more physical and more complete understanding of recently found consistency conditions of supergravity.*

Maldacena, with Luis Fernando Alday, Gaiotto, Amit Sever, and Pedro Vieira, studied a problem involving minimal area surfaces in anti–de Sitter space. This problem arises when one considers the strong coupling limit of Wilson loops or planar scattering amplitudes in N=4 super Yang Mills. This is a simple modification of the classical Plateau problem: the problem of finding a soap bubble that ends on a given contour. Except that now the contour, as well as the surface, live in a curved space with Lorentzian signature. The contour lives on the boundary of anti–de Sitter space and it consists of a sequence of light-like segments. These two papers found a way to compute the area of the surface as a function of the shape of the contour. The problem was solved by using the classical integrability of the equations of motion for a string. It is quite likely that these techniques could be extended to the full quantum theory. In fact, the main motivation for this project has been to compute Wilson loops or scattering amplitudes for all values of the coupling.

Professor **Nathan Seiberg**, with Members Daniel Green, Zohar Komargodski, Yuji Tachikawa, and Brian Wecht, studied the space of exactly marginal deformations of N=1 superconformal field theories in four dimensions. They showed that it is the quotient of the space of marginal couplings by the complexified continuous global symmetry group. This fact explains why exactly marginal deformations are ubiquitous in N=1 theories.

Davide Gaiotto, Seiberg, and Tachikawa revisited the study of the maximally singular point in the Coulomb branch of certain 4d N=2 gauge theories. A proper identification of the long distance theory removed a possible counter example to a conjectured a-theorem.

Member Tom Banks and Seiberg discussed some aspects of global and gauged symmetries in quantum field theory and quantum gravity. An effective Lagrangian description of $Z_p$ gauge theories showed that they are associated with an emergent $Z_p$ one-form (Kalb-Ramond) gauge symmetry. This led them to uncover new observables and new phenomena in nonlinear sigma-models. They argued that in models of quantum gravity, there are no global symmetries, all continuous gauge symmetries are compact, and all charges allowed by Dirac quantization are present in the spectrum. Their discussion led to a more physical and more complete understanding of recently found consistency conditions of supergravity.

Seiberg and Washington Taylor extended the known consistency conditions on the low-energy theory of six-dimensional N=1 supergravity. Following earlier work on two-form gauge fields, they concluded that the charge lattice for such a theory has to be self-dual. The Green-Schwarz anomaly cancellation conditions in the supergravity theory determine a sub-lattice of this charge lattice. The condition that this sub-lattice can be extended to a self-dual lattice leads to a strong constraint on theories that otherwise appear to be self-consistent.

Member Guido Festuccia and Seiberg presented a uniform treatment of rigid supersymmetric field theories in a curved spacetime. The main new tool was the use of classical background values of the auxiliary fields in the supergravity multiplet. This allowed them to reproduce known results about anti–de Sitter space and to find a supersymmetric Lagrangian on a three-sphere and on a four-sphere. Unless the theory is conformal, these are not

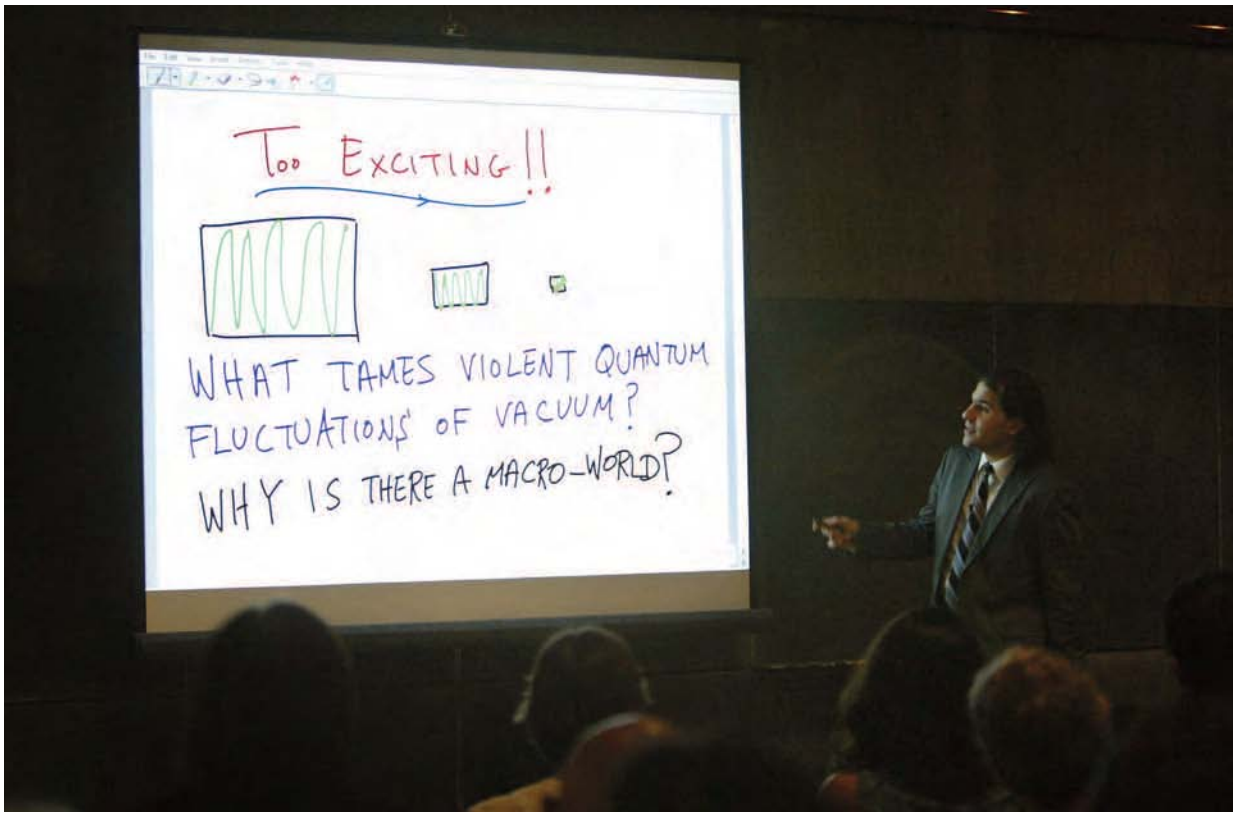
reflection positive. A supersymmetric theory on a three-sphere times a circle exists only when the theory has a continuous R-symmetry. The partition function in this case is independent of the parameters of the flat space theory and depends holomorphically on some complex background gauge fields.

NASA's Kepler spacecraft detects extrasolar planets when they pass in front of their host star and temporarily block a fraction of the star's light. Kepler's unmatched photometric precision and 24/7 coverage are almost impossible to achieve from ground-based observatories. Its first major data release, in February 2011, contains over 1,200 planetary candidates found in a survey of over 150,000 stars. Among these are 170 stars with multiple planets (up to six). The probability that more than one planet in a system will transit the host star depends strongly on the mutual inclination of the planetary orbits: thin, disk-like systems of planets are far more likely to present multiple transits than spherical systems with the same number of planets. Thus a comparison of the multiplicity distribution of Kepler planets with planets discovered by radial-velocity variations, which do not depend on the mutual inclinations, should allow the determination of the inclination distribution. Richard Black Professor **Scott Tremaine**, in collaboration with Member Subo Dong, has carried out this analysis and concluded that the mean inclination of the extrasolar planets in the Kepler catalog is no more than five degrees; thus, on average, the Kepler planetary systems are about as flat as our own solar system. This result provides by far the strongest direct evidence that most extrasolar planets form from a thin circumstellar disk.

One signature accomplishment of the Hubble Space Telescope has been the discovery of massive black holes at the centers of nearby galaxies. The Hubble data has also shown that the black hole masses are strongly correlated

*Professor Tremaine and collaborators conclude that most or all luminous elliptical galaxies—at least 60 percent and possibly almost 100 percent—contain massive central black holes. This result suggests that the formation process for such galaxies inevitably leads to black hole formation.*

Professor Nima Arkani-Hamed, pictured giving a talk on fundamental physics in the twenty-first century during the Institute's eightieth anniversary celebrations, continued his work on understanding the structure of scattering amplitudes in gauge theories.




ANDREA KANE

RANDALL HAGADORN

Members Tracy Slatyer (foreground) and Subo Dong discussed mysterious large-scale gamma-ray structures in the inner galaxy during an informal astrophysics seminar.

with the properties of the host galaxies, in particular the velocity dispersion of the stars in the body of the galaxy, thereby suggesting a deep connection between galaxy formation and black hole formation. Less well understood is what fraction of galaxies contain such black holes; this fraction is difficult to determine from the literature, in part because null results are usually not reported. Tremaine and his collaborators have devised novel statistical methods to account for these selection effects and conclude that most or all luminous elliptical galaxies—at least 60 percent and possibly almost 100 percent—contain massive central black holes. This result suggests that the formation process for such galaxies inevitably leads to black hole formation.

The study of the orbits of particles in rotating disks is essential to understanding phenomena as diverse as spiral structure in galaxies, planet formation, and quasars. Tremaine and Member Hanno Rein have studied a new algorithm for the numerical integration of such orbits, which in many circumstances yields errors that are several orders of magnitude smaller than competing methods in the literature.

Charles Simonyi Professor **Edward Witten**'s main interest in 2010–11 has been to develop a gauge theory approach to Khovanov homology of knots. From one point of view, his starting point is the new perspective on the Feynman path integral that he had developed in the previous academic year. This led to a reformulation of the Jones polynomial of knots in four-dimensional gauge theory (as opposed to the three-dimensional Chern-Simons gauge theory that Witten had used in his earlier work on this subject twenty years ago). Once arriving at a four-dimensional interpretation, Witten used electric-magnetic duality to get a new perspective on the Jones polynomial, and some standard string theory and quantum field theory arguments to get a gauge theory interpretation of a more powerful and more recent theory known as Khovanov homology. An alternative formulation of the same work begins in six dimensions and proceeds through some of the same steps in reverse. Witten spent the first half of the year writing up a detailed account of this work.

Member Simon Caron-Huot (right) studied very hot and dense systems such as the quark-gluon plasma and was also interested in gravitational, especially black hole, physics.

ANDREA KANE

In a second paper, in collaboration with long-term Member Davide Gaiotto, Witten showed explicitly how to recover the Jones polynomial of knots in the new framework. Along the way, Gaiotto and Witten developed a better understanding of the relation of two-dimensional Liouville quantum theory to three-dimensional Chern-Simons theory.

Witten has also pursued, with Stanford graduate students Daniel Harlow and Jonathan Maltz, another project involving Liouville quantum theory and its analytic continuation.

In 2010–11 Professor **Matias Zaldarriaga** worked on a variety of topics in cosmology,

including early universe cosmology; the study of the effects of variations in the gas temperature on the Lyman alpha forest; and the theory of galaxy bias. Tobias Baldauf and Uros Seljak of the University of California, Berkeley; Leonardo Senatore of Stanford University; and Zaldarriaga developed a theory of galaxy bias that includes General Relativistic corrections and used it to understand the effects of primordial departures from Gaussianity on the large-scale clustering properties of galaxies. With Elisa Chisari, a student at Princeton University, Zaldarriaga showed how to use standard Newtonian numerical simulations of structure formation to produce results that include the leading General Relativistic corrections by remapping the coordinate system. Both of these results will be needed to make predictions for and interpret the results of upcoming Large Scale Structure Surveys.

Member Amit Yadav; Meng Su of Harvard University; Matthew McQuinn of the University of California, Berkeley; Jaiyul Yoo of the University of Zurich; and Zaldarriaga studied how inhomogeneous reionization gives rise to angular fluctuations in the Cosmic Microwave Background (CMB) optical depth to the last scattering surface, correlating different spherical harmonic modes and imprinting characteristic non-Gaussianity on CMB maps. These signals could be detected with large signal to noise in future experiments like CMBPol. They demonstrated that the non-Gaussian signal from gravitational lensing of CMB is the dominant source of contamination for reconstructing inhomogeneous reionization signals, even with 98 percent of its contribution removed by delensing. They then constructed unbiased estimators that simultaneously reconstruct inhomogeneous reionization signals and the gravitational lensing potential. They applied their new unbiased estimators to future CMB experiments to assess the detectability of inhomogeneous reionization signals.

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Member Christopher Tully gave a high-energy theory seminar on the status and results of the Large Hadron Collider.

Member Daniel Baumann, Senatore, and Zaldarriaga studied the effective theory of adiabatic fluctuations around arbitrary Friedmann-Robertson-Walker backgrounds—both expanding and contracting—that allow for more than one way to obtain scale-invariant two-point correlations. However, they showed that it is challenging to produce scale-invariant fluctuations that are weakly coupled over the range of wavelengths accessible to cosmological observations. In particular, requiring the background to be a dynamical attractor, the curvature fluctuations are scale-invariant and weakly coupled for at least ten e-folds only if the background is close to de Sitter space. In this case, the time-translation invariance of the background guarantees time-independent n-point functions.

McQuinn, Lars Hernquist of Harvard University, Adam Lidz of the University of Pennsylvania, and Zaldarriaga studied the process of reionization of the intergalactic medium. It appears inevitable that reionization should have produced large-scale temperature fluctuations in the intergalactic medium. Using toy temperature models and detailed heating histories from cosmological simulations of HeII reionization, they studied the consequences of inhomogeneous heating for the Ly-alpha forest. The impact of temperature fluctuations in physically well-motivated models can be surprisingly subtle. In fact, they showed that temperature fluctuations at the level predicted by their reionization simulations do not give rise to detectable signatures in the

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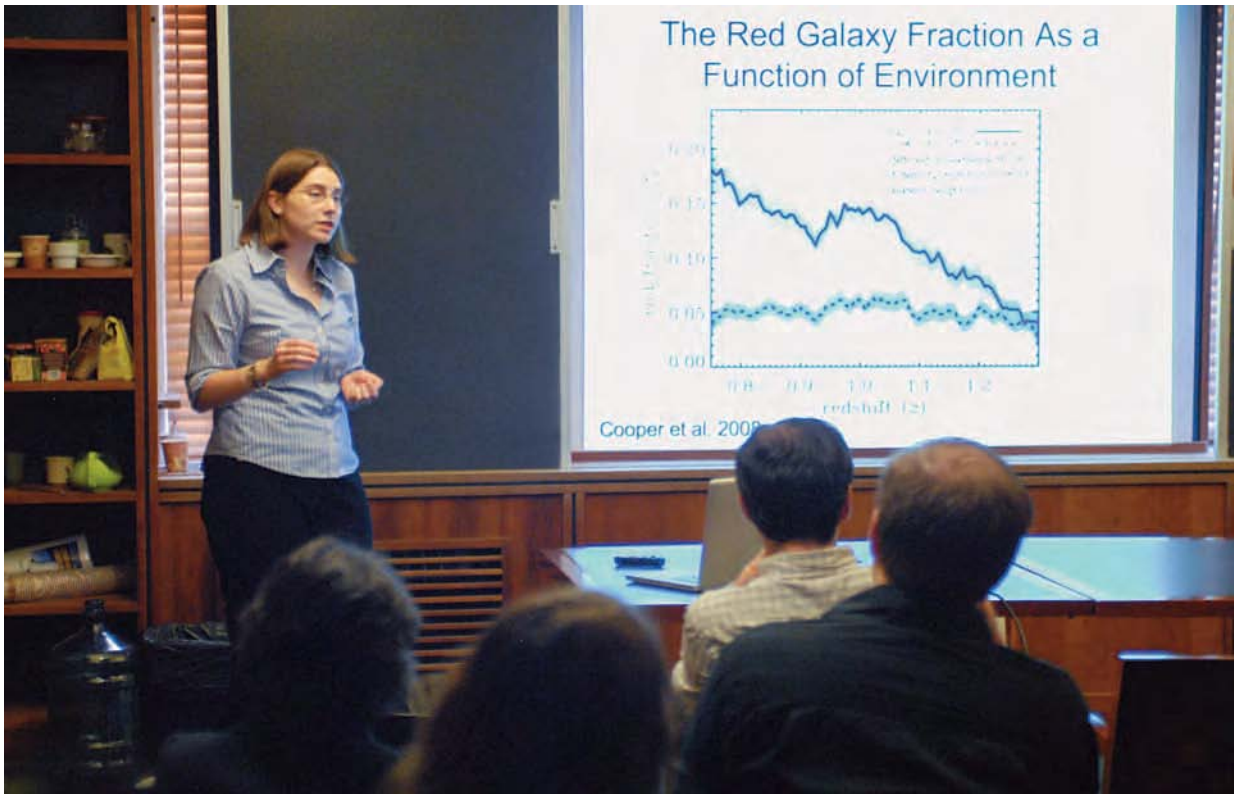
types of statistics that have been employed previously. However, because of the aliasing of small-scale density power to larger-scale modes in the line-of-sight Ly-alpha forest power spectrum, earlier analyses were not sensitive to 3D modes with longer than thirty comoving Mpc wavelengths—scales where temperature fluctuations are likely to be relatively largest. The ongoing Baryon Oscillation Spectroscopic Survey (BOSS) aims to measure the 3D power spectrum of the Ly-alpha forest from a large sample of quasars in order to avoid this aliasing. They found that physically motivated temperature models can alter this spectrum at an order unity level, a magnitude that should be easily detectable with BOSS. Future spectroscopic surveys could extend this measurement to even higher redshifts, potentially detecting the thermal imprint of hydrogen reionization.

Senatore and Zaldarriaga generalized the Effective Field Theory of Inflation to include additional light scalar degrees of freedom that are in their vacuum at the time the modes of interest are crossing the horizon. In order to make the scalars light in a natural way, they considered the case where these fields are the Goldstone bosons of a global symmetry group or are partially protected by an approximate supersymmetry. They wrote the most general Lagrangian that couples the scalar mode associated to the breaking of time translation during inflation to the additional light scalar fields. This Lagrangian is constrained by diffeomorphism invariance and the additional symmetries that keep the new scalars light. This Lagrangian describes the fluctuations around the time of horizon crossing, and it is supplemented with a general parameterization describing how the additional fluctuating fields can affect cosmological perturbations. They found that multifield inflation can reproduce the non-Gaussianities that can be generated in single field inflation but can also give rise to new kinds of non-

Stephanie Tonnesen of Princeton University gave an informal astrophysics seminar on pair interactions versus environment and effects on galaxy evolution.




CLIFF MOORE

Gaussianities. They found several new three-point function shapes and showed that in multifield inflation it is possible to naturally suppress the three-point function, making the four-point function the leading source of detectable non-Gaussianities. They also found that under certain circumstances, i.e., if specific shapes of non-Gaussianities are detected in the data, one could distinguish between single and multifield inflation and sometimes even among the various mechanisms that kept the additional fields light.

RANDALL HAGADORN

The research interests of Visiting Professor Rashid Sunyaev (center) included the cosmological recombination of hydrogen and helium, the physics of gas accretion onto neutron stars and black holes, the problem of matter, and radiation interaction under extreme astrophysical conditions.

Professor Emeritus **Stephen L. Adler**'s principal project this past year was writing a suite of computer programs for multidimensional numerical integration. The programs start with a base region, either a simplex or a hypercube, and proceed by subdividing all sides by a factor of two to give smaller subregions. This process continues until a termination criterion for the integral over each subregion is satisfied. This strategy permits good results to be obtained for truly multidimensional functions that have localized peaks and valleys throughout the higher-dimensional domain. The programs involve new higher-order integration formulas that Adler has devised, combined with efficient use of memory in the programming. For each geometry there are both single processor and parallel processing versions. The programs give good results up to dimension 7 on a personal computer, and up to dimension 9 or higher on a cluster.

Adler has also written a hybrid version of the hypercube programs, which permits subdivision along any subset of the axes giving hyper-rectangular subregions. These are then mapped into hypercubes for evaluation of the integral, by either a higher-order method for smooth functions or by a Monte-Carlo method for nonsmooth functions. Benchmark testing of this variant is the next step of the project.

Adler has posted on arXiv a draft description of the methods and construction of the programs. Substantial revision and expansion of the draft is planned before publication as a book. The programs, once testing is completed, will be posted on the Internet with a license for free use by individual users pursuing nonprofit research at academic institutions.

Adler's secondary project this year has been continuation of work on his dark matter scattering model for the flyby anomalies, which was described in the Fall 2009 issue of the *Institute Letter*. Data for five additional flybys was furnished by scientists affiliated with the Jet Propulsion Laboratory, and combined by Adler with the original six, to fit eleven data points with the eight parameter model. This gives a statistically significant test, and a good fit, with a chi-squared somewhat under three, is obtained. The model parameters now require the dark matter shells to be much closer to Earth than in the six point fit, which may introduce further constraints from satel-

lite orbits. Continuation of this project is planned as more data becomes available.

Professor Emeritus **Freeman J. Dyson** continued to spend most of his time writing book reviews and preparing public lectures. He served as editor for the volume *Best American Science and Nature Writing 2010*, published by Houghton Mifflin, and contributed a foreword to it. He also wrote a foreword for *The Best Writing on Mathematics 2011*, published by Princeton University Press. In collaboration with Norman Frankel of the University of Melbourne and Lawrence Glasser of Clarkson University, he engaged in a piece of recreational mathematics, studying a series of rational approximations to pi discovered by Derek Lehmer. The Lehmer series has the peculiar property that the error of the n'th approximation appears to decrease with n like $10^{(-n)}$, giving rise to the theological speculation that this might be evidence for a decadactylic God, working with arithmetic to base ten and therefore having ten fingers. We were able to demolish this unfounded speculation by proving that the error actually decreases like $Q^{(-n)}$, where $Q=(1+2i\pi/\log 2)$ is a natural constant independent of the arithmetical base.

*Most of Professor Goldreich and Yanqin Wu's efforts have been directed toward evaluating ohmic heating due to currents that originate in a plane's weather layer and then flow into its interior. Although ohmic heating cannot inflate a planet that has previously cooled off and shrunk, it is possible that it could prevent an inflated planet from shrinking.*

Masses, radii, and ages are determined for extrasolar planets that transit nearby stars. A significant fraction of these planets have radii that are larger than would be expected had they passively cooled since birth. Because all inflated planets orbit close to their parent stars, it is plausible that some of the stellar energy they intercept is converted into a low entropy form that is transported and deposited in their interiors. Two different scenarios are conceivable. Professor Emeritus **Peter Goldreich** and Yanqin Wu of the University of Toronto have been investigating both scenarios for inflated planets.

In the first, an amount of energy sufficient to inflate a cold planet is deposited deep in the planet's core over a significant fraction of its lifetime. This would require on the order of one-hundredth of a percent of the incident stellar flux to end up in the core. In this scenario, the planet could have cooled off while on a distant orbit and only later moved into the much smaller orbit in which it is highly irradiated. This is not a fanciful suggestion; there are well-understood mechanisms that can cause a planet's orbit to contract long after it has formed.

The second scenario involves the deposition of a similar or even larger fraction of the incident stellar flux just deep enough (down to pressure of hundreds of bars) to stop convection from transporting thermal energy out of the planet's core. This scenario would allow an inflated planet to remain inflated, but it could not inflate a shrunken planet. Inflated planets, if formed on distant orbits, would have had to migrate much closer to their parent stars early in their lifetimes. Migration driven by angular momentum loss to the protostellar gas disk would be a plausible mechanism for accomplishing this.

Most of Goldreich and Wu's efforts have been directed toward evaluating ohmic heating due to currents that originate in a plane's weather layer and then flow into its interior. Although ohmic heating cannot inflate a planet that has previously cooled off and shrunk, it is possible that it could prevent an inflated planet from shrinking.

## MEMBERS AND VISITORS

*f* First Term ✦ *s* Second Term ✦ *m* Long-term Member ✦ *v* Visitor ✦ *j* Joint Member School of Mathematics

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*Biology* ✦ Institute for Advanced Study ✦ *f*
*Helen and Martin Chooljian Founders' Circle Member*

**Thomas Banks**
*High-Energy Theoretical Physics, Cosmology* ✦ University of California, Santa Cruz, and Rutgers, The State University of New Jersey ✦ *f*
*Funding provided by The Ambrose Monell Foundation*

**Daniel Baumann**
*Cosmology, Astrophysics, String Theory* ✦ Institute for Advanced Study
*William D. Loughlin Member; additional funding provided by the National Science Foundation*

**Vladimir Belyi**
*Biology* ✦ Institute for Advanced Study ✦ *m*
*Martin A. and Helen Chooljian Member in Biology*

**David E. Berenstein**
*High-Energy Theoretical Physics* ✦ University of California, Santa Barbara ✦ *f*

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*Mathematical Physics, Statistical Mechanics, String Theory, Supersymmetry* ✦ Institute for Advanced Study
*Funding provided by the National Science Foundation*

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*Charles L. Brown Member in Biology*

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*Funding provided by the National Science Foundation*

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*Funding provided by the United States Department of Energy and The Ambrose Monell Foundation*

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*Funding provided by the United States Department of Energy*

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*Funding provided by the National Aeronautics and Space Administration, Einstein Fellowship Program*

**Guido Festuccia**
*High-Energy Theoretical Physics* ✦ Institute for Advanced Study
*Funding provided by the National Science Foundation*

**Patrick Fox**
*Particle Physics* ✦ Fermilab ✦ *f*

**Matthias Gaberdiel**
*String Theory* ✦ Eidgenössische Technische Hochschule Zürich ✦ *f*
*Funding provided by The Ambrose Monell Foundation*

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*Funding provided by the National Aeronautics and Space Administration and the National Science Foundation*

# RECORD OF EVENTS

## Astrophysics Activities

### September 20
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

### September 21
Astrophysics Seminar ✦ *Toward a New Era in Planetary Microlensing* ✦ **Andrew Gould**, The Ohio State University

### September 23
Astrophysics Informal Seminar ✦ *The Early History of the Solar System* ✦ **Renu Malhotra**, The University of Arizona

### September 28
Astrophysics Seminar ✦ *A Lensing Map . . . A Redshift Survey* ✦ **Margaret Geller**, Smithsonian Astrophysical Observatory

### September 30
Astrophysics Informal Seminar ✦ *SPLAT! The Solar System* ✦ **Scott J. Kenyon**, Harvard-Smithsonian Center for Astrophysics

### October 4
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *DM Annihilation and the CMB* ✦ **Tracy Slatyer**, Member, School of Natural Sciences ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

### October 5
Astrophysics Seminar ✦ *Modeling Astrophysics Data for Discovery, Classification, and Precise Measurement* ✦ **David Hogg**, New York University

### October 7
Astrophysics Informal Seminar ✦ *The Atacama Cosmology Telescope: Galaxies, Galaxy Clusters, and the CMB* ✦ **Tobias Marriage**, Johns Hopkins University

### October 12
Astrophysics Seminar ✦ *Precision Cosmology and the Interpretation of Quantum Mechanics* ✦ **Max Tegmark**, Massachusetts Institute of Technology

### October 14
Astrophysics Informal Seminar ✦ *Fast and Accurate Cosmic Hydrogen Recombination Theory* ✦ **Yacine Ali-Haimoud**, California Institute of Technology

### October 18
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Primordial Non-Gaussianity and Large-Scale Structure* ✦ **Kendrick Smith**, Princeton University ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

### October 19
Astrophysics Seminar ✦ *Confronting the Dark-Energy Crisis in Fundamental Physics* ✦ **Chris Stubbs**, Harvard-Smithsonian Center for Astrophysics

### October 21
Astrophysics Informal Seminar ✦ *Exploring the Ends of the Rainbow: Cosmic Rays in Star-Forming Galaxies* ✦ **Brian Lacki**, The Ohio State University

### October 26
Astrophysics Seminar ✦ *Cosmic Accelerators: The Possible Sources of Ultrahigh-Energy Cosmic Rays and Neutrinos* ✦ **Peter Mészáros**, The Pennsylvania State University; Visitor, School of Natural Sciences

### October 28
Astrophysics Informal Seminar ✦ *Dimension as the Key to the Mechanism of Core-Collapse Supernova Explosions* ✦ **Adam Burrows**, Princeton University

### November 1
Astrophysics Informal Seminar ✦ *Cosmic-Ray Propagation Time Scales: Lessons from Radioactive Nuclei and Positron Data* ✦ **Kfir Blum**, Weizmann Institute of Science

November 2
Astrophysics Seminar ✦ *Some Results from Herschel Space Telescope* ✦ **Bruce Draine**, Princeton University

November 4
Astrophysics Informal Seminar ✦ *Double Bubble Trouble: Mysterious Large-Scale Gamma-Ray Structures in the Inner Galaxy* ✦ **Tracy Slatyer**, Member, School of Natural Sciences

November 9
Astrophysics Seminar ✦ *Three Freaks of the Solar System (And Why They Matter)* ✦ **David Jewitt**, University of California, Los Angeles

November 11
Astrophysics Informal Seminar ✦ *Some Wrinkles in Recombination* ✦ **Daniel Grin**, Member, School of Natural Sciences

November 16
Astrophysics Seminar ✦ *How Tiny Can Galaxies Be?* ✦ **Hans-Walter Rix**, Max-Planck-Institut für Astrophysik

November 18
Astrophysics Informal Seminar ✦ *The Mechanical Greenhouse: Heat Burial by Forced Turbulence on Hot Jupiters* ✦ **Jonathan Mitchell**, University of California, Los Angeles

November 29
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Features in the Bispectrum* ✦ **Daan Meerburg**, University of Amsterdam ✦ *A Generalized Local Ansatz and Its Effect on Halo Bias* ✦ **Sarah Shandera**, Perimeter Institute for Theoretical Physics ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

November 30
Astrophysics Seminar ✦ *What's Going on Around Saturn? Recent Results from the Cassini Mission* ✦ **Matthew Hedman**, Cornell University

December 2
Astrophysics Informal Seminar ✦ *Don't Modify Gravity—Understand It!* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

December 7
Astrophysics Seminar ✦ *Galactic Enigmas in a Lambda-CDM Universe* ✦ **Martin Weinberg**, University of Massachusetts; Member, School of Natural Sciences

December 9
Astrophysics Informal Seminar ✦ *The Dark Matter at the End of the Galaxy* ✦ **Mariangela Lisanti**, Princeton University

December 13
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Search for Anisotropic Power in Large-Scale Structure* ✦ **Anthony Pullen**, California Institute of Technology, Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

December 14
Astrophysics Seminar ✦ *Stability, Energy Transport, and Variability of High Luminosity Accretion onto Black Holes* ✦ **Edwin Turner**, Princeton University; Visitor, Program in Interdisciplinary Studies

December 16
Astrophysics Informal Seminar ✦ *A (Quantum) Field Theorist's Approach to Gravitational Dynamics* ✦ **Rafael Porto**, Member, School of Natural Sciences

January 10
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

January 24
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ Discussion of Early Planck Papers ✦ Discussion Leaders: **Bill Jones** and **Cynthia Chiang**, Princeton University ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

January 28
Astrophysics Informal Seminar ✦ *The Coevolution of Galaxies and Black Holes* ✦ **Kevin Schawinski**, Yale University

February 1
Astrophysics Seminar ✦ *Cosmology and Astrophysics in the Planck Era* ✦ **Bill Jones**, Princeton University

February 3
Astrophysics Informal Seminar ✦ *Primordial Non-Gaussianity and Large-Scale Structure* ✦ **Roman Scoccimarro**, New York University

February 7
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *A Brachistochrone Approach to Reconstruct the Inflaton Potential* ✦ **Jiajun Xu**, University of Wisconsin–Madison ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

February 8
Astrophysics Seminar ✦ *Astrophysics of Supermassive Black Hole Formation* ✦ **Tom Abel**, Kavli Institute for Particle Astrophysics and Cosmology and SLAC National Accelerator Lab, Stanford University

February 10
Astrophysics Informal Seminar ✦ *Planetary Systems from Kepler* ✦ **Daniel Fabrycky**, University of California, Santa Cruz

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Astrophysics Informal Seminar ✦ *First Results from the Palomar Transient Factory* ✦ **Eran Ofek**, California Institute of Technology

February 22
Astrophysics Seminar ✦ *Some Field Theory Problems in Cosmology* ✦ **Steven Weinberg**, University of Texas at Austin

February 24
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February 28
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

March 1
Astrophysics Seminar ✦ *Sizes and Shapes of Drops Created in High-Speed Impacts* ✦ **Peter Goldreich**, California Institute of Technology; Professor Emeritus, School of Natural Sciences

March 3
Astrophysics Informal Seminar ✦ *The Golden Age of Exoplanet Spin-Orbit Measurements* ✦ **John Johnson**, California Institute of Technology

March 8
Astrophysics Seminar ✦ *Magnetic Star–Disk Interactions and Spin-Orbit Misalignment in Exoplanetary Systems* ✦ **Dong Lai**, Cornell University

March 10
Astrophysics Informal Seminar ✦ *Cosmic Bumps Make Two Humps* ✦ **Matthew Kleban**, New York University

March 14
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

March 15
Astrophysics Seminar ✦ *The Nature of Damped Lyman Alpha Systems* ✦ **Renyue Cen**, Princeton University

March 17
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March 22
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March 24
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March 28
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

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Astrophysics Seminar ✦ *Gravitational Waves from Cosmic Phase Transitions* ✦ **Lawrence Krauss**, Arizona State University

March 31
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April 7
Astrophysics Informal Seminar ✦ *Testing Lorentz Invariance with Cosmic Gamma-Rays, Ultrahigh-Energy Cosmic Rays, and Neutrinos* ✦ **Floyd Stecker**, Goddard Space Flight Center, National Aeronautics and Space Administration

April 11
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

April 12
Astrophysics Seminar ✦ *Collective Origin of Spiral Structure in Disk Galaxies* ✦ **Lars Hernquist**, Harvard University

April 14
Astrophysics Informal Seminar ✦ *Galaxy Formation and Evolution in the Next Decade* ✦ **Saul Perlmutter**, Lawrence Berkeley Laboratory, University of California, Berkeley; Member, Institute for Advanced Study

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April 19
Astrophysics Seminar ✦ *Diverse Energy Sources for Supernovae* ✦ **Lars Bildsten**, Kavli Institute for Theoretical Physics, University of California, Santa Barbara

April 21
Astrophysics Informal Seminar ✦ *Observations of Quasar Feedback* ✦ **Nadia Zakamska**, Johns Hopkins University

April 25
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

April 26
Astrophysics Seminar ✦ *Defending Planet Earth against Cosmic Intruders* ✦ **Irwin Shapiro**, Harvard University

April 28
Astrophysics Informal Seminar ✦ *Did Star-Forming Galaxies Reionize the Universe?* ✦ **Brant Robertson**, California Institute of Technology

May 5
Astrophysics Informal Seminar ✦ *Location, Location, Location! Pair Interactions versus Environment: Effects on Galaxy Evolution* ✦ **Stephanie Tonnesen**, Princeton University

May 9
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ Discussion of Ways to Get Around Cosmic Variance ✦ Discussion Leaders: **Kendrick Smith**, Princeton University, and **Daniel Grin**, Member, Institute for Advanced Study ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

May 10
Astrophysics Seminar ✦ *Shear-Driven Turbulence on Earth and in Space* ✦ **Jeremy Goodman**, Princeton University

May 12
Astrophysics Informal Seminar ✦ *Exoplanetary Atmospheres* ✦ **Kristen Menou**, Columbia University

May 17
Astrophysics Seminar ✦ *Direct Imaging of Terrestrial Exoplanets: Approaches and Progress in High-Contrast Imaging from Space* ✦ **Jeremy Kasdin**, Princeton University

May 19
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May 23
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

May 26
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Astrophysics Informal Seminar ✦ *Satellite-Supported Estimates of Human Rate of NPP Carbon Use on Land: Challenges Ahead* ✦ **Marc Imhoff**, Rutgers, The State University of New Jersey and Goddard Space Flight Center, National Aeronautics and Space Administration

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Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

June 9
Astrophysics Informal Seminar ✦ *Searching for Binary Supermassive Black Holes: From Tens of kpc to kpc Scales* ✦ **Yue Shen**, Harvard-Smithsonian Center for Astrophysics

June 16
Astrophysics Informal Seminar ✦ *Dynamical and Nonthermal Processes in Galaxy Clusters* ✦ **Uri Keshet**, Harvard-Smithsonian Center for Astrophysics

June 20
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ General Discussion ✦ Organizers: **Matias Zaldarriaga**, Professor, School of Natural Sciences, and **David Spergel**, Princeton University

June 30
Special Astrophysics Talk ✦ *Several New Observational Signatures of Relativistic Outflows from Dying Stellar Systems* ✦ **Ehud Nakar**, Rutgers, The State University of New Jersey and Tel Aviv University

## Particle Physics Activities

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September 20
High Energy Theory Seminar ✦ *a-Maximization, Global Symmetries, and RG Flows* ✦ **David Kutasov**, The University of Chicago

September 22
Physics Group Meeting ✦ *N=1 SCFTs from Brane Monodromy* ✦ **Jonathan Jacob Heckman**, Member, School of Natural Sciences

September 29
Physics Group Meeting ✦ *Why is the Inflation Light?* ✦ **Daniel Green**, Member, School of Natural Sciences

September 30
Informal Phenomenology Seminar ✦ *Summary of Ideas on Holographic Space-Time* ✦ **Tom Banks**, University of California, Santa Cruz, and Rutgers, The State University of New Jersey; Member, School of Natural Sciences

October 4
High Energy Theory Seminar ✦ *Microscopic Realization of the Kerr/CFT Correspondence* ✦ **Andrew Strominger**, Harvard University

October 6
Physics Group Meeting ✦ *Proof of the Duality between Scattering Amplitudes and Wilson Loops in N=4* ✦ **Simon Caron-Huot**, Member, School of Natural Sciences

October 8
High Energy Theory Seminar ✦ *Chern-Simons Theory from Four Dimensions* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

October 13
Physics Group Meeting ✦ *The All-Loop S-Matrix of N=4 SYM* ✦ **Jacob Bourjaily**, Princeton University

October 18
High Energy Theory Seminar ✦ *From Weak to Strong Coupling in ABJM Theory* ✦ **Marcos Marino**, University of Geneva

October 20
Physics Group Meeting ✦ *Dynamical Supersymmetry Breaking and the Origins of Flavor* ✦ **Nathaniel Craig**, Member, School of Natural Sciences

October 22
High Energy Theory Seminar ✦ *The Exact Superconformal R-symmetry in 3d Extremizes Z* ✦ **Daniel Louis Jafferis**, Member, School of Natural Sciences

October 27
Informal Physics Seminar ✦ *CFT, Fusion Graphs for Lie Groups at Level K and Quantum Symmetries* ✦ **Robert Coquereaux**, CNRS and Centre de Physique Théorique

November 1
High Energy Theory Seminar ✦ *T-Branes* ✦ **Clay Cordova**, Harvard University

November 2
Informal Physics Seminar ✦ *Small Black Hole Duals and Geometry* ✦ **David E. Berenstein**, University of California, Santa Barbara; Member, School of Natural Sciences

November 3
Physics Group Meeting ✦ *Informal Thoughts on SUSY Breaking and Moduli* ✦ **Matthew Reece**, Princeton University

Informal Phenomenology Seminar ✦ *Current Status of the LHC* ✦ **Christopher Tully**, Princeton University; Member, School of Natural Sciences

November 10
Physics Group Meeting ✦ *Holography at a Cold de Sitter Horizon* ✦ **Thomas Hartman**, Member, School of Natural Sciences

November 12
High Energy Theory Seminar ✦ *Exploring the Geometry behind the Quantum Universe* ✦ **Michael Atiyah**, Trinity College, University of Cambridge, and University of Edinburgh

November 15
High Energy Theory Seminar ✦ *Topics in Wall-Crossing and D=4, N=2 Theories* ✦ **Greg Moore**, Rutgers, The State University of New Jersey

November 17
Physics Group Meeting ✦ *An Elusive Large N Limit* ✦ **Guido Festuccia**, Member, School of Natural Sciences

November 18
Informal Phenomenology Seminar ✦ *Little Higgs and Superlatives* ✦ **Daniel Stolarski**, Johns Hopkins University

November 19
High Energy Theory Seminar ✦ *Symmetry Constraints on Counterterms in N=8 Supergravity* ✦ **Henriette Elvang**, University of Michigan; Member, School of Natural Sciences

November 29
High Energy Theory Seminar ✦ *The Role of Double Trace Deformations in AdS/CMT* ✦ **Gary Horowitz**, University of California, Santa Barbara

December 2
Informal High Energy Theory Seminar ✦ *Scattering Amplitudes in Superconformal Chern-Simons Theories* ✦ **Arthur Lipstein**, California Institute of Technology

December 10
High Energy Theory Seminar ✦ *A Quantum Theory of Stable de Sitter Space* ✦ **Tom Banks**, University of California, Santa Cruz, and Rutgers, The State University of New Jersey; Member, School of Natural Sciences

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February 4
High Energy Theory Seminar ✦ *Symblifying Amplitudes and Wilson Loops* ✦ **Marcus Spradlin**, Brown University; Member, School of Natural Sciences

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Physics Group Meeting ✦ *ABJM Scattering Amplitude* ✦ **Sangmin Lee**, University of Seoul

February 18
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February 22
High Energy Theory Special Seminar ✦ *Pions in Large N Quantum Chromodynamics* ✦ **Steven Weinberg**, The University of Texas at Austin

February 23
Informal Phenomenology Seminar ✦ *The First Year of the LHC: What We Have Learned* ✦ **Michelangelo Mangano**, European Organization for Nuclear Research (CERN)

March 4
High Energy Theory Seminar ✦ *Minimal Holography: Higher Spin Gravity from 2d CFTs* ✦ **Thomas Hartman**, Member, School of Natural Sciences

March 7
High Energy Theory Seminar ✦ *Holographic Dual of Free Field Theory* ✦ **Michael Douglas**, Stony Brook University, The State University of New York

March 11-12
Third Institute for Advanced Study/Perimeter Institute Workshop on Integrability in Scattering Amplitudes Informal Discussions ✦ *(Super) Wilson Loop* ✦ *Integrability and the OPE* ✦ *Integrals and Integrands* ✦ *(Hidden) Symmetries* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences, and **Freddy Cachazo** and **Pedro Vieira**, Perimeter Institute for Theoretical Physics

March 14
High Energy Theory Seminar ✦ *Holomorphic Linking, Loop Equations, and Scattering Amplitudes in Twistor Space* ✦ **David Skinner**, Perimeter Institute for Theoretical Physics

March 18
High Energy Theory Seminar ✦ *Boosts upon Boosts: Dark Matter Annihilation, Sommerfeld Enhancement, and Substructure* ✦ **Tracy Slatyer**, Member, School of Natural Sciences

March 23
Physics Group Meeting ✦ *Small Steps, Giant Leaps, Bubbles of Nothing, and the Fastest Decay in the Landscape* ✦ **Adam Brown**, Princeton University

March 25
High Energy Theory Seminar ✦ *Writing CFT Correlation Functions as AdS Scattering Amplitudes* ✦ **Joao Penedones**, Perimeter Institute for Theoretical Physics

March 24
Informal Physics Discussion ✦ *Higher Spin Theories* ✦ **Misha Vasiliev**, Lebedev Physical Institute

March 28
High Energy Theory Seminar ✦ *SO(3) Conformal Symmetry in Hadronic Collisions* ✦ **Steve Gubser**, Princeton University

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Physics Group Meeting ✦ *A New Look at Gluing in TQFT* ✦ **Tudor Dan Dimofte**, Member, School of Natural Sciences

April 11
High Energy Theory Seminar ✦ *LHC Status and Results* ✦ **Christopher Tully**, Princeton University; Member, School of Natural Sciences

April 13
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Physics Group Meeting ✦ *Dark Matter Debris in the Milky Way: Exploring New Possibilities for Substructure* ✦ **Mariangela Lisanti**, Princeton University

April 25
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May 4
Physics Group Meeting ✦ *S-duality of 5d Super Yang-Mills on S1* ✦ **Yuji Tachikawa**, Member, School of Natural Sciences

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Physics Group Meeting ✦ *SUSY without Missing Energy* ✦ **Josh Ruderman**, Princeton University

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Informal Phenomenology Seminar ✦ *The Theory of M-parity* ✦ **Pavel Fileviez Perez**, University of Wisconsin–Madison

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High Energy Theory Seminar ✦ *Introduction to the BFKL Equation and the High Energy Behavior of Gauge Theories* ✦ **Lev Lipatov**, Universität Hamburg

May 25
High Energy Theory Seminar ✦ *Solving the BFKL Equation and Integrability* ✦ **Lev Lipatov**, Universität Hamburg

May 27
High Energy Theory Seminar ✦ *Black Holes with Only One Symmetry* ✦ **Gary Horowitz**, University of California, Santa Barbara

May 31
High Energy Theory Seminar ✦ *An Effective Action for High Energy Processes* ✦ **Lev Lipatov**, Universität Hamburg

June 1
Physics Group Meeting ✦ *Superconformal Symmetry and Scattering Amplitudes* ✦ **Simon Caron-Huot**, Member, School of Natural Sciences

June 13
High Energy Theory Seminar ✦ *Recursion Relations for AdS/CFT Correlators* ✦ **Suvrat Raju**, Harvard University

## The Simons Center for Systems Biology

July 1
The Simons Center for Systems Biology Group Meeting ✦ *Evolution of the p53 Protein Family* ✦ **Prashanth AK**, Member, School of Natural Sciences ✦ *The Regulation of Maternal Reproduction by the p53 Family* ✦ **Wenwei Hu**, The Cancer Institute of New Jersey ✦ *Hunting for Genes in Autism* ✦ **Chang Chan**, Member, School of Natural Sciences ✦ *Germ Line Fidelity and Autism* ✦ **Asad Naqvi**, Member, School of Natural Sciences ✦ *The Regulation of Genes in the Central Nervous System by p53* ✦ **Zhaohui Feng**, The Cancer Institute of New Jersey ✦ *Signature Profiling for Prostate Cancer* ✦ **Elke Katrin Markert**, Member, School of Natural Sciences ✦ *Cox Bivariate Model for Discovering Survival-Related SNPs in Genetic Profiles of Cancers* ✦ **Hideaki Mizuno**, Chugai Pharmaceutical Co., Ltd.; Member, School of Natural Sciences

July 2
The Simons Center for Systems Biology Group Meeting ✦ *Predicting Redox Switches in Proteins* ✦ **Jamil Momand**, California State University at Los Angeles

September 10
The Simons Center for Systems Biology Group Meeting ✦ *Monozygotic Twins Discordant for Autism* ✦ **Chang Chan**, Member, School of Natural Sciences ✦ *Germ Line Fidelity and Autism: Results from the Simons Simplex Collection* ✦ **Asad Naqvi**, Member, School of Natural Sciences

September 16
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Michael Lässig**, Universität zu Köln

October 1
The Simons Center for Systems Biology Seminar ✦ *Oncogenic Activation in Stem Cells as a Model for Cancer Formation* ✦ **Chi-Wei Lu**, University of Medicine and Dentistry of New Jersey

October 15
Breast Cancer Bioinformatics Meeting ✦ *Signature Profiling for Prostate Cancer* ✦ **Elke Katrin Markert**, Member, School of Natural Sciences ✦ *Identifying Splice Variants in mRNA-seq Data from Breast Cancers* ✦ **Shridar Ganesan**, Robert Wood Johnson Medical School, University of Medicine and Dentistry of New Jersey, and **Michael Seiler**, Rutgers, The State University of New Jersey ✦ *Amplicons and Tamoxifen Resistance in ER+/HER2- Breast Cancer* ✦ **Gyan Bhanot**, Rutgers, The State University of New Jersey and The Cancer Institute of New Jersey ✦ *Stratifying Breast Cancer by p53 Pathway Signatures* ✦ **Vessela Kristensen**, University of Oslo

October 28
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Daniel S. Fisher**, Stanford University

October 29
The Simons Center for Systems Biology Group Meeting

November 9
The Simons Center for Systems Biology Group Meeting ✦ *Using Computational Algebraic Topology to Characterize Chromosome Instability in Cancer* ✦ **Javier Arsuaga**, San Francisco State University

November 12
Joint Lab Meeting ✦ *Using Diffusion Models to Understand Population Structure* ✦ **Sergio Lukic**, Rutgers, The State University of New Jersey ✦ *Identifying Signals for Recent Selection Using Fst and Haplotype Diversity-Based Methods* ✦ **Gyan Bhanot**, Rutgers, The State University of New Jersey and The Cancer Institute of New Jersey, and **Kshitij Wagh**, Rutgers, The State University of New Jersey

November 17
The Simons Center for Systems Biology Group Meeting ✦ *Dynamics of HIV Envelope Glycoprotein Incorporation* ✦ **Nick Parrish**, University of Alabama at Birmingham

November 18
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Albert Libchaber**, The Rockefeller University; Visiting Professor, School of Natural Sciences

December 1
Informal Talk on Collective Behavior ✦ **Seth Marvel**, Cornell University

December 2
The Simons Center for Systems Biology Seminar ✦ *ccA+ccB=ccRCC: Molecular Stratification of Renal Cell Carcinoma* ✦ **Rose Brannon**, University of North Carolina at Chapel Hill

December 6
The Simons Center for Systems Biology Seminar ✦ *Diffusion Theory-Based Models of Demography in Population Genetics* ✦ **Sergio Lukic**, Rutgers, The State University of New Jersey

December 7
The Simons Center for Systems Biology Group Meeting ✦ *Quantifying the Evolution of Multi-Component Systems: Two Case Studies* ✦ **Chen-Hsiang Yeang**, Institute of Statistical Science, Academia Sinica

December 9
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Leonid Kruglyak**, Princeton University

December 20
Joint Lab Meeting ✦ *Pathways Utilized by Mutant p53 to Alter Morphogenesis of Breast Cancer Cells in 3D Cultures* ✦ **William Wilfred-Pastor**, Columbia University

January 7
The Simons Center for Systems Biology Seminar ✦ *Probing Pluripotency Using GPR125-Expressing Spermatogonial Stem and Progenitor Cells* ✦ **Marco Seandel**, Weill Cornell Medical College

January 20
The Simons Center for Systems Biology Group Meeting ✦ *Immunosuppression in HIV Infection* ✦ **Olivier Manches**, Langone Medical Center, New York University ✦ *Immune Activation in HIV Infection* ✦ **Meagan O'Brien**, Langone Medical Center, New York University

January 20
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Michael P. Brenner**, Harvard University

January 21
The Simons Center for Systems Biology Seminar ✦ *Synthetic Biology from Scratch: Designing Interactions for Equilibrium Self-Assembly* ✦ **Sahand Hormoz**, Harvard University

February 4
The Simons Center for Systems Biology Seminar ✦ *Exploring the Pet-Dog Paradigm: Will Pet Dogs Become Biogerontology's New Workhorse?* ✦ **David J. Waters**, Purdue University

February 9
The Simons Center for Systems Biology Seminar ✦ *Information Geometry, Sloppy Models, and Optimization* ✦ **Mark Transtrum**, Cornell University

February 16
The Simons Center for Systems Biology Seminar ✦ *Play Your Cards Right: Optimality of Proteins under Constraints* ✦ **Yonatan Savir**, Weizmann Institute of Science

February 17
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Sean Eddy** and **Janelia Farm**, Howard Hughes Medical Institute

February 18
The Simons Center for Systems Biology Seminars ✦ *Work from the Laboratory of Dr. Nina Bhardwaj* ✦ **Sonia Jimenez-Baranda**, Langone Medical Center, New York University ✦ *Work from the Laboratory of Dr. Jean-Laurent Casanova* ✦ **Dusan Bogunovic**, Langone Medical Center, New York University

February 25
The Simons Center for Systems Biology Group Meeting ✦ *Incomplete DNA Methylation and Somatic Cell Memory in Human iPS Cells* ✦ **Jun S. Song**, University of California, San Francisco

February 28
The Simons Center for Systems Biology Seminar ✦ *Germ-Line Fidelity and Autism* ✦ **Asad Naqvi**, Member, School of Natural Sciences

March 2
Joint Lab Meeting ✦ *Influenza in Developing Countries: Seasonal Impact, Pandemic Equity* ✦ **Doug Holtzman**, Bill & Melinda Gates Foundation ✦ *Kawaoka Research Interests: Gates & Other Projects* ✦ **Yoshi Kawaoka**, Influenza Research Institute, University of Wisconsin–Madison ✦ *The Antigenic Evolution of Influenza Viruses* ✦ **Derek Smith**, University of Cambridge ✦ *Exploring the Diversity of Influenza A* ✦ **Raúl Rabadán**, Columbia University ✦ *Host-Specific Mutational Patterns and Innate Immunity* ✦ **Benjamin Greenbaum**, Member, School of Natural Sciences ✦ *Reassortment Patterns in Influenza Viruses* ✦ **Hossein Khiabanian**, Columbia University ✦ *Measuring Diversity and Frequency Analysis of Genomic Data* ✦ **Vladimir Trifonov**, Columbia University ✦ *Network*

*Analysis of the Global Spread of Influenza* ✦ **Joe Chan**, Columbia University ✦ *Modern Computational Techniques for Pandemic Suppression* ✦ **Philip Eckhoff**, Intellectual Ventures Lab

### March 7

Creative Process in Architecture and Science Panel Discussion ✦ **Frank O. Gehry**, Gehry Partners, LLP ✦ **Irving Lavin**, Professor Emeritus, School of Historical Studies ✦ **Arnold J. Levine**, Professor, School of Natural Sciences ✦ **Stephen F. Heinemann**, Salk Institute

### March 16

The Simons Center for Systems Biology Public Lecture ✦ *Thinking Out Loud* ✦ **Frank O. Gehry**, Gehry Partners, LLP

### March 18

Architecture for Science Panel Discussion ✦ **Denise Scott Brown**, Venturi Scott Brown and Associates ✦ **Frank O. Gehry**, Gehry Partners, LLP ✦ **Michael Graves**, Michael Graves & Associates ✦ Moderator: **Jeff Kipnis**, Wexner Center for the Arts

### March 25

Truth & Beauty at the Institute for Advanced Study ✦ **Irving Lavin**, Professor Emeritus, School of Historical Studies, and **Marilyn Lavin**

### April 7

The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Yoav Soen**, Weizmann Institute of Science

### April 13

Viruses & Host Genomes Group Meeting ✦ *Viruses and Cancer* ✦ *Evolution and Endogenous Viruses* ✦ **Karin Moelling**, Universität Zürich ✦ *Hunt for Ancient Viruses* ✦ **Vladimir Belyi**, The Cancer Institute of New Jersey; Member, School of Natural Sciences ✦ *Big Ideas & Interesting Directions for Future Research* ✦ **Arnold J. Levine**, Professor, School of Natural Sciences ✦ **Ann Skalka**, Fox Chase Cancer Center

### April 20

Viruses & Host Genomes Group Meeting ✦ *Sequence Pressures in RNA Viruses* ✦ **Benjamin Greenbaum**, Member, School of Natural Sciences

### April 21

The Governor's Conference on Effective Partnering in Cancer Research: Metabolism and Cancer ✦ *Control of Growth by the mTOR Pathway* ✦ **David M. Sabatini**, Whitehead Institute for Biomedical Research, Massachusetts Institute of Technology, and Howard Hughes Medical Institute ✦ *Metabolism and Cancer* ✦ **Craig B. Thompson**, Memorial Sloan-Kettering Cancer Center ✦ *Cancer Metabolism: Back to the Future* ✦ **Tak W. Mak**, University of Toronto ✦ *Metabolic Hijacking by Viruses and Oncogenes* ✦ **Joshua D. Rabinowitz**, Princeton University ✦ *Role of Autophagy in Cancer Metabolism* ✦ **Eileen P. White**, The Cancer Institute of New Jersey and Rutgers, The State University of New Jersey ✦ *PI 3-Kinase and Cancer Metabolism* ✦ **Lewis C. Cantley**, Harvard Medical School and Beth Israel Deaconess Medical Center

### May 18

The Joshua Lederberg–John von Neumann Symposium: Towards Quantitative Biology (at the Rockefeller University) ✦ *Maximum Caliber: A Principle for Kinetic Modeling* ✦ **Ken A. Dill**, Stony Brook University, The State University of New York ✦ *Collective Neural Dynamics and Emergent Animal Behavior* ✦ **John J. Hopfield**, Princeton University; Visiting Professor, School of Natural Sciences ✦ *Growth Laws and Catabolite Repression: The Emergence of Physiological Simplicity from Molecular Complexity* ✦ **Terence Hwa**, University of California, San Diego ✦ *Connecting the Dots: Propofol, Parkinson's Disease, and Brain Rhythms* ✦ **Nancy Kopell**, Boston University ✦ *Enforcing a Reliable Immune Response with Unreliable Lymphocytes: A Lederberg–von Neumann Solution?* ✦ **Grégoire Altan-Bonnet**, Memorial Sloan-Kettering Cancer Center

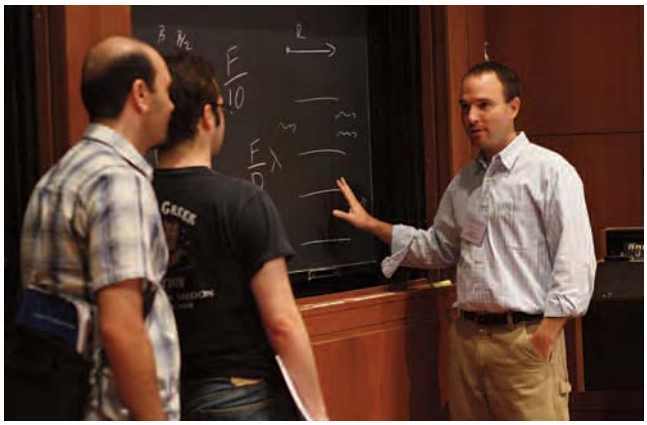
### June 22–23

Rita Allen Foundation Scholars Meeting ✦ *The p53 Family of Genes Regulates Germ Line Genomic Stability Resulting in Enhanced Rates of Genetic Disorders, Egg Development, Autism, and Cancers* ✦ **Arnold J. Levine**, Professor, School of Natural Sciences ✦ *Dissecting the Roles of Complexin in the Control of Synaptic Transmission* ✦ **Jeremy Dittman**, Weill Cornell Medical College ✦ *A Yeast Functional Screen Predicts New ALS Disease Genes* ✦ **Aaron Gitler**, University of Pennsylvania School of Medicine ✦ *Neuropathic Changes in Neuronal Excitability in the Periphery and Spinal Cord* ✦ **Steven Prescott**, University of Pittsburgh ✦ *A Spinally Encoded, PKMζ-Dependent Engram for Chronic Pain* ✦ **Theodore Price**, University of Arizona ✦ *Marking and Maintaining Centromere Location and the Histone Variant CENP-A* ✦ **Ben Black**, University of Pennsylvania ✦ *DNA Nanotechnology Tools to Probe the Mechanism of Molecular Motors* ✦ **Samara Reck-Peterson**, Harvard Medical School ✦ *Discovery and Characterization of Endogenous Metastasis Suppressor microRNAs* ✦ **Sohail Tavazoie**, The Rockefeller University ✦ *Intrinsic and Extrinsic Regulation of Neurogenesis in the Cerebral Cortex* ✦ **Christopher A. Walsh**, Harvard Medical School, Children's Hospital of Boston, and Howard Hughes Medical Institute

### June 29

The Simons Center for Systems Biology Seminar ✦ *Making Sense of a Colorful Herpesvirus* ✦ **Lynn Enquist**, Princeton University

# Prospects in Theoretical Physics



(L) ANDREA KANE, (R) RANDALL HAGADORN

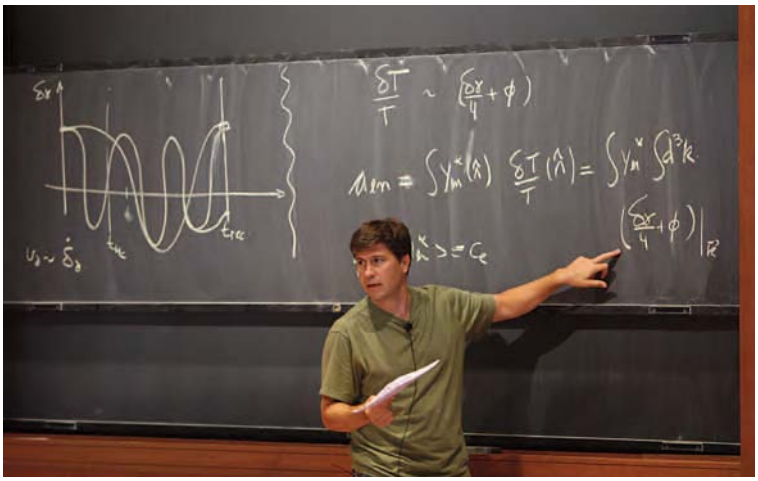
William Jones of Princeton University (left) and Eva Silverstein of Stanford University (right) were among the lecturers during the 2011 Prospects in Theoretical Physics summer program.

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 or astrophysics. First held at the Institute in 2002, PiTP has, in past years, covered topics ranging from cosmology to the Large Hadron Collider to string theory. The program builds upon the strong relationship between the research groups at the Institute and Princeton University. Representatives from both institutions are among the program's organizers and lecturers. A special effort is made to involve women and minorities, along with graduate students in small universities, who typically do not have the same opportunities and access to leaders in the field as graduate students in large research institutions.

PiTP 2011 was held from July 18 to 29 on the campus of the Institute, and the focus of the program was frontiers of physics in cosmology. Cosmology has undergone a revolution, due to advances in observational and experimental techniques, as well as progress in the models used to describe the evolution of our universe. New results have led to new puzzles. The program focused on the role of cosmology as a source of information about physics at very high energies.

Roughly one hundred participants from twelve countries were officially enrolled in the program, with the majority of the visiting students living in the Institute's housing complex during the two-week program. The lectures also attracted many students, postdocs, and professors from nearby institutions.

The 2011 Prospects in Theoretical Physics program was under the direction of Matias Zaldarriaga, Professor in the School of Natural Sciences. The scientific organizing committee included Nima Arkani-Hamed, Professor in the School of Natural Sciences, and David Spergel and Paul Steinhardt of Princeton University. In addition to the organizers, lecturers included: Raphael Bousso (University of California, Berkeley), Paolo Creminelli (Abdus Salam International Center for Theoretical Physics), William Jones (Princeton University), Juan Maldacena (Institute for Advanced Study), Eva Silverstein (Stanford University), Leonard Susskind (Stanford University), and Neil Turok (Perimeter Institute).



ANDREA KANE

The program, which focused on frontiers of physics in cosmology, was under the direction of Matias Zaldarriaga, Professor in the School of Natural Sciences.

CLIFF MOORE

Member Judith Surkis was a participant in the School's annual theme, which focused on secularism in light of what, for many, is being defined as a world-wide resurgence of religiosity both as a spiritual and political force.

# School of Social Science

Faculty

**Danielle S. Allen**, UPS Foundation Professor

**Didier Fassin**, James D. Wolfensohn Professor

**Eric S. Maskin**, Albert O. Hirschman Professor

**Joan Wallach Scott**, Harold F. Linder Professor

Professors Emeriti

**Albert O. Hirschman**

**Michael Walzer**

The School of Social Science invited twenty-two scholars from a pool of 225 applicants from the United States and abroad to be part of the School's scholarly community as Members for the 2010–11 academic year. Eight Visitors and a Research Assistant also participated in the year's activities. Individual Members were supported by gifts from the Leon Levy Foundation, the American Council of Learned Societies, and the Friends of the Institute for Advanced Study, along with endowment funding provided by Deutsche Bank, the Florence Gould Foundation, Roger W. Ferguson Jr. and Annette L. Nazareth, Richard B. Fisher, and the Wolfensohn Family Foundation. Funding from the Carnegie Corporation also allowed for the participation of a professional journalist in the School's thematic seminar. Fields of inquiry of the group included history, economics, religion, anthropology, political science, sociology, and literature.

During the 2010–11 academic year, the School conducted four seminar series: the Social Science Thursday Lunch Seminar; the Secularism Seminar led by Professor Joan Scott; a Seminar on Moral Issues led by Professor Didier Fassin; and the Economics Seminar led by Professor Eric Maskin. The School also continued publication of its series of Occasional Papers and Economics Working Papers, which can be accessed online from the School's website, www.sss.ias.edu.

**Danielle S. Allen**, UPS Foundation Professor, completed a book manuscript, "A Course in Human Events," about the Declaration of Independence, as well as several papers on new media and political participation for the MacArthur Foundation working group on youth participatory politics. She gave the annual Spencer Lecture at the American Educational Research Association annual meeting, as well as lectures at Reston, Virginia; the University of Bristol; and the University of Cambridge. She was appointed to the American Academy Commission on the Humanities and Social Sciences.

**Didier Fassin**, James D. Wolfensohn Professor, gave two talks for the eightieth anniversary of the Institute on conspiracy theories and on human rights. Much of his work was dedicated to the exploration of moral economies, which was the theme of his seminar at the École des Hautes Études en Sciences Sociales in Paris, particularly the tension between compassion and repression in contemporary societies. On humanitarianism, he published *La Raison Humanitaire: Une Histoire Morale du Temps Présent* (Hautes Etudes-Gallimard-Seuil). This was also the subject of lectures at New York University, the University of Hong Kong, and the University of País Vasco, as well as the Munro Lecture at the University of Edinburgh. Violence is a central issue of the book he wrote this year based on the ethnography of the police he conducted in France, *La Force de l'Ordre*, forthcoming from Le Seuil. It was the topic of his opening lecture for the conference "The Body and the State" at the New School for Social Research, and for other talks at McGill University and Birzeit University. For the sixtieth anniversary of the United Nations Convention Relating to the Status of Refugees, he gave the Elizabeth Colson Lecture at the University of Oxford on the vanishing truth of

CLIFF MOORE

After his public lecture on elections and strategic voting, Professor Eric Maskin (left) engaged in conversation with attendees, including Matias Zaldarriaga, Professor in the School of Natural Sciences (far right).

asylum. During his visit to the University of Hong Kong, where he served as an advisor for the recently created Centre for the Humanities and Medicine, he gave two lectures on global health and on humanitarian wars. His previous work on South Africa was presented at the University of Pennsylvania and in an article for the *Brown Journal of World Affairs*. The question of critique and engagement was discussed in his talk at the conference "Walls and Bridges" in New York and in his contribution to the conference "Ethnography and Social Change" at Columbia University. At the W.H.R. Rivers Symposium at Harvard University, he proposed a reflection on the relationship between philosophy and anthropology. Fassin's book *The Empire of Trauma: An Inquiry into the Condition of Victimhood*, coauthored with Richard Rechtman, was awarded the William A. Douglass Book Prize by the Society for the Anthropology of Europe, and *Les Nouvelles Frontières de la Société Française*, which he edited, was selected as best essay of 2010 by France Culture. As part of the "Ideas" Advanced Grant he was awarded by the European Research Council, he developed a website, http://morals.ias.edu/; organized a workshop at IAS with the interdisciplinary group he coordinates; and proposed a seminar on moral issues for Members of the School. With João Biehl, he taught a course on ethnography and social theory at Princeton University.

In August 2010, **Eric S. Maskin**, Albert O. Hirschman Professor, lectured on "Elections and Strategic Voting" at a meeting of the Game Theory Society in São Paulo. This was also the subject of his Hurwicz Memorial Lecture at the Warsaw School of Economics, his Rosenthal Memorial Lecture at Boston University, and a public lecture at the Institute for Advanced Study in spring of 2011. He spoke on "How Should We Elect Presidents?" at Math For America in August. This was also the topic of public lectures at Bryn Mawr College, Harvard University, and St Andrews University. In

Member Gabriella Coleman (left) spoke about computer hacking during a lunch seminar; Member Rohini Somanathan (right) gave the Leon Levy Lecture in which she explored the emergence and the consequences of the strategy adopted by the Indian state to equalize opportunity.

(L) CLIFF MOORE, (R) BENTLEY DREZNER

September, he spoke on "Why Haven't Global Markets Reduced Inequality" at the Shanghai Forum. This was also the subject of lectures in Beijing and Asunción, Paraguay. He spoke on "Financial Crises: Why They Occur and What to Do About Them" at the Polish Financial Supervisory Authority in October. This was also the subject of lectures in Xiamen, China, and the Chen Daisun Memorial Lecture at Tsinghua University in Beijing. In November, he gave the keynote address on "Using Economic Theory for Policy" at the twenty-fifth anniversary celebration of FEDEA in Madrid. Maskin conducted a graduate course at Princeton University in spring 2011 on repeated games, and directed the twenty-second annual Jerusalem Summer School on the topic of financial crises. He will begin a two-year term as president of the Game Theory Society in November 2011. He also received an honorary degree from the Universidad del Norte in Paraguay.

ANDREA KANE

Professor Joan Scott (left) discussed the influence of gender on the reinterpretation of the fields of history and social science with Caroline Bynum (right), Professor in the School of Historical Studies, during the Institute's eightieth anniversary celebrations in the fall.

**Joan Wallach Scott**, Harold F. Linder Professor, ran the School's seminar on Secularism this year. She gave the Marcus W. Orr Faculty Senate Lecture at the University of Memphis and the History & Theory Lecture at Columbia University. She also gave lectures at the Washington History Seminar in Washington, D.C.; New York University; Stony Brook University, the State University of New York; and Princeton University. She presented papers at the American Historical Association meetings and at a conference on "Sexual Nationalisms" in Amsterdam. She also served on an American Council of Learned Societies selection committee for fellowships for assistant professors.

Professor Emeritus **Michael Walzer** spent the academic year as a Fellow of the newly established Straus Institute for the Advanced Study of Law & Justice at the New York University School of Law and also as a Fellow of NYU's Tikvah Center for Law & Jewish Civilization. His research there was focused on just war theory and questions of global justice (for Straus)

PHOTOS CLIFF MOORE

Members Gil Anidjar (left) and Winnifred Fallers Sullivan (right) participated in a discussion on law and secularism.

RANDALL HAGADORN

During a lunch seminar, Member Rita Chin spoke about the problem of difference, as raised by millions of postwar migrants, in the Federal Republic of Germany.

and biblical politics (for Tikvah). He attended the Social Studies Fiftieth Anniversary Celebration at Harvard University, where he chaired the panel on "Social Studies and Social Change." On November 8–10, the Institute for International Law and Justice, the European Journal of International Law, and the Jean Monnet Center for International and Regional Economic Law & Justice, along with the Tikvah Center, hosted "The Enduring Legacy of *Just and Unjust Wars*—35 Years Later," a conference at the NYU School of Law, on the occasion of the thirty-fifth anniversary of Walzer's book. At Princeton University, Walzer gave the Doll Family Lecture on Religion and Money, "Humanitarianism: What is It?" In April, at the United States Naval Academy, he gave a keynote address at a conference on "Ten Years Later: Warfare Ethics Since 9/11." From May through August 2011, Walzer was a Fellow of the Institute for Advanced Studies at the Hebrew University of Jerusalem. He is currently working on the third of four volumes of *The Jewish Political Tradition*, a collaborative project on the history of Jewish political thought. Walzer continues as coeditor of *Dissent* magazine.

## MEMBERS, VISITORS, AND RESEARCH STAFF

*f* First Term ✦ *s* Second Term ✦ *v* Visitor
*a* Research Assistant

**Gil Anidjar**
*Religion* ✦ Columbia University

**Markus K. Brunnermeier**
*Economics* ✦ Princeton University ✦ *v*

**Rita Chin**
*History* ✦ University of Michigan
*Frederick Burkhardt Fellowship funded by the American Council of Learned Societies*

**E. Gabriella Coleman**
*Anthropology* ✦ New York University
*Ginny and Robert Loughlin Founders' Circle Member*

**James W. Cook**
*History* ✦ University of Michigan ✦ *v*

**Kathleen Davis**
*Literature* ✦ University of Rhode Island

**Geoffroy de Clippel**
*Economics* ✦ Brown University
*Deutsche Bank Member*

**Amrita Dhillon**
*Economics* ✦ University of Warwick
*Roger W. Ferguson, Jr. and Annette L. Nazareth Member*

**Avinash K. Dixit**
*Economics* ✦ Princeton University ✦ *v*

**James Doyle**
*Philosophy* ✦ University of Bristol ✦ *v, f*

**Tanya E. Erzen**
*Religion* ✦ The Ohio State University

**Henry S. Farber**
*Economics* ✦ Princeton University ✦ *v*

**Mayanthi L. Fernando**
*Anthropology* ✦ University of California, Santa Cruz

**Martin Gilens**
*Political Science* ✦ Princeton University
*Richard B. Fisher Member*

**Manu Goswami**
*History* ✦ New York University
*The Wolfensohn Family Member*

**Kimberly Hart**
*Anthropology* ✦ Buffalo State College

**Mark Hewitson**
*History* ✦ University College London

**Sheena Kang**
*Political Theory* ✦ The University of Chicago ✦ *a*

**Cécile Laborde**
*Political Science* ✦ University College London
*Funding provided by the Florence Gould Foundation Fund*

**Tomoko Masuzawa**
*History* ✦ University of Michigan

**Stelios Michalopoulos**
*Economics* ✦ Tufts University
*Deutsche Bank Member*

**Mohamed Nachi**
*Sociology* ✦ Institut des Sciences Humaines et Sociales, Université de Liège

**Steven T. Pierce**
*History* ✦ The University of Manchester

**Laura Secor**
*Journalist* ✦ *v*

**Rohini Somanathan**
*Economics* ✦ University of Delhi
*Leon Levy Foundation Member*

**Jeffrey L. Stout**
*Religion* ✦ Princeton University

**Winnifred Fallers Sullivan**
*Religion and Law* ✦ University at Buffalo, The State University of New York
*Friends of the Institute for Advanced Study Member*

**Anna Sun**
*Sociology* ✦ Kenyon College

**Judith Surkis**
*History* ✦ Institute for Advanced Study

**Chantal Thomas**
*Law* ✦ Cornell Law School ✦ *v, s*

**Yang Xiao**
*Philosophy* ✦ Kenyon College ✦ *v*

## RECORD OF EVENTS

### August 30–September 1
Spencer Workshop: Education, Democracy, and Justice ✦ Organized by **Danielle S. Allen**, UPS Foundation Professor, School of Social Science, and **Rob Reich**, Stanford University

### September 29
Secularism Seminar ✦ Planning Meeting

### September 30
Social Science Thursday Lunch Seminar ✦ *Secularism and Its Discontents* ✦ **Cécile Laborde**, University College London; Member, School of Social Science

### October 7
Social Science Thursday Lunch Seminar ✦ *A Tale of Two Scandals: Sexual and Legal Conflict in France and French Algeria* ✦ **Judith Surkis**, Member, School of Social Science

Secularism Seminar ✦ Discussion of "Secularism, Sex, and Religious Liberty" by **Saba Mahmood**, University of California, Berkeley, and "Sexularism" by **Joan Scott**, Harold F. Linder Professor, School of Social Science

### October 11
Economics Workshop ✦ *Detail Free Contracts to Screen, Elicit, and Reward Expert Information* ✦ **Sylvain Chassang**, Princeton University

### October 14
Social Science Thursday Lunch Seminar ✦ *"I did it for the Lulz!!! but I stayed for the outrage:" Internet Trolls, the Politics of Spectacle, and Geek Protests against the Church of Scientology* ✦ **E. Gabriella Coleman**, New York University; Member, School of Social Science

### October 20
Secularism Seminar ✦ Discussion of *An Atheism that Is Not Humanist Emerges in French Thought* by **Stefanos Geroulanos**, New York University

### October 21
Social Science Thursday Lunch Seminar ✦ *Caste Hierarchies and Social Mobility in India* ✦ **Rohini Somanathan**, University of Delhi; Member, School of Social Science

### October 25
Economics Workshop ✦ *Corporate Control and Multiple Large Shareholders* ✦ **Amrita Dhillon**, University of Warwick; Member, School of Social Science (joint work with Silvia Rossetto)

### October 28
Social Science Thursday Lunch Seminar ✦ *Bloods of America (The Vampire State)* ✦ **Gil Anidjar**, Columbia University; Member, School of Social Science

Seminar on Moral Issues ✦ Planning Meeting

### November 1
Economics Workshop ✦ *Speech Is Silver, but Silence Might Be Golden: On the Strategic Disclosure of Feasible Options in Bargaining* ✦ **Geoffroy de Clippel**, Brown University; Member, School of Social Science (joint work with Kfir Eliaz)

November 3
Secularism Seminar ✦ Discussion focusing on works by Talal Asad and Hussein Ali Agrama

November 4
Social Science Thursday Lunch Seminar ✦ *From Rasse to Race: On the Problem of Difference in the Federal Republic of Germany* ✦ **Rita Chin**, University of Michigan; Member, School of Social Science

November 10
Seminar on Moral Issues ✦ Discussion focusing on works by **Kimberly Hart**, Buffalo State College; Member, School of Social Science, and **Yang Xiao**, Kenyon College; Visitor, School of Social Science

November 11
Social Science Thursday Lunch Seminar ✦ *The Secular/Scholar in the Field of Multiplicity: A Visual Meditation on the Origin of Biblical Criticism* ✦ **Tomoko Masuzawa**, University of Michigan; Member, School of Social Science

November 15
Economics Workshop ✦ *Divide and Rule or the Rule of the Divided: Evidence from Africa* ✦ **Stelios Michalopoulos**, Tufts University; Member, School of Social Science (joint work with Elias Papaioannou)

November 17
Secularism Seminar ✦ Discussion on law and secularism

November 18
Social Science Thursday Lunch Seminar ✦ *Religion, Land, and Rights: Reflections on the Park51 Controversy* ✦ **Winnifred Fallers Sullivan**, University of Buffalo, The State University of New York; Member, School of Social Science

November 29
Economics Workshop ✦ *Repayment Incentives and the Distribution of Gains from Group Lending* ✦ **Rohini Somanathan**, University of Delhi; Member, School of Social Science

December 1
Secularism Seminar ✦ Discussion of readings from *After Secular Law*

December 2
Social Science Thursday Lunch Seminar ✦ *Reason-Based Choice: A Bargaining Rationale for the Attraction and Compromise Effect* ✦ **Geoffroy de Clippel**, Brown University; Member, School of Social Science (joint work with Kfir Eliaz)

December 8
Seminar on Moral Issues ✦ Discussion of readings suggested by **E. Gabriella Coleman**, New York University, and **Jeffrey L. Stout**, Princeton University; Members, School of Social Science

Secularism Seminar ✦ *The Ruse of Law: Legal Equality and the Problem of Citizenship in a Multi-Religious Sudan* ✦ **Noah Salomon**, Carleton College

December 9
Social Science Thursday Lunch Seminar ✦ *Inside the Carceral Church: The Politics of Transformation in Faith-Based Prisons* ✦ **Tanya E. Erzen**, The Ohio State University; Member, School of Social Science

December 15
Secularism Seminar ✦ *The Period of Constant Contemplation* ✦ **Laura Secor**, Journalist; Visitor, School of Social Science

January 13
Social Science Thursday Lunch Seminar ✦ *The Quest for Secular and Sacred Salvation in Rural Anatolia* ✦ **Kimberly Hart**, Buffalo State College; Member, School of Social Science

January 19
Secularism Seminar ✦ Discussion of readings suggested by **Cécile Laborde**, University College London; Member, School of Social Science

January 20
Social Science Thursday Lunch Seminar ✦ *A Moral Economy of Corruption: Histories of the Nigerian State* ✦ **Steven T. Pierce**, The University of Manchester; Member, School of Social Science

January 26
Seminar on Moral Issues ✦ *Moral Economies* ✦ **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science, and **Steven T. Pierce**, The University of Manchester; Member, School of Social Science

February 2
Secularism Seminar ✦ Screening of the film *Meet John Doe* ✦ **Jeffrey L. Stout**, Princeton University; Member, School of Social Science

February 3
Social Science Thursday Lunch Seminar ✦ *Confusions over Confucianism: Concepts, Methods, and Realities* ✦ **Anna Sun**, Kenyon College; Member, School of Social Science

February 7
Economics Workshop ✦ *Laws and Norms* ✦ **Roland Benabou**, Princeton University (joint work with Jean Tirole)

February 10
Social Science Thursday Lunch Seminar ✦ *Development and the Interaction of Enforcement Institutions* ✦ **Amrita Dhillon**, University of Warwick; Member, School of Social Science

February 16
Secularism Seminar ✦ Discussion of readings suggested by **Kimberly Hart**, Buffalo State College; Member, School of Social Science

February 23
Seminar on Moral Issues ✦ Discussion of readings suggested by **Mayanthi L. Fernando**, University of California, Santa Cruz, and **Mark Hewitson**, University College London; Members, School of Social Science

February 24
Social Science Thursday Lunch Seminar ✦ *"Neither Whores Nor Doormats": The Politics of Inclusion in France* ✦ **Mayanthi L. Fernando**, University of California, Santa Cruz; Member, School of Social Science

March 3
Social Science Thursday Lunch Seminar ✦ *Thinking about* Ikhtilâf *("Difference"): The Political Construction of Difference in Islamic Context* ✦ **Mohamed Nachi**, Institut des Sciences Humaines et Sociales, Université de Liège; Member, School of Social Science

March 7
Economics Workshop ✦ *The I Theory of Money* ✦ **Markus K. Brunnermeier**, Princeton University; Visitor, School of Social Science (joint work with Yuliy Sannikov)

March 10
Social Science Thursday Lunch Seminar ✦ *The Benevolent Baker: Altruism and Political Preference Formation* ✦ **Martin Gilens**, Princeton University; Member, School of Social Science

March 14
Economics Workshop ✦ *Sovereign Debt Default: The Impact of Creditor Composition* ✦ **Amrita Dhillon**, University of Warwick; Member, School of Social Science (joint work with Lei Zhang)

March 16
Secularism Seminar ✦ Roundtable Discussion with **Janet Jakobsen**, Barnard College, and **Tanya E. Erzen**, The Ohio State University; Member, School of Social Science

March 17
Social Science Thursday Lunch Seminar ✦ *The Presidency of Religious Affairs* ✦ **Elizabeth Shakman Hurd**, Northwestern University

March 23
Seminar on Moral Issues ✦ Discussion of readings suggested by **Tomoko Masuzawa**, University of Michigan, and **Rohini Somanathan**, University of Delhi; Members, School of Social Science

Secularism Seminar ✦ *The Vampire State* ✦ **Gil Anidjar**, Columbia University; Member, School of Social Science

March 24
Social Science Thursday Lunch Seminar ✦ *Delineating the History of Human Rights: Does "The Middle Ages" Matter?* ✦ **Kathleen Davis**, University of Rhode Island; Member, School of Social Science

March 28
Economics Workshop ✦ *Hierarchy, Identity, and Collective Action* ✦ **Rohini Somanathan**, University of Delhi; Member, School of Social Science

March 30
Secularism Seminar ✦ Discussion of readings suggested by **Mohamed Nachi**, Institut des Sciences Humaines et Sociales, Université de Liège, and **Judith Surkis**, Members, School of Social Science

March 31
Social Science Thursday Lunch Seminar ✦ *Of Markets and Morals: Albert Hirschman, the Institute for Advanced Study, and the 1970s* ✦ **Jeremy I. Adelman**, Princeton University

April 7
Social Science Thursday Lunch Seminar ✦ *From Einstein Drive to Hamilton Place and Back: Reflections on the Use of Social Science in Government* ✦ **Alan B. Krueger**, Princeton University

April 12
Secularism Seminar ✦ *Walled States, Waning Sovereignty* ✦ **Wendy Brown**, University of California, Berkeley

April 13
Seminar on Moral Issues ✦ Discussion of readings suggested by **Manu Goswami**, New York University, and **Cécile Laborde**, University College London; Members, School of Social Science

April 14
Social Science Thursday Lunch Seminar ✦ *An Internationalist Sociology: Thinking the Future in Interwar India* ✦ **Manu Goswami**, New York University; Member, School of Social Science

April 18
Economics Workshop ✦ *Bargaining Foundations of Conflict Games* ✦ **Tomas Sjöström**, Rutgers, The State University of New Jersey

April 27
Secularism Seminar ✦ Discussion of readings suggested by **Steven T. Pierce**, The University of Manchester; Member, School of Social Science

April 28
Social Science Thursday Lunch Seminar ✦ *Hitchcock's Shadow* ✦ **Jeffrey L. Stout**, Princeton University; Member, School of Social Science

May 2
Economics Workshop ✦ *Implementation and Bounded Rationality* ✦ **Geoffroy de Clippel**, Brown University; Member, School of Social Science

May 4
Seminar on Moral Issues ✦ Discussion of works submitted by **Anna Sun**, Kenyon College, and **Judith Surkis**, Members, School of Social Science

May 5
Social Science Thursday Lunch Seminar ✦ *Trade and Geography in the Origins and Spread of Islam: Theory and Evidence* ✦ **Stelios Michalopoulos**, Tufts University; Member, School of Social Science

May 11
Secularism Seminar ✦ Discussion of readings suggested by **Anna Sun**, Kenyon College; Member, School of Social Science

May 12
Social Science Thursday Lunch Seminar ✦ *In Defense of Lost Causes: Germany and the Outbreak of World War I* ✦ **Mark Hewitson**, University College London; Member, School of Social Science

May 16
Economics Workshop ✦ *Employee Referrals vs. Market-Based Recruitment: The Case of Unskilled Labor Markets* ✦ **Amrita Dhillon**, University of Warwick; Member, School of Social Science

May 18
Secularism Seminar ✦ Final conversations and discussion of readings suggested by **Gil Anidjar**, Columbia University; Member, School of Social Science

June 27–30
Seminar on Critical Moral Anthropology ✦ Coordinated by **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science


RANDALL HAGADORN

Applicants to the Schools are motivated primarily by their need for free time in which to carry out research and writing.

# The Libraries

The Historical Studies–Social Science Library (Marcia Tucker, Librarian) contains some 125,000 volumes and has subscriptions to over one thousand 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 two thousand 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 Central Asian–studies scholar. Walther Heissig's library came to the Institute partly as a gift and partly on deposit from the Princeton University East Asian Studies Department and Princeton University Library.

The HS–SS Library includes books and offprints from past Professors including 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. The Library also contains the library of Giorgio Tonelli.

The microfilm collections of the HS–SS Library include a large selection from *Manuscripta*, a collection of several thousand fifteenth- to nineteenth-century printed books from the Vatican Library. The Bavarian Academy in 1965 provided the Institute with a microfilm copy of slips presented for the *Thesaurus Linguae Latinae* along with recent additional material on CD. The Library has microfilm copies of the papers of Simone Weil.

The Library houses the Institute archives. The records in the collection of the Shelby White and Leon Levy Archives Center (Christine Di Bella, Archivist) date from the 1930s and consist of official correspondence of the Director's Office, minutes of meetings of the Faculty and the Board of Trustees, correspondence concerning past Faculty and Members, records of the Electronic Computer Project, and the papers of select Faculty members, including astrophysicist John N. Bahcall. The archives also include the Institute's photograph collection and a growing oral history collection. The reading room is located in the annex of the HS–SS Library. It provides a space for researchers to consult resources from the archives, as well as a display area featuring selections from the collections. A generous gift from the Leon Levy Foundation supports the ongoing work of the Institute to formally organize and preserve the important historical materials already in its possession and to serve as a repository for essential source materials going forward.

The Mathematics–Natural Sciences Library (Momota Ganguli, Librarian) is located in Fuld Hall, with smaller departmental branches in Bloomberg Hall and compact shelving spread across campus. The collection, which includes about thirty thousand volumes of monographs and bound periodicals as well as 140 print and/or 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 three hundred books to its collection.

Both of the Institute's libraries participate in the shared cataloguing system OCLC, which gives Institute scholars computerized access to a database that is in use by 57,000 libraries in 112 countries. The Institute is a member of the OCLC Research Library SHARES group, a resource-sharing program. The Institute's Web-accessible online catalogue provides holdings information for the libraries and is accessible via http://library.ias.edu from anywhere in the world.

The HS–SS Library maintains computers that provide access to scanners, a variety of software packages for both PCs and Macintoshes, and databases in the fields of Classics, the history of science, and Islamic and French studies. The M–NS Library's electronic resources include access to Math-SciNet, JSTOR, and arXiv.org. 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 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 Faculty, Members, and Visitors of the Institute.

# The IAS Community

For more than eighty 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, understanding the organization of biological systems, fourteenth-century Mongolian history, the very latest developments in string theory, the mathematical basis of computer security, the history and meaning of secularism, and how to evaluate the signals for supersymmetry at the Large Hadron Collider at CERN.

Members, who typically stay for one year but 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. To celebrate its eightieth anniversary, the Institute held two weekends in the fall of 2010, which illustrated the work of its Schools and presented opportunities for the Institute's former scientists and scholars to return and meet current Faculty, Members, and Visitors (see photos, below). In addition, the Institute offers a series of activities for Members, Visitors, and their families. In the 2010–11 academic year, these included films, play readings, clay modeling classes, yoga, tennis lessons, trips to museums and other cultural sites, and activities for children in the Institute community.

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BOTTOM: (L) KATE ABLUTZ, (R) CLIFF MOORE

# RECORD OF EVENTS

### September 21
Member Welcome Reception

### September 24–25
Eighteith Anniversary Celebration—Schools of Mathematics and Natural Sciences ✦ *Fundamental Physics in the Twenty-First Century* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences ✦ *Geometry of Growth and Form: Commentary on D'Arcy Thompson* ✦ **John Milnor**, Co-Director, Institute for Mathematical Sciences, Stony Brook University, The State University of New York ✦ *Expansion in Linear Groups and Applications* ✦ **Jean Bourgain**, Professor, School of Mathematics ✦ *Cosmology: Recent Results and Future Prospects* ✦ **Matias Zaldarriaga**, Professor, School of Natural Sciences ✦ *Quanta, Symmetry, and Topology* ✦ **Frank Wilczek**, Herman Feshbach Professor, Massachusetts Institute of Technology ✦ Remarks: **Freeman J. Dyson**, Professor Emeritus, School of Natural Sciences and **Robert P. Langlands**, Professor Emeritus, School of Mathematics ✦ *Conspiracy Theories in Medicine* ✦ **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science ✦ *Quatre-vingt. Four Bases, Twenty Amino Acids: Is Biology Becoming Quantitative?* ✦ **Stanislas Leibler**, Professor, School of Natural Sciences ✦ *What if Current Foundations of Mathematics are Inconsistent?* ✦ **Vladimir Voevodsky**, Professor, School of Mathematics

### October 8
Writers Conversation ✦ *Poets Panel* ✦ **Tracy K. Smith**, Assistant Professor, The Lewis Center for the Arts, Princeton University; **Thomas Sayers Ellis**, Assistant Professor, Sarah Lawrence College; **Suji Kwock Kim**, Poet; **Wendy S. Walters**, Poet

### October 13
Public Lecture ✦ *Voting Paradoxes and Combinatorics* ✦ **Noga Alon**, Visiting Professor, School of Mathematics

### October 29
Public Lecture ✦ *The Mathematical Truth* ✦ **Enrico Bombieri**, IBM von Neumann Professor, School of Mathematics

### November 5–6
Edward T. Cone Concert Series ✦ **Borromeo String Quartet** with guest artists **Paul Neubauer**, viola; **Fred Sherry**, cello; **Derek Bermel**, clarinet

### November 6
Edward T. Cone Concert Series Talk ✦ **Nicholas Kitchen**, **Mai Motobuchi**, **Paul Neubauer**, **Andreia Pinto-Correia**, **Fred Sherry**, **Kristopher Tong**, and **Derek Bermel**, Artist-in-Residence

### November 12–13
Eighteith Anniversary Celebration—Schools of Historical Studies and Social Science ✦ *The Influence of Gender on the Reinterpretation of the Fields of History and Social Science* ✦ **Caroline Walker Bynum**, Professor, School of Historical Studies; **Joan Wallach Scott**, Harold F. Linder Professor, School of Social Science ✦ *The Relevance of the Classical World to Current Political Phenomena* ✦ **Danielle S. Allen**, UPS Foundation Professor, School of Social Science; **Angelos Chaniotis**, Professor, School of Historical Studies ✦ *The History of Basic Human Rights: The Declaration of the Rights of Man, 1789* ✦ **Jonathan Israel**, Professor, School of Historical Studies ✦ *Historical Studies and Social Science: An Illustrated History* ✦ **George Dyson**, Author ✦ *Secularism and Human Rights: Basic Human Rights in History, Philosophy, Political Science, and Sociology* ✦ Panel Discussion: Moderator: **Harold T. Shapiro**, President Emeritus and Professor of Economics and Public Affairs, Princeton University; Panelists: **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science; **Jonathan Israel**, Professor, School of Historical Studies; **Joan Wallach Scott**, Harold F. Linder Professor, School of Social Science

### November 17
Friends Forum ✦ *Honest Doubt* ✦ **Paul Hodgson**, Artist and Director's Visitor, Institute for Advanced Study

### November 19
Public Policy Lecture ✦ *Human-Made Climate Change: A Moral, Political, and Legal Issue* ✦ **James E. Hansen**, Climatologist and Adjunct Professor, Columbia University

### November 21
Princeton Symphony Orchestra Concert ✦ *Chamber Music Gems* ✦ **Ruotao Mao** and **Hanfang Zhang**, violins; **Sarah Sutton**, viola; **Elizabeth Thompson**, cello

### December 3
Friends Fireside Chat ✦ *Mechanisms of Cancer Evolution and Strategies for Cancer Therapy: My Experience at the Institute for Advanced Study* ✦ **Robert A. Beckman**, Executive Director, Clinical Research Oncology, Daiichi-Sankyo Pharmaceutical Development

### December 8
Public Lecture ✦ *The Fear of God: An Emotion and Its Contexts* ✦ **Angelos Chaniotis**, Professor, School of Historical Studies

### December 10
Edward T. Cone Concert Series ✦ *Mallet Madness* ✦ **Joe Locke**, vibraphone; **Lisa Pegher**, marimba; **Bernard Woma**, Dagara gyil (African xylophone)

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PHOTO CREDITS, FROM TOP: BENTLEY DREZNER, CLIFF MOORE, KATE ABLUTZ, ANDREA KANE, CLIFF MOORE

December 11
Edward T. Cone Concert Series Talk ✦ **Joe Locke**; **Lisa Pegher**; **Bernard Woma**; **Derek Bermel**, Artist-in Residence; and **Paul Lansky**, Composer

January 10
Member Welcome Reception

January 14
Friends Fireside Chat ✦ *The Future of the All-Volunteer Force in a Democratic Republic* ✦ **William S. Greenberg**, Chairman, Reserve Forces Policy Board

January 16
Princeton Symphony Orchestra Concert ✦ *The Beethoven Difference* ✦ **Jesse Mills**, violin; **Alistair MacRae**, cello; **Rieko Aizowa**, piano

February 4–5
Edward T. Cone Concert Series ✦ **Brooklyn Rider**

February 5
Edward T. Cone Concert Series Talk ✦ **Nicholas Cords**, **Johnny Gandelsman**, **Colin Jacobsen**, **Eric Jacobsen**, and **Derek Bermel**, Artist-in-Residence

February 11
Friends Culture and Cuisine ✦ *Appetite City, A Culinary History of New York* ✦ **William Grimes**, Writer, *The New York Times*

February 26
Midwinter Party for Faculty, Members, and Staff

March 4
Einstein Legacy Society Talk ✦ **Linda G. Arntzenius**, Author of *Images of America: Institute for Advanced Study*

March 9
Friends Forum ✦ *Thinking About Climate Change: Science and Politics* ✦ **Harold T. Shapiro**, President Emeritus and Professor of Economics and Public Affairs, Princeton University

March 11–12
Edward T. Cone Concert Series ✦ *The End of Time* ✦ **Edward Aaron**, cello; **Derek Bermel**, clarinet; **Steven Copes**, violin; **Stephen Gosling**, piano; and **Tara O'Connor**, flute

March 12
Edward T. Cone Concert Series Talk ✦ **Edward Arron**, **Steven Copes**, **Tara O'Connor**, and **Derek Bermel**, Artist-in-Residence

March 25
Concert for Donors and Friends ✦ **Graham Walker**, cello; **Christopher Whitton**, piano

March 26
Children's Concert ✦ **Graham Walker**, cello; **Christopher Whitton**, piano

March 30
Public Lecture ✦ *The Politics of Academic Freedom* ✦ **Joan Wallach Scott**, Harold F. Linder Professor, School of Social Science

April 3
Princeton Symphony Orchestra Concert ✦ *Stravinsky's Russian Tales* ✦ Large Chamber Ensemble with Singers, **Eric Dudley**, Conductor

April 8
Friends Culture and Cuisine ✦ *African Foodways Are Like Jazz: Culinary Improvisations in Africa and America* ✦ **Frederick Douglass Opie**, Visiting Associate Professor, Babson College

April 11
Leon Levy Lecture ✦ **Rohini Somanathan**, Professor, University of Delhi; Member, School of Social Science

April 29
Friends Fireside Chat ✦ *Parsing Resemblance: Intimating Bach in the Modern Symphony Orchestra* ✦ **Tarik O'Regan**, Composer and Director's Visitor, Institute for Advanced Study

May 6
Public Lecture ✦ *Elections and Strategic Voting* ✦ **Eric S. Maskin**, Albert O. Hirschman Professor, School of Social Science

May 11
Friends Forum ✦ *Out of This World: A History of Structure in the Universe* ✦ **Marilena Lo Verde**, Member, School of Natural Sciences

May 15
Friends Tour and Talk with Peter Goddard, Director, Institute for Advanced Study

June 15
Staff Picnic

# After Hours Conversations

After Hours Conversations, a program conceived and organized by Professors Caroline Bynum of the School of Historical Studies and Piet Hut of the Program in Interdisciplinary Studies, was launched in February 2008 to encourage inter-School conversations in an informal and relaxed environment. In 2010–11, the program continued with talks held in Harry's Bar every Monday and Thursday in October and November and again in February and March. After a ten-minute presentation of a theme or problem of broad significance, there were twenty minutes of lively group discussion, often followed by continuing conversation as people lingered over drinks. In the fall term, Professors Helmut Hofer and Caroline Bynum chaired the sessions; in the spring term, both of them were joined by Professor Piet Hut. Attendance varied from twenty to seventy. There were presentations by Members, Visitors, and Faculty, both active and emeriti, from all four Schools of the Institute and from the Program in Interdisciplinary Studies, as well as by Director's Visitors and Staff. Topics ranged from the nature of spacetime to producing operas; personalized medicine; game theory perspectives on pastoral cattle herders in Kenya; and anthropology of hackers. A webpage (www.ids.ias.edu/after-hours-conversations) provides information on dates, speakers, and topics. The program will continue in 2011–12.

BENTLEY DREZNER

Director's Visitor Tom Phillips spoke about the artist's life during After Hours Conversations.

BENTLEY DREZNER

Director's Visitor Paul Hodgson combines painting and photography to explore different kinds of uncertainty.

# Special Programs

## Program in Interdisciplinary Studies

**Piet Hut**'s activities included both his astrophysics research and his responsibilities as the head of the Program in Interdisciplinary Studies. The latter program had seventeen visitors, with durations of their visits ranging from days to months, in fields including mathematical physics, astrophysics, computer science, philosophy, science writing, bioinformatics, classical music, art history, and political economy.

During the year, Hut, together with Caroline Bynum, Professor in the School of Historical Studies, and Helmut Hofer, Professor in the School of Mathematics, organized a series of After Hours Conversations, which were held at the Institute in Harry's Bar two times a week for a period of two months during each semester. Each get-together had a more formal part lasting thirty minutes, starting with a ten-minute talk by a speaker 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 encourage inter-School communication at the Institute.

Hut spent part of the fall semester at Kyoto University in Japan, where he visited the interdisciplinary program Hakubi, a promising new initiative bringing together researchers from all fields of natural science, social science, and the humanities. He also co-organized an interdisciplinary applied mathematics seminar at the Research Institute for Mathematical Sciences at the same university. Following that, he visited the new supercomputer research institute in Kobe, Japan, in order to develop software for astrophysical simulations. As of June 2011, their K computer is the fastest computer in the world.

He also spent some time visiting Yamagata University, where he started a collaboration with Shigeru Taguchi, a specialist in Husserlian phenomenology, and the Nagahama Bio University, working with Hayato Saigo, whose field is applied mathematics. After introducing Taguchi and Saigo to each other, Hut started a three-way collaboration with the aim to explore new mathematical structures for phenomenological philosophy.

As part of his ongoing research of virtual worlds, he explored OpenSim as well as Open Wonderland, two alternative environments, in addition to the more established world of Second Life. Within the latter, he organized workshops and other regular meetings for the Meta Institute for Computational Astrophysics (MICA; www.mica-vw.org), and for the Kira Institute (www.kira.org), focused on interdisciplinary collaborations.

KATE ABLUTZ

The Program in Interdisciplinary Studies, headed by Professor Piet Hut (right), had seventeen visitors, whose fields included mathematical physics, astrophysics, computer science, philosophy, science writing, bioinformatics, classical music, art history, and political economy.

# Artist-in-Residence Program

KATE ABLUTZ

Artist-in-Residence Derek Bermel (center) participated in a post-concert talk with performers.

"The Harmonic Series," led by Artist-in-Residence **Derek Bermel**, continued in 2010–11. The series 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.

The Edward T. Cone Concert Series opened with performances by the Borromeo String Quartet, with guest artists Paul Neubauer on viola, Fred Sherry on cello, and Bermel on the clarinet. The program included Béla Bartók's String Quartet no. 6, Milton Babbitt's *More Melismata*, *Variações sobre temas populares* by Andreia Pinto-Correia, Derek Bermel's *Soul Garden* and *Coming Together*, and Osvaldo Golijov's *The Dreams and Prayers of Isaac the Blind*. The second concert weekend of the season was *Mallet Madness*, featuring vibraphonist Joe Locke, marimbist Lisa Pegher, and African xylophonist Bernard Woma in an all-percussion program. The spring concerts began with Brooklyn Rider and traced more than a century of American concert music, with Dvořák's *American Quartet* (String Quartet no. 12 in F) as its centerpiece. Other works on the program included Bermel's *Amerikanizálódik*, Don Byron's *Four Thoughts on Marvin Gaye*, John Cage's *In a Landscape*, Philip Glass's String Quartet no. 3 (Mishima), and Colin Jacobsen's *Achille's Heel*. The season concluded with *The End of Time*, with performances of Béla Bartók's *Contrasts*, Edward T. Cone's *Sphinxes: 25 Aphorisms for Piano*, Bermel's *Twin Trio*, and Olivier Messiaen's *Quartet for the End of Time*. Concert talks by the performers followed the Friday performances and preceded the Saturday concerts.

This year the Writers Conversations continued with a poets panel featuring moderator Tracy K. Smith and poets Thomas Sayers Ellis, Suji Kwock Kim, and Wendy S. Walters. The next event was a conversation with Shimon Attie, an internationally renowned visual artist who discussed a variety of his work, from his early site-specific installations across Europe through his more recent artworks that involve multiple-channel immersive video installations. The final presentation was a conversation with Alex Ross, music critic of the *New Yorker*, who joined Bermel in a discussion of the challenges in writing about music for different formats, including books, magazines, newspapers, and blogs.

In addition to directing "The Harmonic Series," during the 2010–11 year Bermel composed a newly commissioned work, *Mar de Setembro*, for the Los Angeles Chamber Orchestra with soprano soloist Luciana Souza, as well as an electric guitar concerto jointly commissioned by the Albany Symphony and the Nederlands Jeugd Stijkorkest, which had its American and European premieres in the spring. He also had works performed by the Chicago Symphony and the Alabama Symphony, among others. Bermel has been busy co-curating the ten-day SONiC festival, featuring the music of over one hundred composers age forty and under, which will take place at venues throughout New York City during October 2011, including Carnegie Hall, the Joyce Soho, the Kitchen, Joe's Pub, the World Financial Center, and Columbia University's Miller Theatre.

# 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.*

**Graham Farmelo** is writing a book on Winston Churchill's work on the atomic bomb, from his early acquaintance with the idea of such weapons to the end of his second premiership. Farmelo will be concentrating on his relationships with British physicists—Lord Cherwell among others—but including the American presidents with whom he worked on nuclear policy, from Roosevelt to Eisenhower.

During his time at the Institute, **Paul Hodgson** continued to explore different kinds of uncertainty through painting, photography, and digital media. He also continued an ongoing examination of the value of a subjective response. The work that he produced has since led him to separate the different visual languages that he had previously combined in a single picture, and to reconsider each in turn. A studio on the edge of the Institute woodlands prompted him to work directing from a landscape motif, raising interesting questions of how this activity relates to his current practice. The largest of the pictures that he worked on during his stay is *Compendium*—a mixed media piece, completed on his return to London in early 2011.

The great benefit of being a Director's Visitor is the opportunity, away from normal work constraints, to follow serendipity. Thanks to the open stacks policy in so many of Princeton's libraries, both at IAS and at the University, **Fiona Maddocks** chanced upon some specialist texts concerning the use of non-Western musical styles in early-twentieth-century opera. This fed directly into the exploration of wider social-cultural issues she has been examining in relation to opera, and prompted a fresh and rewarding line of inquiry. She arrived at the Institute with one set of questions and left a month later, after many walks in the woods and stimulating lunchtime encounters, having posed, if not entirely answered, several others far more interesting.

*Fiona Maddocks arrived at the Institute with one set of questions and left a month later, after many walks in the woods and stimulating lunchtime encounters, having posed, if not entirely answered, several others far more interesting.*

**Tarik O'Regan** continued making final revisions to *Heart of Darkness*, his opera based on Conrad's novel of the same name (a collaboration with fellow Director's Visitor Tom Phillips), which opens in November 2011 at the Royal Opera House, London. He also completed a commission for Paul Hillier and the National Chamber Choir of Ireland: *Acallam na Senórach*, an hour-long chamber rendering for sixteen solo voices of this important Middle Irish narrative dating from the twelfth century. The new work tours the United States and is released on CD by Harmonia Mundi in October 2011.

Once again **Tom Phillips** arrived at the Institute with a task and departed with an idea. Inspiration (if one dare use that word) can only come to the worker on duty, so the task was performed using (once again) trashed magazines from the humanities library. The same library furnished reading matter, which led, with the usual admixture of lunches, conversations, astrophysical ping pong, and walks in the woods, to a visual commentary on Cicero, now happily in progress.

Writing yet another history of the Institute after the half dozen written since Beatrice Stern's pioneer study? Downsizing the project was one answer, choosing a different angle another. The history **Ulrich Raulff** is doing now focuses on the humanists at the Institute, its time horizon being the first two and half decades after the war. What was it to be a cold-war humanist, coming out of one war, being surrounded by people that seemed to be busy preparing the next? When policy-making in the nuclear age forged new coalitions and broke old solidarities; when the gatekeepers of pure science and scholarship rallied for their last battle: What styles of communication (living, talking) were then in fashion and bridged the gap of the two cultures? These were some of the questions he began to tackle, and it was a wonderful experience to discuss them with old and new members of faculty, guests, and visitors, and being most generously helped by the staff of the Institute's library and archive.

# Institute for Advanced Study/Park City Mathematics Institute (PCMI)

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. Established in 1991 through a grant from the National Science Foundation, PCMI has been an outreach program of the Institute for Advanced Study since 1994.

The Annual PCMI Summer Session is the flagship activity of PCMI. Held annually in Park City, Utah, the Summer Session combines high-quality lectures and seminars with activities and events designed to foster all-institute interaction. The interaction at PCMI creates strong bonds throughout the mathematical community and increases awareness of the roles and contributions of all professionals in mathematics-based occupations.

In addition to the annual Summer Session, PCMI offers year-round professional development activities to secondary school mathematics teachers through its Math Science Partnership project and in the many Professional Development and Outreach Groups associated with the summer Secondary School Teachers Program.

Another method of outreach is through the publications offered by PCMI. The Graduate Summer School lectures are typically disseminated through the Park City Mathematics Series published by the American Mathematical Society and targeted at graduate students and research mathematicians. Also published by the AMS is a series of lectures from PCMI's Undergraduate Summer School. The Math Forum at Drexel University publishes online the products created by PCMI's Secondary School Teachers Program, and the proceedings and briefs authored by PCMI's International Seminar on Mathematics Education are also available on the Math Forum website.

## Annual Summer Session

The twenty-first annual Summer Session was held July 3–23, 2011, in Park City and attracted some 350 participants combined in all programs.

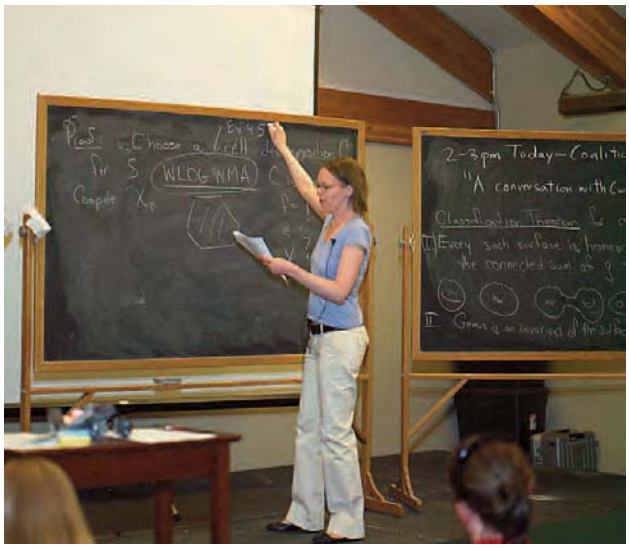
The following programs took place during the Summer Session (except as noted, all programs met for the entire three weeks):

Graduate Summer School and Research Program
International Seminar on Mathematics Education (one week)
Research Program in Mathematics
Secondary School Teachers Program
Service, Teaching, and Research (STaR) Program (one week)
Undergraduate Faculty Program
Undergraduate Summer School

The mathematical research topic informs the courses and seminars for the Graduate Summer School, the Research Program, the Undergraduate Summer School, and the Undergraduate Faculty Program; in 2011 the topic was "Moduli Spaces of Riemann Surfaces." The topic "Making Mathematical Connections" provided the focus for the International 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 cross-program activities three or four days each week.

Opening social events were held for each program on the evening of registration day, designed to introduce participants to their program's leaders in a casual setting and to foster early acquaintances among the diverse population of each program.



PHOTOS TODD ROYAL HICKEN

(Left) Participants in the International Seminar Sitsofe Anku (left) from Ghana and Shannon Sookochoff (right) from Canada were among those brought from Canada, Finland, Ghana, Honduras, Indonesia, South Korea, and Slovenia to work with a team from the United States. (Right) In the Undergraduate Summer School, Tara Brendle of the University of Glasgow lectured on surface topology.

## Graduate Summer School and Research Program

The Graduate Summer School and the Research Program 2011 were organized by Benson Farb, University of Chicago; Richard Hain, Duke University; and Eduard Looijenga, Universiteit Utrecht. This year's theme, "Moduli Spaces of Riemann Surfaces," included recent developments in mathematical theory of these moduli spaces and brought together viewpoints from the disparate fields of algebraic geometry, geometric topology, geometric analysis, and representation theory. Thus the graduate lecture series and research seminars brought together a broad range of mathematical approaches to the fundamental problem of understanding the moduli spaces of Riemann surfaces and its many compactifications. There were many cross-field interactions among participants that are expected to lead to collaborations in the near future.

### Graduate Summer School

The 2011 Graduate Summer School had six lecture series (with a total of forty lectures) on a variety of approaches to understanding the moduli spaces of Riemann surfaces. Each lecture, which was balanced between introductory and advanced research material, was supplemented with an additional daily session where students worked on prepared problems guided by the lecturers' teaching assistants.

The Summer Session is designed to provide graduate students with a comprehensive and diverse learning experience that few, if any, could obtain in their own university. Attendance at all lectures was very high and included participants from the Graduate Summer School, the Research Program, the Undergraduate Faculty Program, and the Undergraduate Summer School.

### Graduate Summer School Lecture Series 2011

"Tautological Algebras of Moduli Spaces," Carel Faber, KTH Royal Institute of Technology, Stockholm

"Stable Cohomology of Mapping Class Groups," Søren Galatius, Stanford University, and Nathalie Wahl, University of Copenhagen

"Teichmüller Theory and Moduli Spaces of Riemann Surfaces," Ursula Hamenstädt, Universität Bonn, and Martin Möller, Goethe Universität-Frankfurt

"Arithmetic Mapping Class Groups," Makoto Matsumoto, Tokyo University

"Mapping Class and Torelli Groups," Yair Minsky, Yale University, and Andrew Putman, Rice University

"Weil-Petersson Geometry and Intersection Numbers on Moduli Space," Scott Wolpert, University of Maryland

## International Seminar on Mathematics Education

Begun in 2001, the annual PCMI International Seminar on Mathematics Education: Bridging Policy and Practice brings diverse perspectives and practices to a national dialogue in the United States on mathematics

PHOTOS TODD ROYAL HICKEN

(Left) Participants in the Undergraduate Faculty Program worked on a book to introduce college students to topology and geometry and their applications. (Right)The Graduate Summer School focused on a variety of approaches to understanding the moduli spaces of Riemann surfaces.

education. The 2011 International Seminar focused on the topic "Complex Numbers" and the mathematical knowledge needed by teachers for working with this concept. This seminar brought teams from Canada, Finland, Ghana, Honduras, Indonesia, South Korea, and Slovenia to work with a team from the United States. Each country was invited to send two participants, one a currently practicing teacher and one working on educational policy or in a university setting.

During the seminar, team members presented a response based on their country's view of secondary education to specific questions related to complex numbers and the teaching of this concept. Participants from each of the other countries raised clarifying questions and discussed the implications of the response from the perspective of their own cultures. Michèle Artigue, past President of the International Congress on Mathematical Instruction, and Gail Burrill, past President of the National Council of Teachers of Mathematics, lead the seminar.

Issues emerging from the conversations formed the basis for jointly written policy briefs on topics of mutual concern. The 2011 briefs deal with "Some Elements of the History of Complex Numbers," "Integration of Algebra and Geometry through Complex Numbers," "Progressions of Complex Numbers over Time," and "Complex Numbers in Teacher Education: Connecting Mathematics and Pedagogy." Once edited, these briefs will appear with the previous policy briefs and the proceedings of the earlier seminars on PCMI's website at the Math Forum, http://mathforum.org/pcmi/int.html.

This year, the seminar extended its efforts for conversation with the Secondary School Teachers Program through a special presentation, a morning visit, several social events, and the bringing of two past international seminar participants to the entire three-week summer secondary school program.

## Research Program in Mathematics

A broad spectrum of highly active researchers in fields including algebraic geometry, Teichmüller theory, and algebraic topology were recruited to participate in this year's research program. A large number of them stayed the entire three weeks, and almost all stayed at least one week.

The main formal activity of the research program consisted of nine hours of research talks each week. Eight of these were devoted to the work of established researchers, and one to the work of graduate students and early postdocs. Almost all speakers took into account the diversity of the audience and carefully explained the background and motivation for their work as well as their recent results. Informal activity was also extensive; small groups gathered for conversations wherever they could find space. The conversations included a good many between people with different backgrounds, such as algebraic geometers and topologists or analysts and group theorists. Several of these conversations developed into research collaborations.

## Secondary School Teachers Program

Fifty-four high school and middle school teachers followed an intense daily schedule that included learning mathematics, reflecting on what it means to teach mathematics, and working together to create products to be shared with their colleagues.

Participants came from many different areas of the United States, as well as from Canada, Peru, Turkey, and Vietnam. The range of teaching experience among the SSTP participants ran from one year of teaching to seasoned veterans.

The daily "Mathematical Problem Solving" course used materials created by a team from the Educational Development Center and the PROMYS for Teachers program at Boston University. The course in 2011 focused on geometry as a useful tool for studying and understanding all kinds of phenomena inside and outside mathematics. Participants created functions that give insight on a geometric problem, and looked for things that remain constant when the inputs of a function change. These were applied to a wide variety of situations, including geometric optimization and the fundamental theorem of algebra.

In the daily "Reflecting on Practice" session, participants considered research related to teaching and learning mathematics with a particular focus on formative assessment—student thinking and how it can be used to shape instruction. The discussion was grounded in the study of lessons and classroom practice in both the United States and other countries. Participants worked collaboratively to better understand why assessment for learning is important and how they can design and use such assessments in their own classrooms.

For two hours each afternoon, each participant took part in one of six working groups on data analysis, functions, geometry, discrete mathematics, lesson study, and a group that took part in the mathematics course given as part of PCMI's Undergraduate Faculty Program. In the latter working group, participants not only learned about the research topic but provided input to the course instructors about the pedagogy involved in delivering the course. The working group on functions focused on preparing materials to enable their colleagues to understand the role of functions in the Common Core State Standards. The other 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.

TODD ROYAL HICKEN

The range of teaching experience among participants in the Secondary School Teachers Program ran from one year of teaching to seasoned veterans.

## Service, Teaching, and Research (STaR) Program

The Service, Teaching, and Research (STaR) induction program for recent doctoral graduates in mathematics education, organized by Robert and Barbara Reys, University of Missouri, with National Science Foundation funding, was associated with PCMI for the second year. The program supported thirty-five mathematics educators for one week at PCMI, taking part in courses offered by leading mathematics educators in the United States and working together in small groups on topics of interest and relevance to their emerging work. In addition to informal connections between PCMI's Secondary School Teachers Program and STaR, participants from the two programs met together for a focused lunch discussion led by facilitators from both groups around a set of common questions.

## 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, confer with peers about new teaching approaches, address 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.

This year's UFP instructor/coordinator was Erica Flapan, Pomona College. The UFP 2011 had three goals:

To write a book that introduces first-year college students to topology and geometry and their applications to understanding models of our universe, knot theory, molecular symmetries, and DNA topology;

To develop usable homework problems with complete solutions;

To present a set of lectures to the undergraduates and teachers participating in PCMI during the summer.

To meet these goals, the eighteen participants were divided into smaller working groups. Each day one of the groups presented an hour-long lecture based on the notes they had developed. These lectures were attended by a group of secondary school teachers as well as by a group of undergraduate student participants. The participants were careful to make sure that the lectures were self-contained with no prerequisites so that the teachers and undergraduates could understand them.

The UFP also developed homework problems and solutions to accompany the lecture notes.

At the end of the PCMI Summer Session, a manuscript with twelve chapters was submitted to the American Mathematical Society (AMS) for the Student World series. The solutions together with some notes to instructors will also be made available online to future instructors. Many of the participants in the 2011 UFP plan to teach a course at their home institutions that would use the book once it is published.

## Undergraduate Summer School

The broad goal of the Undergraduate Summer School was to give an introduction to the geometry and topology of surfaces. The particular goal was to define and study the moduli space of Riemann surfaces, starting with only calculus and linear algebra. Motivated by Euclidean space, the first part of the course described metric spaces and some basic facts, and then defined the three model spaces: the sphere, the Euclidean plane, and the hyperbolic plane. Geometric surfaces were defined using these as models, and the participants analyzed several ways to think about such surfaces. Finally, the moduli space in terms of geometric surfaces was defined and studied by looking at its "universal covering," the Teichmüller space, and the action of its "covering group," the mapping class group. There were officially two separate undergraduate courses, but the two lecturers carefully orchestrated their efforts in order to create the feeling of one integrated course with two viewpoints, the geometric and the topological.

One challenge was how to meet the needs of students with a wide range of backgrounds. The first week's introductory material leveled the playing field, and by the second week, all the students were learning something new with each lecture. The daily problem sessions provided a productive environment for the students to discuss the problems with each other and also opened the doors to working together outside of the problem sessions.

TODD ROYAL HICKEN

In the Secondary School Teachers Program, fifty-four high school and middle school teachers followed an intense daily schedule that included creating products to be shared with their colleagues.

The two courses offered were: "Surface Topology" by Tara Brendle, University of Glasgow, and "Hyperbolic Geometry" by Christopher Leininger, University of Illinois at Urbana-Champaign.

In addition, many of the undergraduate students chose to participate in the daily Undergraduate Faculty Program's mathematical lecture series.

Typed lecture notes were provided each day during the Summer Session, with some figures and details purposely omitted to encourage active note-taking and revision; students' suggestions were often incorporated into updated drafts, made available to students at www.math.uiuc.edu/~clein/pcmi.html.

## Cross-Program Activities

In order to bring together the entire PCMI community during the three weeks of the Summer Session, many cross-program activities were planned by the organizers, including socials and dinners, creative and outdoor activities, and a number of talks.

TODD ROYAL HICKEN

The broad goal of the Undergraduate Summer School was to give an introduction to the geometry and topology of surfaces.

## Publications

Published by the American Mathematical Society, the Park City Mathematics Series comprises nearly all of the lectures ever given in PCMI's Graduate Summer School, from 1991 to 2009 thus far. The series now consists of eighteen volumes, all of which are currently in print and available for sale. Also published are seven volumes in the Park City Mathematics Institute Subseries, a subsection of the AMS Student Mathematics Series. These volumes are aimed at undergraduate students, and each is written by a lecturer from the Undergraduate Summer School of PCMI's Summer Session. The Secondary School Teachers Program disseminates its teacher-created materials and other resources at PCMI's website at the Math Forum, http://mathforum.org/pcmi/, where the proceedings and briefs of the International Seminar on Mathematics Education are also published.

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Eric and Wendy Schmidt
The Wolfensohn Family Foundation

Appreciation is extended for the in-kind contributions of the Department of Mathematics at the University of Utah.

## IAS/Park City Mathematics Institute Governance and Management

# Science Initiative Group (SIG)

The Science Initiative Group (SIG) is dedicated to fostering science in developing countries. Formed in 1999 as an IAS outreach program to provide oversight for the Millennium Science Initiative in Latin America, which now operates independently, SIG has since shifted its focus to improving science and engineering capacity in sub-Saharan Africa. For the past four years, SIG has worked to develop, implement, and manage the Regional Initiative in Science and Education, known as RISE.

RISE prepares Ph.D.- and M.S.-level scientists and engineers in sub-Saharan Africa in university-based networks. Its goal is to increase the cadre of highly qualified academic staff members teaching and conducting research in African universities on subjects relevant to Africa's development. As of the end of June 2011, some one hundred students were pursuing doctoral or masters degrees or were engaged in postdoctoral research through RISE, and several had completed their studies and started or resumed academic careers at African universities.

Each RISE network includes universities in at least three countries. Fourteen universities and research institutes in nine countries—Botswana, Kenya, Malawi, Mozambique, Namibia, Nigeria, South Africa, Tanzania and Uganda—are part of at least one of the five RISE networks:

AMSEN: African Materials Science and Engineering Network

RISE-AFNNET: African Natural Products Network

SABINA: Southern African Biochemistry and Informatics for Natural Products Network

SSAWRN: Sub-Saharan Africa Water Resources Network

WIO-RISE: Western Indian Ocean Regional Initiative

ARLEN HASTINGS

Paul Mensah, a Ghanaian Ph.D. student in the SSAWRN network, conducts research at Rhodes University, South Africa, on the effects of run-off herbicide on the lifecycle of the indigenous shrimp *Caridina nilotica*.

By the end of the three-year implementation phase of RISE in December 2010, all of the students had benefited from the opportunities offered by the network structure, including participation in international workshops and conferences and access to specialized scientific instrumentation and to supervisors with complementary expertise. Some students had published papers, applied for patents, or won prestigious academic prizes.

RISE's first phase culminated in a weeklong program in October 2010 in Benoni, South Africa, featuring a forum on regional networks in Africa and a scientific conference. The event showcased RISE student research in a series of talks and poster sessions in a format inspired by the annual meetings of the David and Lucile Packard Foundation, SIG's original funder and a conference cosponsor. Information about the conference, including links to news coverage, is available at http://sig.ias.edu/2010conference.

Carnegie Corporation of New York, which provided the initial planning and implementation grants for RISE, awarded a renewal grant in January 2011 that will fund RISE through 2013.

PHOTOS ARLEN HASTINGS

(Left) An AMSEN student at the University of Botswana displays a grid used in transmission electron microscopy. (Right) RISE-AFNNET Ph.D. student Gaymary Bakari of the Sokoine University of Agriculture in Tanzania demonstrates the high-performance liquid chromatography machine donated by the Norwegian Program for Development, Research, and Education in recognition of the network's accomplishments.

A profile of the Okavango Research Institute in Maun, Botswana, a member of the SSAWRN network, was written by SIG research and editorial consultant Alan Anderson and published in May 2011 in the "Excellence in Science" series produced by TWAS, the Academy of Sciences for the Developing World. The richly illustrated publication, which includes a section on "tomorrow's rising research stars" where RISE student projects are described, is available for download at http://twas.ictp.it/publications/excellence-in-science/botswana-ori/view. Preparation of another booklet in the series, on the Zanzibar-based Institute of Marine Science, was underway as of June 2011. The IMS, a semi-independent institution within the University of Dar es Salaam, is part of the WIO-RISE network.

SIG lost one board member in 2010 and gained another. Harold Varmus was obligated to step down when he became Director of the National Cancer Institute in July. Shortly thereafter, the SIG board was pleased to welcome Bruce Alberts, a prominent biochemist with a strong commitment to improving science education. Alberts, Professor Emeritus at the University of California, San Francisco, serves as Editor-in-Chief of *Science* and U.S. science envoy to Indonesia and Pakistan. During his tenure as president of the National Academy of Sciences from 1993 to 2005, Alberts established programs and linkages to engage scientists from around the world. Long an advocate for science in developing countries, he participated in the convocation in Chile in 1998 where SIG's inaugural program, the Millennium Science Initiative, was launched.

Further information about SIG and RISE is available at www.ias.edu/sig.

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# Institute for Advanced Study—
# Louis Bamberger and Mrs. Felix Fuld Foundation

## Financial Statements
## June 30, 2011 and 2010

*(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, 2011 and 2010, 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, 2011 and 2010, 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.


November 15, 2011

## STATEMENTS OF FINANCIAL POSITION
## JUNE 30, 2011 AND 2010

| Assets | | 2011 | 2010 |
|---|---|---|---|
| Cash and cash equivalents | $ | 6,612,912 | 6,952,589 |
| Accounts receivable | | 320,377 | 585,413 |
| Grants receivable | | 4,991,868 | 4,371,757 |
| Prepaid expenses and other assets | | 866,085 | 635,260 |
| Contributions receivable—net | | 1,148,040 | 1,974,608 |
| Unamortized debt issuance costs—net | | 518,933 | 573,080 |
| Funds held by bond trustee | | 5,141,266 | 7,187,358 |
| Beneficial interest in remainder trust | | 3,206,005 | 2,786,283 |
| Land, buildings and improvements, equipment and rare book collection—net | | 59,800,972 | 60,191,610 |
| Investments | | 607,661,511 | 571,200,943 |
| Total assets | $ | 690,267,969 | 656,458,901 |
| **Liabilities and Net Assets** | | | |
| Liabilities: | | | |
| Accounts payable and accrued expenses | $ | 6,989,724 | 7,455,400 |
| Deferred revenue | | 8,561,989 | 15,474,995 |
| Liabilities under split-interest agreements | | 2,510,801 | 2,234,409 |
| Postretirement benefit obligation | | 14,454,112 | 14,582,000 |
| Asset retirement obligation | | 965,449 | 940,283 |
| Bond swap liability | | 3,940,182 | 4,629,600 |
| Note payable | | 426,503 | 492,767 |
| Long-term debt, net of discount | | 54,774,645 | 57,475,994 |
| Total liabilities | | 92,623,405 | 103,285,448 |
| Net assets: | | | |
| Unrestricted | | 358,444,469 | 346,689,111 |
| Temporarily restricted | | 141,116,464 | 125,676,785 |
| Permanently restricted | | 98,083,631 | 80,807,557 |
| Total net assets | | 597,644,564 | 553,173,453 |
| Total liabilities and net assets | $ | 690,267,969 | 656,458,901 |

See accompanying notes to financial statements.

## STATEMENT OF ACTIVITIES
## YEAR ENDED JUNE 30, 2011

| | Unrestricted | Temporarily restricted | Permanently restricted | Total |
|---|---|---|---|---|
| Operating revenues, gains and other support: | | | | |
| Private contributions and grants | $ — | 18,264,714 | — | 18,264,714 |
| Government grants | — | 8,412,323 | — | 8,412,323 |
| Endowment spending policy | 12,748,198 | 10,021,902 | — | 22,770,100 |
| Auxiliary activity | 4,996,594 | — | — | 4,996,594 |
| Net assets released from restrictions—satisfaction of program restrictions | 36,698,939 | (36,698,939) | — | — |
| Total operating revenues, gains and other support | 54,443,731 | — | — | 54,443,731 |
| Expenses: | | | | |
| School of Mathematics | 10,051,179 | — | — | 10,051,179 |
| School of Natural Sciences | 10,752,485 | — | — | 10,752,485 |
| School of Historical Studies | 6,965,575 | — | — | 6,965,575 |
| School of Social Science | 4,219,856 | — | — | 4,219,856 |
| Libraries and other academic | 8,269,839 | — | — | 8,269,839 |
| Administration and general | 11,279,587 | — | — | 11,279,587 |
| Auxiliary activity | 5,684,557 | — | — | 5,684,557 |
| Total expenses | 57,223,078 | — | — | 57,223,078 |
| Change in net assets from operations, including depreciation | (2,779,347) | — | — | (2,779,347) |
| Other revenues, gains and other support: | | | | |
| Private contributions and grants | 248,767 | 397,952 | 7,276,074 | 7,922,793 |
| Endowment change after applying spending policy | 25,028,125 | 13,653,824 | — | 38,681,949 |
| Change in fair value of bond swap liability | 689,418 | — | — | 689,418 |
| Loss on sale of plant assets | (43,702) | — | — | (43,702) |
| Reclassification of unrestricted net assets | (11,387,903) | 1,387,903 | 10,000,000 | — |
| Change in net assets | 11,755,358 | 15,439,679 | 17,276,074 | 44,471,111 |
| Net assets—beginning of year | 346,689,111 | 125,676,785 | 80,807,557 | 553,173,453 |
| Net assets—end of year | $ 358,444,469 | 141,116,464 | 98,083,631 | 597,644,564 |

See accompanying notes to financial statements.

## STATEMENT OF ACTIVITIES
## YEAR ENDED JUNE 30, 2010

| | Unrestricted | Temporarily restricted | Permanently restricted | Total |
|---|---|---|---|---|
| Operating revenues, gains and other support: | | | | |
| Private contributions and grants | $ — | 18,180,059 | — | 18,180,059 |
| Government grants | — | 7,905,853 | — | 7,905,853 |
| Endowment spending policy | 11,264,751 | 13,158,949 | — | 24,423,700 |
| Auxiliary activity | 4,865,176 | — | — | 4,865,176 |
| Net assets released from restrictions—satisfaction of program restrictions | 39,244,861 | (39,244,861) | — | — |
| Total operating revenues, gains and other support | 55,374,788 | — | — | 55,374,788 |
| Expenses: | | | | |
| School of Mathematics | 10,141,826 | — | — | 10,141,826 |
| School of Natural Sciences | 12,032,292 | — | — | 12,032,292 |
| School of Historical Studies | 7,220,001 | — | — | 7,220,001 |
| School of Social Science | 4,627,413 | — | — | 4,627,413 |
| Libraries and other academic | 7,410,944 | — | — | 7,410,944 |
| Administration and general | 12,456,320 | — | — | 12,456,320 |
| Auxiliary activity | 5,871,469 | — | — | 5,871,469 |
| Total expenses | 59,760,265 | — | — | 59,760,265 |
| Change in net assets from operations, including depreciation | (4,385,477) | — | — | (4,385,477) |
| Other revenues, gains and other support: | | | | |
| Private contributions and grants | 289,253 | 732,749 | 2,778,663 | 3,800,665 |
| Endowment change after applying spending policy | 28,960,507 | 10,109,129 | — | 39,069,636 |
| Change in fair value of bond swap liability | (1,115,233) | — | — | (1,115,233) |
| Gain on sale of plant assets | 349,567 | — | — | 349,567 |
| Change in net assets | 24,098,617 | 10,841,878 | 2,778,663 | 37,719,158 |
| Net assets—beginning of year | 322,590,494 | 114,834,907 | 78,028,894 | 515,454,295 |
| Net assets—end of year | $ 346,689,111 | 125,676,785 | 80,807,557 | 553,173,453 |

See accompanying notes to financial statements.

## STATEMENTS OF CASH FLOWS
## YEARS ENDED JUNE 30, 2011 AND 2010

| | 2011 | 2010 |
|---|---|---|
| Cash flows from operating activities: | | |
| Change in net assets | $ 44,471,111 | 37,719,158 |
| Adjustments to reconcile change in net assets to net cash used in operating activities: | | |
| Depreciation | 4,128,125 | 4,060,637 |
| Contributions restricted for endowment and plant | (8,022,724) | (4,478,275) |
| Net realized and unrealized (gains) losses | (63,282,128) | (64,911,928) |
| Change in fair value of bond swap liability | (689,418) | 1,115,233 |
| Loss (gain) on sale of plant assets | 43,702 | (349,567) |
| Amortization of debt issuance costs | 54,147 | 58,926 |
| Amortization of bond discount | 23,651 | 26,985 |
| Changes in assets/liabilities: | | |
| Accounts receivable and grants receivable | (355,075) | (1,521,633) |
| Prepaid expenses and other assets | (230,825) | (137,249) |
| Contributions receivable | 826,568 | 1,072,702 |
| Beneficial interest in remainder trust | (419,722) | (132,027) |
| Accounts payable and accrued expenses | (465,676) | (105,455) |
| Deferred revenue | (6,913,006) | 6,071,548 |
| Postretirement benefit obligation | (127,888) | 4,113,000 |
| Asset retirement obligation | 25,166 | 31,405 |
| Net cash used in operating activities | (30,933,992) | (17,366,540) |
| Cash flows from investing activities: | | |
| Proceeds from sale of plant assets | 704,663 | 1,822,338 |
| Purchase of plant assets | (4,485,852) | (5,031,476) |
| Proceeds from sale of investments | 373,514,014 | 567,497,630 |
| Purchase of investments | (346,692,454) | (543,466,493) |
| Net cash provided by investing activities | 23,040,371 | 20,821,999 |
| Cash flows from financing activities: | | |
| Contributions restricted for endowment and plant | 8,022,724 | 4,478,275 |
| Increase (decrease) in liabilities under split-interest agreements | 276,392 | (13,400) |
| Repayment of long-term debt | (2,725,000) | (2,615,000) |
| Repayment of note payable | (66,264) | (64,957) |
| Decrease in funds held by bond trustee | 2,046,092 | 1,400,050 |
| Net cash provided by financing activities | 7,553,944 | 3,184,968 |
| Net (decrease) increase in cash and cash equivalents | (339,677) | 6,640,427 |
| Cash and cash equivalents—beginning of year | 6,952,589 | 312,162 |
| Cash and cash equivalents—end of year | $ 6,612,912 | 6,952,589 |
| Supplemental data: | | |
| Interest paid | $ 1,497,977 | 1,829,881 |

See accompanying notes to financial statements.

## 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 members visiting the Institute from other research institutions and universities throughout the world.

The Founders' original letter to the first Trustees described the objectives of the Institute as follows: "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.

*(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-adjusted discount rate. The discount rates range from 0.19% to 0.61%. Amortization of discount is recorded as additional contribution revenue in accordance with donor-imposed restrictions, if any, on the contributions.

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.

*(b) Cash and cash equivalents*

Cash and cash equivalents consist of cash on hand and all highly liquid investments with an original maturity of three months or less, except for those managed as a component of the Institute's investment portfolio.

### *(c) Investments*

Investments in marketable securities are reported in the financial statements at fair value based on published market quotations. Investments in limited partnerships and hedge funds are reported in the financial statements at estimated fair value using net asset value (NAV) or its equivalent as a practical expedient, based upon values provided by external investment managers or general partners, unless it is probable that all or a portion of the investment will be sold for an amount different from NAV. 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. As of June 30, 2011 and 2010, the Institute had no plans or intentions to sell investments at amounts different from NAV.

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 or law. 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.

### *(d) Fair Value Measurements*

Fair value is defined as the exchange price that would be received for an asset or paid to transfer a liability (an exit price) in the principal or most advantageous market for the asset or liability in an orderly transaction between market participants on the measurement date. The fair value hierarchy requires an entity to maximize the use of observable inputs and minimize the use of unobservable inputs when measuring fair value. The three levels of inputs used to measure fair value are as follows:

- Level 1: Quoted prices in active markets for identical assets or liabilities.
- Level 2: Observable inputs other than Level 1 prices such as quoted prices for similar assets or liabilities; quoted prices in markets that are not active; or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities.
- Level 3: Unobservable inputs that are supported by little or no market activity and that are significant to the fair value of the asset or liabilities.

Fair value estimates are made at a specific point in time, based on available market information and judgments about the financial asset, including estimates of timing, amount of expected future cash flows, and the credit standing of the issuer. In some cases, the fair value estimates cannot be substantiated by comparison to independent markets. In addition, the disclosed fair value may not be realized in the immediate settlement of the financial asset and does not reflect any premium or discount that could result from offering for sale at one time an entire holding of a particular financial asset. Potential taxes and other expenses that would be incurred in an actual sale or settlement are not reflected in amounts disclosed.

Because the net asset value reported by limited partnerships and hedge funds is used as a practical expedient to estimate fair value of the Institute's interest therein, classification of such investments in the fair value hierarchy as Level 2 or 3 is based on the Institute's ability to redeem its interest at or near the balance sheet date. If the interest can be redeemed in the near term, the investment is classified as Level 2.

### *(e) 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).

### *(f) Deferred Revenue*

Amounts received on conditional grants are recorded initially as deferred revenue and are reported as revenues when expended in accordance with the terms of the condition.

### *(g) 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 to reflect changes in the life expectancy of the donor or annuitant, amortization of the discount and other changes in the estimates of future payments. The assets held by the Institute under these arrangements are recorded at fair value as determined by quoted market prices and are included as a component of investments.

### *(h) 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, 2011 and 2010 were net of accumulated amortization of $810,820 and $756,673, respectively.

### *(i) 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. Private contributions and grants budgeted for operations are included in operating revenues, gains and other support. All other private contributions and grants are considered other revenues, gains and other support.

### *(j) 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, 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.

### *(k) Fund Raising Expenses*

Fund raising expenses incurred by the Institute amounted to $1,349,617 and $1,302,728 for the years ended June 30, 2011 and 2010, respectively. This amount is included in administration and general expenses in the accompanying statements of activities.

### *(l) 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.

### *(m) 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.

There are certain transactions that could be deemed unrelated business income and would result in a tax liability. Management reviews transactions to estimate potential tax liabilities using a threshold of more likely than not. It is management's estimation that there are no material tax liabilities that need to be recorded.

### *(n) 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.

## (2) Contributions Receivable

Unconditional promises to give at June 30, 2011 and 2010 were as follows:

| | | 2011 | 2010 |
|---|---|---|---|
| Unconditional promises to give: | | | |
| Less than one year | $ | 784,833 | 1,123,166 |
| One to five years | | 383,334 | 866,668 |
| | | 1,168,167 | 1,989,834 |
| Discount on promises to give | | (20,127) | (15,226) |
| Total | $ | 1,148,040 | 1,974,608 |

During fiscal 2011, the Institute received two conditional pledges totaling $100 million to enhance the Institute's endowment fund. The pledges are conditioned on the Institute raising an additional $100 million in cash or pledges from third party donors in the period January 1, 2011 through June 30, 2015. The conditional pledge payments began in June 2011 and will continue through March 31, 2016. During fiscal 2011, the Institute received $4 million which is recorded in other revenues, gains, and other support: private contributions and grants in the accompanying financial statements.

## (3) Investments, Funds Held by Bond Trustee, and Beneficial Interest in Remainder Trust

### *(a) Overall Investment Objective*

The overall investment objective of the Institute is to invest its assets in a prudent manner that will achieve a long-term rate of return sufficient to fund a portion of its annual operating activities and capital preservation. The Institute diversifies its investments among various managers and investment opportunities. 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. Major investment decisions are authorized by the Board's Investment Committee, which oversees the Institute's investment program in accordance with established guidelines.

### *(b) Allocation of Investment Strategies*

In addition to traditional stocks and fixed-income securities, the Institute may also hold shares or units in traditional institutional funds as well as in alternative investment funds involving hedged strategies, private equity, and real asset strategies. Hedged strategies involve funds whose managers have the authority to invest in various asset classes at their discretion, including the ability to invest long and short. Funds with hedged strategies generally hold securities or other financial instruments for which a ready market exists and may include stocks, bonds, put or call options, swaps, currency hedges, and other instruments, and are valued accordingly. Private equity funds employ buyout and venture capital strategies and focus on investments in turn-around situations. Real asset funds generally hold interests in public real estate investment trusts (REITS) or commercial real estate through sole-member entities. Private equity and real asset strategies therefore often require the estimation of fair values by the fund managers in the absence of readily determinable market values. Because of the inherent uncertainties of valuation, these estimated fair values may differ significantly from values that would have been used had a ready market existed, and the differences could be material. Such valuations are determined by fund managers and generally consider variables such as operating results, comparable earnings multiples, projected cash flows, recent sales prices, and other pertinent information, and may reflect discounts for the illiquid nature of certain investments held.

The following tables summarize the Institute's investments and other assets by major category in the fair value hierarchy as of June 30, 2011 and 2010, as well as related strategy, liquidity, and funding commitments:

| | June 30, 2011 | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| Investments: | | | | |
| Long-term investment strategies: | | | | |
| Fixed income: | | | | |
| U.S. Treasuries | $ 19,943,706 | — | — | 19,943,706 |
| Total | 19,943,706 | — | — | 19,943,706 |
| Hedge funds—onshore: | | | | |
| Emerging markets | — | — | 6,655,647 | 6,655,647 |
| Equities—long bias | — | — | 8,924,080 | 8,924,080 |
| Multiple strategies | — | — | 45,684,421 | 45,684,421 |
| Total | — | — | 61,264,148 | 61,264,148 |
| Hedge funds—offshore: | | | | |
| Commercial mortgage backed | — | — | 15,955,789 | 15,955,789 |
| Commodity trading advisor | — | 7,378,003 | — | 7,378,003 |
| Distressed/high-yield | — | — | 22,725,842 | 22,725,842 |
| Emerging markets | — | — | 9,941,832 | 9,941,832 |
| Equities—long bias | — | — | 16,372,902 | 16,372,902 |
| Equities—long/short | — | 46,961,416 | — | 46,961,416 |
| Fixed income arbitrage | — | — | 26,560,042 | 26,560,042 |
| Global asset allocation | — | 27,179,583 | — | 27,179,583 |
| Multiple strategies | — | 68,905,637 | 151,326,637 | 220,232,274 |
| Bio tech/health care | — | — | 9,756,928 | 9,756,928 |
| Total | — | 150,424,639 | 252,639,972 | 403,064,611 |
| Limited partnerships (1) | — | — | 89,493,643 | 89,493,643 |
| Cash and cash equivalents | 20,507,229 | — | — | 20,507,229 |
| Other investments: | | | | |
| Assets held under split-interest agreements: | | | | |
| Cash and cash equivalents | 154,797 | — | — | 154,797 |
| Fixed income securities | — | — | 4,138,260 | 4,138,260 |
| Mortgages from faculty and staff | — | — | 9,095,117 | 9,095,117 |
| Total investments | $ 40,605,732 | 150,424,639 | 416,631,140 | 607,661,511 |
| Other assets: | | | | |
| Beneficial interest in remainder trust | — | — | 3,206,005 | 3,206,005 |
| Funds held by bond trustee: | | | | |
| U.S. government obligations | 5,141,266 | — | — | 5,141,266 |
| Total other assets | $ 5,141,266 | — | 3,206,005 | 8,347,271 |

(1) The private equity funds have initial terms of 10 years with extensions of 1 to 3 years, and have an average remaining life of 6 years.

| | June 30, 2010 | | | |
|---|---|---|---|---|
| | Level 1 | Level 2 | Level 3 | Total |
| Investments: | | | | |
| Long-term investment strategies: | | | | |
| Fixed income: | | | | |
| U.S. Treasuries | $ 39,913,689 | — | — | 39,913,689 |
| Total | 39,913,689 | — | — | 39,913,689 |
| Hedge funds—onshore: | | | | |
| Emerging markets | — | — | 5,620,295 | 5,620,295 |
| Equities—long bias | — | — | 6,802,442 | 6,802,442 |
| Multiple strategies | — | — | 46,920,737 | 46,920,737 |
| Total | — | — | 59,343,474 | 59,343,474 |
| Hedge funds—offshore: | | | | |
| Commercial mortgage backed | — | — | 16,727,631 | 16,727,631 |
| Commodity trading advisor | — | 7,197,803 | — | 7,197,803 |
| Distressed/high-yield | — | — | 31,950,967 | 31,950,967 |
| Emerging markets | — | — | 9,778,981 | 9,778,981 |
| Equities—long bias | — | — | 19,069,305 | 19,069,305 |
| Equities—long/short | — | 38,744,376 | 7,288,394 | 46,032,770 |
| Fixed income arbitrage | — | — | 25,587,287 | 25,587,287 |
| Global asset allocation | — | — | 23,549,745 | 23,549,745 |
| Multiple strategies | — | 16,185,952 | 175,410,347 | 191,596,299 |
| Total | — | 62,128,131 | 309,362,657 | 371,490,788 |
| Limited partnerships (1) | — | — | 71,778,972 | 71,778,972 |
| Cash and cash equivalents | 15,767,896 | — | — | 15,767,896 |
| Other investments: | | | | |
| Assets held under split-interest agreements: | | | | |
| Cash and cash equivalents | 222,233 | — | — | 222,233 |
| Fixed income securities | — | — | 3,506,803 | 3,506,803 |
| Mortgages from faculty and staff | — | — | 9,177,088 | 9,177,088 |
| Total investments | $ 55,903,818 | 62,128,131 | 453,168,994 | 571,200,943 |
| Other assets: | | | | |
| Beneficial interest in remainder trust | — | — | 2,786,283 | 2,786,283 |
| Funds held by bond trustee: | | | | |
| U.S. government obligations | 7,187,358 | — | — | 7,187,358 |
| Total other assets | $ 7,187,358 | — | 2,786,283 | 9,973,641 |

(1) The private equity funds have initial terms of 10 years with extensions of 1 to 3 years, and have an average remaining life of 6 years.

The following tables present the Institute's activities for the years ended June 30, 2011 and 2010 for investments classified in Level 3:

2011

| Level 3 roll forward | Limited partnerships | Hedge funds | Mortgages from faculty and staff | Assets held under split-interest agreements: Fixed income securities | Beneficial interest in remainder trust | Total |
|---|---|---|---|---|---|---|
| Fair value at July 1, 2010 | $ 71,778,972 | 368,706,131 | 9,177,088 | 3,506,803 | 2,786,283 | 455,955,277 |
| Acquisitions | 19,308,234 | 4,156,993 | 588,000 | — | 125,935 | 24,179,162 |
| Dispositions | (14,320,805) | (39,054,360) | (669,971) | (232,671) | — | (54,277,807) |
| Transfers in/out of Level 3 | — | (53,253,331) | — | — | — | (53,253,331) |
| Net realized and unrealized gains | 12,727,242 | 33,348,687 | — | 864,128 | 293,787 | 47,233,844 |
| Fair value at June 30, 2011 | $ 89,493,643 | 313,904,120 | 9,095,117 | 4,138,260 | 3,206,005 | 419,837,145 |

2010

| Level 3 roll forward | Limited partnerships | Hedge funds | Mortgages from faculty and staff | Assets held under split-interest agreements: Fixed income securities | Beneficial interest in remainder trust | Total |
|---|---|---|---|---|---|---|
| Fair value at July 1, 2009 | $ 61,657,620 | 333,893,548 | 8,151,049 | 4,133,861 | 2,654,256 | 410,490,334 |
| Acquisitions | 10,547,098 | 40,103,388 | 1,518,813 | 35,000 | — | 52,204,299 |
| Dispositions | (12,747,314) | (60,256,399) | (492,774) | (1,260,372) | — | (74,756,859) |
| Transfers in/out of Level 3 | — | 10,000,000 | — | — | — | 10,000,000 |
| Net realized and unrealized gains | 12,321,568 | 44,965,594 | — | 598,314 | 132,027 | 58,017,503 |
| Fair value at June 30, 2010 | $ 71,778,972 | 368,706,131 | 9,177,088 | 3,506,803 | 2,786,283 | 455,955,277 |

The Institute's accounting policy is to recognize transfers between levels of the fair value hierarchy on the date of the event or change in circumstances that caused the transfer. There were no transfers of investments classified as either Level 1 or Level 2 for the years ended June 30, 2011 or 2010.

Private equity and venture capital investments are generally made through limited partnerships. Under the terms of such agreements, the Institute may be required to provide additional funding when capital or liquidity calls are made by fund managers. These partnerships have a limited existence, and they may provide for annual extensions for the purpose of disposing portfolio positions and returning capital to investors. However, depending on market conditions, the inability to execute the fund's strategy, or other factors, a manager may extend the terms of a fund beyond its originally anticipated existence or may wind the fund down prematurely. The Institute cannot anticipate such changes because they generally arise from unforeseeable events, but should they occur they could reduce liquidity or originally anticipated investment returns. Accordingly, the timing and amount of future capital or liquidity calls in any particular future year are uncertain. As of June 30, 2011, the Institute is obligated under certain limited partnership agreements to advance additional funding in the amount of $86,596,821, which is anticipated to be called over the next 10 years.

Investment liquidity as of June 30, 2011 is aggregated below based on redemption or sale period:

| | Investment fair values |
|---|---|
| Investment redemption or sale period: | |
| Daily | $ 44,743,992 |
| Monthly | 37,700,834 |
| Quarterly | 103,564,759 |
| Semi-annually | 23,178,744 |
| Annually | 65,117,355 |
| Subject to rolling lock ups or other restrictions | 175,751,100 |
| Illiquid | 157,604,727 |
| Total as of June 30, 2011 | $ 607,661,511 |

### *(c) Funds Held by Bond Trustee*

Funds held by bond trustee represent the balance of the proceeds from the 2001, 2006, and 2008 New Jersey Educational Facilities Authority (NJEFA or 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.

### *(d) Redemption Restrictions—Hedge Funds*

At June 30, 2011, the Institute had hedge fund investments of approximately $464,329,000, of which approximately $126,405,300 was restricted from redemption for lock-up periods. At June 30, 2010, the Institute had hedge fund investments of approximately $430,834,000, of which approximately $127,457,000 was restricted from redemption for lock-up periods. Some of the investments with redemption restrictions allow early redemption for specified fees. The terms and conditions upon which an investor may redeem an investment vary, usually with the majority requiring 30 to 180 days notice after the initial lock-up period.

The expirations of redemption lock-up periods are summarized in the table below:

| | Amount |
|---|---|
| Fiscal year: | |
| 2012 | $ 44,208,300 |
| 2013 | 41,114,000 |
| 2014 | — |
| 2015 and thereafter | 41,083,000 |
| Total | $ 126,405,300 |

### *(e) Redemption Restrictions—Limited Partnerships*

At June 30, 2011 and 2010, the Institute had limited partnership investments of approximately $89,493,600 and $71,778,900, respectively, which were restricted from redemption for lock-up periods. Some of the investments with redemption restrictions allow early redemption for specified fees. The terms and conditions upon which an investor may redeem an investment vary, usually with the majority requiring 30 to 180 days notice after the initial lock-up period.

The expirations of redemption lock-up periods are summarized in the table below:

| | Amount |
|---|---|
| Fiscal year: | |
| 2012 | $ — |
| 2013 | 11,732,800 |
| 2014 | — |
| 2015 and thereafter | 77,760,800 |
| Total | $ 89,493,600 |

### *(f) Contingencies*

The Institute has an investment in the Ariel Fund Limited (the Fund), which on June 30, 2011 and 2010 had a fair value of approximately $15,391,000 and $18,854,000, respectively. During fiscal year 2009, the fund became subject to the oversight of a receiver appointed by the Attorney General of New York for the principal purposes of marshalling and preserving the assets of the Fund, for ultimate distribution of the proceeds to the respective investors of the Fund. During fiscal 2011, the Institute received the first distribution of $4,677,839 from the receiver. There is a potential for litigation to recover amounts from investors who have received previous distributions from the Fund. Management does not expect this to have a significant impact on the Institute's financial statements.

## (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 spending rate for operating and capital purposes was 4.7% for 2011 and 2010.

The following tables summarize the investment return and its classification in the statements of activities for the years ended June 30, 2011 and 2010:

| | 2011 | | |
|---|---|---|---|
| | Unrestricted | Temporarily restricted | Total |
| Dividends and interest, net of investment expenses | $ (784,578) | (1,045,501) | (1,830,079) |
| Net realized and unrealized gains | 38,560,901 | 24,721,227 | 63,282,128 |
| Total investment return | 37,776,323 | 23,675,726 | 61,452,049 |
| Endowment spending policy for use in operations | 12,748,198 | 10,021,902 | 22,770,100 |
| Endowment change after applying spending policy | $ 25,028,125 | 13,653,824 | 38,681,949 |

| | 2010 | | |
|---|---|---|---|
| | Unrestricted | Temporarily restricted | Total |
| Dividends and interest, net of investment expenses | $ (715,443) | (703,149) | (1,418,592) |
| Net realized and unrealized gains | 40,940,701 | 23,971,227 | 64,911,928 |
| Total investment return | 40,225,258 | 23,268,078 | 63,493,336 |
| Endowment spending policy for use in operations | 11,264,751 | 13,158,949 | 24,423,700 |
| Endowment change after applying spending policy | $ 28,960,507 | 10,109,129 | 39,069,636 |

Total investment management and advisory fees were $2,464,321 and $2,766,610 for the years ended June 30, 2011 and 2010, respectively.

## (5) Endowment

The Institute's endowment consists of approximately 90 individual funds established for a variety of purposes including both donor-restricted endowment funds and funds designated by the Board of Trustees to function as endowments. Net assets associated with endowments, including funds designated by the Board of Trustees to function as endowments, are classified and reported based on the existence or absence of donor-imposed restrictions.

### *(a) Interpretation of Relevant Law*

The Institute has interpreted the New Jersey-enacted version of the Uniform Prudent Management of Institutional Funds Act (UPMIFA) as allowing the Institute to appropriate for expenditure or accumulate so much of a donor-restricted endowment fund as the Institute determines is prudent for the uses, benefits, purposes, and duration for which the endowment fund is established, subject to the intent of the donor as expressed in the gift instrument. Unless stated otherwise in the gift instrument, the assets in a donor-restricted endowment fund are donor-restricted assets until appropriated for expenditure by the Board of Trustees of the Institute. As a result of applicable accounting guidance included in Financial Accounting Standards Board Accounting Standards Codification Subtopic 958-205-45, *Not-for-Profit Entities: Presentation of Financial Statements, Other Presentation Matters* (ASC 958-205-45), the Institute classifies as permanently restricted net assets (a) the original value of gifts donated to the permanent endowment, (b) the original value of subsequent gifts to the permanent endowment, and (c) accumulations to the permanent endowment made in accordance with the direction of the applicable donor gift instrument at the time the accumulation is added to the fund. The remaining portion of the donor-restricted endowment fund that is not classified as permanently restricted net assets is classified as temporarily restricted net assets until those amounts are appropriated for expenditure in a manner consistent with the standard of prudence prescribed by UPMIFA.

From time to time, the fair value of assets associated with individual donor-restricted endowments may fall below the original corpus of the fund included in permanently restricted net assets due to unfavorable market fluctuations subsequent to the investment of the gift. Deficiencies of this nature, which are reported in unrestricted net assets in accordance with ASC 958-205-45, totaled approximately $1,202,000 and $1,369,000, at June 30, 2011 and 2010, respectively. Subsequent gains that restore the fair value of the assets of the donor-restricted endowment fund are classified as an increase in unrestricted net assets.

Endowment net assets consisted of the following at June 30, 2011 and 2010:

| | 2011 | | | |
|---|---|---|---|---|
| | Unrestricted | Temporarily restricted | Permanently restricted | Total |
| Donor restricted | $ (1,202,008) | 140,107,904 | 98,083,631 | 236,989,527 |
| Board designated | 349,588,623 | — | — | 349,588,623 |
| | $ 348,386,615 | 140,107,904 | 98,083,631 | 586,578,150 |

| | 2010 | | | |
|---|---|---|---|---|
| | Unrestricted | Temporarily restricted | Permanently restricted | Total |
| Donor restricted | $ (1,368,509) | 125,249,638 | 80,807,557 | 204,688,686 |
| Board designated | 346,580,860 | — | — | 346,580,860 |
| | $ 345,212,351 | 125,249,638 | 80,807,557 | 551,269,546 |

Changes in endowment net assets for the fiscal years ended June 30, 2011 and 2010 were as follows:

| | Unrestricted | Temporarily restricted | Permanently restricted | Total |
|---|---|---|---|---|
| Net assets, June 30, 2009 | $ 320,878,531 | 114,789,876 | 78,028,894 | 513,697,301 |
| Dividends and interest income, net | (715,443) | (406,482) | — | (1,121,925) |
| Realized and unrealized gains | 40,696,680 | 23,536,468 | — | 64,233,148 |
| Contributions | 289,253 | — | 2,778,663 | 3,067,916 |
| Transfer of gain on investments to replenish unrestricted net assets | 244,021 | (244,021) | — | — |
| Appropriation for expenditure—operations | (11,264,751) | (13,158,949) | — | (24,423,700) |
| Appropriation for expenditure—capital and other | (4,915,940) | — | — | (4,915,940) |
| Unspent appropriation returned to principal | — | 732,746 | — | 732,746 |
| Net assets, June 30, 2010 | $ 345,212,351 | 125,249,638 | 80,807,557 | 551,269,546 |
| Dividends and interest income, net | (785,580) | (497,074) | — | (1,282,654) |
| Realized and unrealized gains | 38,560,901 | 23,591,387 | — | 62,152,288 |
| Contributions | 253,680 | 397,952 | 7,276,074 | 7,927,706 |
| Appropriation for expenditure—operations | (12,748,198) | (10,021,902) | — | (22,770,100) |
| Appropriation for expenditure—capital and other | (10,718,636) | — | — | (10,718,636) |
| Reclassification of unrestricted net assets | (11,387,903) | 1,387,903 | 10,000,000 | — |
| Net assets, June 30, 2011 | $ 348,386,615 | 140,107,904 | 98,083,631 | 586,578,150 |

Reclassification of unrestricted net assets represents amounts reclassified by the Institute to temporarily restricted and permanently restricted net assets to satisfy donor matching requirements.

### *(b) Return Objectives and Risk Parameters*

The Institute has adopted investment and spending policies for endowment assets that attempt to provide a predictable stream of funding to programs supported by its endowment while seeking to maintain the purchasing power of the endowment assets.

### *(c) Strategies Employed for Achieving Objectives*

The Institute manages its investments in accordance with a total return concept and the goal of maximizing returns within acceptable levels of risk. The Institute relies on a total return strategy in which investment returns are achieved through both capital appreciation (realized and unrealized) and current yield (dividends and interest). The Institute's spending policy is designed to provide a stable level of financial support and to preserve the real value of its endowment.

## (6) Physical Plant

Physical plant and equipment are stated at cost at date of acquisition, less accumulated depreciation.

A summary of plant assets at June 30, 2011 and 2010 follows:

| | | 2011 | 2010 |
|---|---|---|---|
| Land | $ | 377,470 | 377,470 |
| Land improvements | | 1,681,925 | 1,543,134 |
| Buildings and improvements | | 93,828,846 | 91,713,069 |
| Equipment | | 26,931,479 | 25,757,852 |
| Construction in progress | | 204,022 | 200,508 |
| Rare book collection | | 203,508 | 203,508 |
| Joint ownership property | | 3,340,441 | 3,340,441 |
| | | 126,567,691 | 123,135,982 |
| Accumulated depreciation | | (66,766,719) | (62,944,372) |
| Net book value | $ | 59,800,972 | 60,191,610 |

The Institute has capitalized interest income of $1,117 and $3,238 and interest expense of $6,956 and $8,942 in construction in progress for the years ended June 30, 2011 and 2010, respectively.

## (7) Long-Term Debt

A summary of long-term debt at June 30, 2011 and 2010 follows:

| | | 2011 | 2010 |
|---|---|---|---|
| 2001 Series A—NJEFA | $ | 2,215,000 | 2,480,000 |
| 2006 Series B—NJEFA | | 28,400,000 | 28,600,000 |
| 2006 Series C—NJEFA | | 18,400,000 | 18,800,000 |
| 2008 Series C—NJEFA | | 5,955,000 | 7,815,000 |
| Less unamortized bond discount | | (195,355) | (219,006) |
| Total long-term debt | $ | 54,774,645 | 57,475,994 |

Interest expense on long-term debt for the years ended June 30, 2011 and 2010 was $1,461,015 and $1,768,112, respectively.

### *(a) 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.

### *(b) 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.

### *(c) 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.

### *(d) 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.

### *(e) Interest Rates*

The 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.

### *(f) 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.

On December 22, 2008, the Institute entered into a new swap agreement with Wells Fargo Bank covering $28,800,000 of outstanding Series B Bonds that required the Institute to pay a fixed rate of 3.7702% to Wells Fargo Bank in exchange for Wells Fargo 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 December 22, 2008 and the termination date of the swap agreement coincides with the maturity of the bonds, which is July 1, 2031.

The Institute entered into this swap agreement with the intention of lowering its effective interest rate. At June 30, 2011 and 2010, the fair value of the interest rate swap was ($3,940,182) and ($4,629,600), respectively. The unrealized gain (loss) recognized during the year ended June 30, 2011 and 2010 in the amount of $689,418 and ($1,115,233), respectively is reported in the statements of activities in change in fair value of bond swap liability. The swap agreement utilizes level 2 inputs to measure fair value. The fair value of the interest rate swaps was determined using pricing models developed based on the LIBOR swap rate and other market data. Under the swap agreement, the Institute may be required to post collateral to the counterparty if certain triggering events (rates and dollar thresholds) are met. As of June 30, 2011 and 2010, there was no requirement to post collateral imposed by the swap counterparty.

The bonds are repayable as follows at June 30, 2011:

| | Amount |
|---|---|
| Year ending June 30: | |
| 2012 | $ 2,055,000 |
| 2013 | 2,290,000 |
| 2014 | 2,320,000 |
| 2015 | 2,360,000 |
| 2016 | 2,505,000 |
| 2017 through 2036 | 43,440,000 |
| Total | $ 54,970,000 |

The 2001 Series A, 2006 Series B, 2006 Series C, and 2008 Series C bonds are secured by a pledge of revenues pursuant to the respective Loan Agreements.

### *(g) Line of Credit*

As of June 30, 2011 and 2010, the Institute had an unsecured loan agreement representing a line of credit. The agreement provides for borrowings up to $20,000,000 and is available through January 2012. As of June 30, 2011 and 2010, there were no amounts outstanding against the line of credit. Interest payments are due on demand and interest

accrues at the LIBOR rate plus 100 basis points, which was 1.73% and 2.19% as of June 30, 2011 and 2010, respectively. No interest expense was recorded for the years ended June 30, 2011 and 2010.

## (8) 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, 2011 and 2010 totaled approximately $2,085,000 and $2,066,000, 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.

The following table provides a reconciliation of the change in benefit obligation of the plan at June 30, 2011 and 2010. There are no plan assets at June 30, 2011 and 2010.

| | | 2011 | 2010 |
|---|---|---|---|
| Postretirement benefit obligation: | | | |
| Retirees | $ | 6,535,144 | 5,853,000 |
| Fully eligible active plan participants | | 1,292,141 | 1,746,000 |
| Other active plan participants | | 6,626,827 | 6,983,000 |
| Postretirement benefit obligation | $ | 14,454,112 | 14,582,000 |
| Change in benefit obligation: | | | |
| Benefit obligation at beginning of year | $ | 14,582,000 | 10,469,000 |
| Service cost | | 691,000 | 450,000 |
| Interest cost | | 773,000 | 633,000 |
| Benefits paid | | (413,758) | (375,946) |
| Actuarial (gain) loss | | (1,178,130) | 3,405,946 |
| Benefit obligation at end of year | $ | 14,454,112 | 14,582,000 |
| Components of net periodic benefit cost: | | | |
| Service cost | $ | 691,000 | 450,000 |
| Interest cost | | 773,000 | 633,000 |
| Amortization of net (gain) loss | | (1,178,130) | 3,405,946 |
| Net periodic postretirement benefit cost | $ | 285,870 | 4,488,946 |

| | 2011 | 2010 |
|---|---|---|
| Benefit obligation weighted average assumptions at June 30, 2011 and 2010: | | |
| Discount rate | 5.61% | 5.40% |
| Periodic benefit cost weighted average assumptions for the years ended June 30, 2011 and 2010: | | |
| Discount rate | 5.40% | 6.19% |

The current year trend rate for health care costs was 10.0% and 11.0% at June 30, 2011 and 2010, respectively. It is estimated that it will take 9 years and 10 years to reach the ultimate trend rate of 5.0% at June 30, 2011 and 2010, respectively.

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:

| | 2011 | | 2010 | |
|---|---|---|---|---|
| | Increase | Decrease | Increase | Decrease |
| Effect on total service and interest cost | $ 335,000 | (258,000) | 222,000 | (175,000) |
| Effect on the postretirement benefit obligation | 2,468,152 | (1,975,416) | 2,514,000 | (2,011,000) |

Projected payments for each of the next five fiscal years and thereafter through 2021 are as follows:

| | Amount |
|---|---|
| Year ending June 30: | |
| 2012 | $ 562,000 |
| 2013 | 587,000 |
| 2014 | 623,000 |
| 2015 | 651,000 |
| 2016 | 674,000 |
| 2017 through 2021 | 4,016,000 |

The Institute funds claims as they are incurred. The Institute does not expect to contribute any amounts in fiscal 2012, except as needed to provide for benefit payments.

In 2010, the Patient Protection and Affordable Care Act and the Health Care and Education Reconciliation Act (collectively, the "Health Care Acts") were signed into law by President Obama. The Health Care Acts include several provisions that may affect an organization's postretirement benefit plans, including imposing an excise tax on high cost coverage, eliminating lifetime and annual coverage limits, reducing subsidies to Medicare Advantage plans, and imposing inflation-adjusted fees of $2 ($1 in fiscal year 2013) for each person covered by a health insurance policy for each policy plan year ending after September 30, 2012 through September 30, 2019. The Institute has evaluated the effects of the Health Care Acts and concluded that there is no material impact on the Institute's measurement of its postretirement health benefit obligation. The Institute will continue to monitor developments, interpretations, and guidance relating to the law and incorporate the latest thinking in future measurements.

## (9) Temporarily and Permanently Restricted Assets

Restricted net assets are available for the following purposes at June 30, 2011 and 2010:

| | 2011 | 2010 |
|---|---|---|
| Temporarily restricted net assets are restricted to: | | |
| School of Mathematics | $ 31,199,717 | 29,019,998 |
| School of Natural Sciences | 10,189,133 | 6,412,172 |
| School of Historical Studies | 34,864,151 | 31,210,429 |
| School of Social Science | 54,241,963 | 50,295,421 |
| Libraries and other academic | 4,658,414 | 3,805,200 |
| Administration and general | 5,963,086 | 4,933,565 |
| | $ 141,116,464 | 125,676,785 |
| Permanently restricted net assets are restricted to: | | |
| Investments to be held in perpetuity, the income from which is expendable to support academic services | $ 98,083,631 | 80,807,557 |

## 10) Disclosures About Fair Value of Financial Instruments

The carrying amount of the Institute's financial instruments not carried at fair value approximates fair value due to the short maturity, except for long-term indebtedness. The estimated fair value of the Institute's long-term indebtedness was approximately $55,642,000 and $58,324,000 at June 30, 2011 and 2010, respectively.

## (11) Subsequent Events

In September 2011, the Institute entered into three new equity swap agreements, totaling approximately $80,000,000, with Goldman Sachs to hedge against fluctuations in the S&P index relative to their overall investment portfolio. The effective dates of the swap range between September 21, 2011 and September 30, 2011 and the formal termination dates of each swap is one year after the trade date, unless amended.

The Institute evaluated events subsequent to June 30, 2011 and through November 15, 2011, the date on which the financial statements were issued. The Institute determined there were no additional subsequent events required to be disclosed.


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