IAS

Institute for Advanced Study

Report for the Academic Year 2011–2012

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: Anna Anguissola and Nicola Suthor, Members in the School of Historical Studies, with Director's Visitor Subhankar Banerjee during teatime in the Common Room
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

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Members converse over lunch in the Birch Garden.

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 no more than 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 thirty-three 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

When Peter Goddard became Director of the Institute for Advanced Study in January 2004, he brought to the role a rare combination as a first-rate scholar, who has made highly significant contributions to quantum field theory and string theory, and as an exceptional administrator with extensive experience in implementing new initiatives, resolving complex issues, and creating long-range plans. As he steps down as Director after eight-and-a-half years, it is clear that the Institute has benefited immensely from the contribution of his ideas and guidance.

With great skill, Peter has enlivened the Institute's spirit and unified its many parts through organization and design. To individuals and organizations near and far, Peter has articulated the importance of the Institute's founding principles and the relevance of its present research. He has nurtured the Institute as a true community of scholars that extends beyond its residential academic village to the more than seven thousand scholars and scientists affiliated with the Institute since its founding.

Among his many achievements, Peter deftly managed the impact of the worldwide financial crisis on the Institute's resources and operations that began in 2008 by working with Trustees to secure $30 million in special contributions over three years toward operating costs and by working with Faculty and Staff to reduce expenditures by $36 million over the same three-year period. He also oversaw two campaigns to fortify the Institute's resources; a grand total of $293 million in both operating and endowment funds was raised during his tenure.

I am especially grateful for contributions from Trustees who have joined me and Vice Chairman James Simons in the $200 million Campaign for the Institute. The Campaign, which was initiated in 2011 with a $100 million challenge grant from the Simons Foundation and the Charles and Lisa Simonyi Fund for Arts and Sciences, will strengthen the Institute's endowment and ensure the freedom needed for fundamental research for future generations.

CLIFF MOORE

Trustee Shelby White and the Leon Levy Foundation have been immensely generous with a $20 million gift to the Campaign, which permanently endows the Directorship and creates the associated position of Leon Levy Professor. We are highly encouraged by the financial support provided by other sectors of the Institute community—Faculty, Members, Friends, and Staff—as well as the foundations, corporations, and other benefactors who support the Institute's mission.

During the last academic year, the Board was very pleased to welcome two new Trustees: Neil A. Chriss, Founder and Chief Investment Officer of Hutchin Hill Capital, and Benedict H. Gross, George Vasmer Leverett Professor of Mathematics at Harvard University, whose appointment is effective July 1, 2012. Benedict was nominated by the School of Mathematics to succeed Andrew J. Wiles, Royal Society Research Professor at the University of Oxford, who served an extraordinarily effective five-year term as Trustee for the School.

We are honored and delighted that Robbert Dijkgraaf, a distinguished mathematical physicist who has made significant contributions to string theory and the advancement of science education, has accepted our invitation to become the Institute's ninth Director and first Leon Levy Professor as of July 1, 2012. A former Member and Visitor in the School of Natural Sciences, Robbert was awarded the Spinoza Prize, the highest scientific award in the Netherlands, in 2003, and was named a Knight of the Order of the Netherlands Lion in 2012. Past President (2008–12) of the Royal Netherlands Academy of Arts and Sciences, Robbert is an exceptionally talented scientist, administrator, communicator, and advocate for science and the humanities, making him an outstanding appointment for the Institute.

We are deeply grateful to Trustee Vartan Gregorian, President of Carnegie Corporation of New York, who served as the Chair of the Search Committee, as well as its other members: Institute Trustees John S. Hendricks, Founder and Chairman of Discovery Communications; Harold T. Shapiro, President Emeritus and Professor of Economics and Public Affairs at Princeton University; and Shelby White, philanthropist and Trustee of the Leon Levy Foundation; and Institute Professors Nicola Di Cosmo in the School of Historical Studies; Robert MacPherson in the School of Mathematics; Joan Wallach Scott in the School of Social Science; and Edward Witten in the School of Natural Sciences.

We have the utmost confidence that Robbert will build on the astute direction provided by Peter Goddard, who we are delighted to have join the School of Natural Sciences as a Professor as of July 1, 2012. With Robbert's arrival, we look forward to the continuation of a brilliant tradition of Directorships since the founding of the Institute in 1930.

Charles Simonyi
Chairman

Report of the Director

In one of his earliest reports, the founding Director of the Institute, Abraham Flexner, noted that it would be difficult to overestimate the importance of the freedom to pursue research that a year at the Institute provides for those who have been carrying out the duties of university teaching and administration. Eight decades later, as I step down as the eighth Director, the opportunities that the Institute provides for academics from around the world are needed even more, not least because the sheer "busyness" of universities, as Robert Oppenheimer described it more than fifty years ago, no longer makes them conducive to the most difficult and intensive intellectual effort. The growing number of institutes, whose foundations have been avowedly inspired by the success of this Institute, demonstrates clearly the continuing and increasing relevance of its mission.

The constancy of the Institute's objectives and the tranquility of its physical setting stand in contrast to the vibrancy of its intellectual and social daily life and the annually changing composition of its academic community. Likewise with the Faculty, more than half have been appointed since I became Director. This year new appointments were made, with Richard Taylor and Patrick Geary taking up their posts in January 2012.

Richard Taylor, one of the world's leading number theorists, has developed powerful new techniques and used them to solve important long-standing problems in number theory. His work with Andrew Wiles, a former Member of the Institute and, until this summer, a Trustee, played an important role in Wiles's completion of his proof of Fermat's Last Theorem. Patrick Geary's appointment continues the Institute's distinguished tradition of medieval scholarship; the exceptional scope and innovative nature of his research has illuminated topics from the function of saints and relics in the Middle Ages to the medieval origins of European nations and ethnic identities.


CLIFF MOORE

The freedom and opportunities that the Institute provides to scholars depend crucially on its endowment, which supports a very high proportion of its expenditure. It is thanks to the cooperation of the whole Institute community—Faculty, Members, Staff, Friends, and Trustees—that we were able to weather the global economic crisis of the last four years without compromising the academic life and culture of the Institute. The Faculty and Staff worked together extremely effectively to reduce expenditure and increase income, and the Trustees provided extraordinarily generous support for the Institute's operating budget.

While these measures have safeguarded the Institute's endowment for the last few years, in order to strengthen it for the long term, a $200 million fundraising campaign was initiated in 2011 with a historic $100 million challenge grant from the Simons Foundation and the Charles and Lisa Simonyi Fund for Arts and Sciences. By the end of June 2012, $43 million had been raised toward matching the $100 million challenge, including: a pledge of $20 million from the Leon Levy Foundation, to provide an endowment for the Directorship, in recognition of which the Director will hold the title of Leon Levy Professor; a grant of $7.5 million from the Starr Foundation, which will be placed together with other funds to form a $15 million endowment fund to support a Professorship and three Memberships in the Simons Center for Systems Biology; and a grant of $3 million from the Andrew W. Mellon Foundation, which will be matched by other funds to create a $6 million Andrew W. Mellon Fellowships for Assistant Professors Fund in the School of Historical Studies to provide a permanent endowment to enable scholars to work at the Institute at a critical point in their careers.

I was absolutely delighted to hear last October that the Trustees had appointed Robbert Dijkgraaf as my successor as Director. He comes to an institute that remains one of the most exciting and productive places for fundamental research in the world. I regard it as an immense privilege to be able to remain at the Institute, joining my colleagues in the School of Natural Sciences, though I shall miss working closely with my administrative colleagues. The administration here is focused, like no other institution I have known, on supporting the work of the Faculty and Members and providing them with what they need for their research. Every year, the reports of the Members make this very evident. I have felt deeply privileged to be Director of an institution with this ethos and these ideals.

Peter Goddard
Director

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Member Nicola Suthor spoke about Rembrandt's "daubing" during a Lunchtime Colloquium.

School of Historical Studies

Faculty

Yve-Alain Bois

Angelos Chaniotis

Patricia Crone, Andrew W. Mellon Professor

Nicola Di Cosmo, Luce Foundation Professor in East Asian Studies

Patrick Geary *(as of January 1, 2012)*

Jonathan Israel

Professors Emeriti

Glen W. Bowersock

Caroline Walker Bynum

Giles Constable

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, the history of art, and the history of science, but over time the School's interests have been expanded 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-nine Members and two Visitors who joined the School for the academic year 2011–12. Societies as diverse as the Russian Empire, modern China, ancient Greece, colonial Jamaica, and tenth-century Iran were the focus of projects that examined a broad spectrum of the human experience from religion, philosophy, art, and music, to war, books and literature, mathematics, and science. The periods studied ranged from as far back as the fourth millennium B.C.E. to the late twentieth century. The scholars themselves came from universities throughout the United States and Europe, and from as far away as South Africa and Tajikistan. Members received support both from the Institute's own funds and from a variety of external sources, including the National Endowment for the Humanities, the Andrew W. Mellon Foundation, the Gerda Henkel Stiftung, and the Gladys Krieble Delmas Foundation.

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.) Michael van Walt van Praag joined the Faculty as a Visiting Professor for a period of three years, conducting research on opposing perceptions of history in intrastate conflicts and peace processes, and the ways they can be addressed. This year, he supervised a group of Members working on international relations in modern history.

CLIFF MOORE

Member Jérémie Barthas (center) spoke about "Machiavelli and the Revolutionary Tradition: A Genealogy of the Critique of Financial Fetishism" during an Early Modern History Seminar.

ACADEMIC ACTIVITIES

In 2011–12, Professor **Yve-Alain Bois** pursued his work on the catalogue raisonné of the paintings and sculpture of the American artist Ellsworth Kelly, the first volume of which is scheduled to appear in May 2013. He also published a revised and enlarged edition of *Art Since 1900* (coauthored with Professors Rosalind Krauss, Benjamin Buchloh, and Hal Foster), as well as essays on the Brazilian Concrete and Neo-Concrete art movements during the fifties and sixties, on the paintings and installations of the Californian filmmaker Morgan Fisher (for his exhibition at the Museum Abteiberg in Mönchengladbach and the Generali Foundation in Vienna), on the work of John Baldessari (for the catalogue raisonné of his production until 1974) and on the *Entablature* painting series by Roy Lichtenstein (for the artist's retrospective at the Chicago Art Institute). In September, he participated in a panel on the Brazilian artist Lygia Clark at the SESC Pinheiros Center in São Paulo. In September and February, he participated in daylong colloquia on abstraction at New York's Museum of Modern Art in preparation for curator Leah Dickerman's exhibition on the topic, scheduled for fall 2012. Also in February, he organized a panel of six speakers at the College Art Association conference, at which he spoke, devoted to the work of Rosalind Krauss, University Professor at

Columbia University. In June, he gave a talk and participated in a roundtable on the artist Morgan Fisher at the Generali Foundation in Vienna. 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 organized the fourth series of public lectures cosponsored with the Department of Art and Archaeology of Princeton University (the title of this year's series was *Art and Its Spaces*).

Professor **Angelos Chaniotis** coedited *Supplementum Epigraphicum Graecum* LVII (Leiden, 2011) and edited the volume *Festivals and Contests* for the series *Thesaurus Cultus et Rituum Antiquorum* (Los Angeles, 2011). He also completed the editorial work for the collective volume *Unveiling Emotion: Sources and Methods for the Study of Emotions in the Greek World*, which is expected to be published in 2012.

Professor Chaniotis continued a project with his research team in Oxford, which concerns the collection and analysis of Greek sources that reveal how social and cultural parameters determine manifestations of emotions.

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 concerns the collection and analysis of Greek sources that reveal how social and cultural parameters determine manifestations of emotions. Continuing his research on the inscriptions and the history of Aphrodisias, Chaniotis worked 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."

At the Institute, Chaniotis organized the Ancient Studies Seminar, which gave Members the opportunity to present their ongoing research (October–December 2011 and January–April 2012). In May 2012, he co-organized the Second Greek-Turkish Epigraphy Congress in Antalya, Turkey. He also lectured in Bochum, Helsinki, Nafplion, Munich, New York, Oxford, Paris, Rome, and Tallahassee. In May 2012, he was awarded an honorary degree from the International Hellenic University.

Patricia Crone, Andrew W. Mellon Professor, spent part of the year answering editorial queries, proofreading, and compiling the index for her book *The Nativist Prophets of Early Islamic Iran: Rural Revolt and Local Zoroastrianism*, which is now in print. Three of her articles also were published: two were triggered by research for the book (one on the Mubayyida in the festschrift for Farhad Daftary and the other on the Jahmiyya in the festschrift for Fritz Zimmermann), while the third (in a volume edited by Philippa Townsend and Moulie Vidas) forms part of Crone's attempt to identify the religious identity of the so-called polytheists against whom most of the polemics in the Qur'an are directed; it tries to answer the question of what these opponents took a messenger of God to be. Another article, completed this year and to be published in two parts in the *Bulletin of the School of Oriental and African Studies*, examines their denial of the resurrection and the afterlife altogether. Crone also completed an article, "Ungodly Cosmologies," for the forthcoming *Oxford Companion to Islamic Theology*, edited by Sabine Schmidtke.

Crone ran two groups at the Institute. One was the usual Islamicist seminar convoked when a Member felt moved to give a paper. For the first time in many years, however, the other was not the Qur'an reading group, which has now been abandoned. It was replaced by a reading group for medieval Arabic texts. In addition, Crone was meant to preside over the third and last gathering of contributors to a project on the transmission of subversive ideas from the Islamic world to Europe, but unfortunately her ill health meant that it had

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Professor Nicola Di Cosmo (center) participated in the workshop "On Borders" organized by Didier Fassin, James D. Wolfensohn Professor in the School of Social Science.

to be canceled, with the result that the future of this project is now uncertain. Illness also forced Crone to cancel her participation in other gatherings elsewhere.

In 2011–12, **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, served as Executive Officer of the School. In his research, he worked mostly on three areas. One project was the editing of an English-language grammar of Manchu, based on a Japanese text. He also taught Manchu language (one course each term, attended by six graduate students) at Princeton University. Manchu is becoming increasingly important for the study of seventeenth- and eighteenth-century China, and is taught only at two universities in the United States. (Our Library is acquiring a sizeable collection of Manchu and Mongol documents).

The second research area is the political culture of the Manchus, based especially on recently published sources. The main essay he worked on "From Alliance to Tutelage: A Historical Analysis of Manchu-Mongol Relations before the Qing Conquest" was published in *Frontiers of History in China* (2012). The third area is the study of ancient nomadic peoples, on which he published the essay "Ethnogenesis, Coevolution, and Political Morphology of the Earliest Steppe Empire: The Xiongnu Question Revisited" in *Xiongnu Archaeology: Multidisciplinary Perspectives of the First Steppe Empire in Inner Asia* (Bonn, 2011). Here he argues for a nomadic political-religious imperial tradition independent from China with possible ties to the Central Asian and Iranian worlds.

The third area concerns a collaborative project with climate scientists to assess the impact of climate change and, in particular, short-term warming on sociopolitical conditions in thirteenth-century Mongolia. A three-year grant application submitted to the National Science Foundation has been successful and will provide funding from 2011–14.

At the November 2011 conference "From Nomad Empires to Neoliberal Conquests" in Hamburg, he spoke on the meaning of "elite" in the history and archaeology of ancient nomads. In December 2011, he served as discussant at a workshop in Konstanz on the circulation of knowledge in early modern empires. In February 2012, he attended a workshop at the University of Pennsylvania on the study of early China. In March 2012, he presented a paper on Chinese historical knowledge at the Notre Dame Institute for Advanced Study's conference on "Conceptions of Truth and the Unity of Knowledge." In April, he gave three lectures at the Scuola Normale Superiore in Pisa, Italy. Within the School, he organized the East Asian Studies Seminar, which this year included ten meetings, with seven presentations by Members and three by outside speakers. He also participated in the workshop "On Borders" organized by Didier Fassin, James D. Wolfensohn Professor in the School of Social Science.

Professor Geary has concentrated on his long-term, collaborative, and interdisciplinary project analyzing migration period demographics using ancient DNA analysis. He has been coordinating the collection of ancient DNA specimens in Italy and Hungary and their analysis in Florence, Italy.

Professor **Patrick Geary**, who joined the School of Historical Studies in January 2012, has concentrated on his long-term, collaborative, and interdisciplinary project analyzing migration period demographics using ancient DNA analysis. Last fall, he was awarded the Humboldt Foundation's Anneliese Maier Research Prize that will fund part of this study. In January, he organized a meeting in Vienna of the Italian, Hungarian, Austrian, German, British, and

American geneticists, archaeologists, and historians participating in the project, and he has been coordinating the collection of ancient DNA specimens in Italy and Hungary and their analysis in Florence, Italy. In June, he and his colleagues at the University of California, Los Angeles, completed his long-term project, sponsored by the Andrew W. Mellon Foundation, to digitize Carolingian manuscripts from the monasteries of St. Gall and Reichenau and make them available along with metadata on the web (www.stgallplan.org).

Since arriving at the Institute, he has compiled a volume of his essays being published by the Romanian Academy of Sciences, *Writing History: Identity, Conflict, and Memory in the Middle Ages*; a short monograph, *Language and Power in the Early Middle Ages*, which will be published by the University Press of New England; and he has coedited with Gábor Klaniczay a volume of essays on the search for alternate antiquities and medieval origins in nineteenth-century Europe to be published by Brill. He also delivered lectures at the Austrian Academy of Sciences, the University of Leeds, and the University of Porto. In June, he participated in an international workshop on comparative court cultures in Shanghai, China.

At the Institute, he organized a series of lunchtime seminars for Members, hosted a lecture by Régine Le Jan of the Sorbonne on competition in the societies of the Early Middle Ages, and presented a lecture to the Friends of the Institute on "Modern European Nationalism and the Fight to Control the Past."

During 2011–12, Professor **Jonathan Israel** mainly worked on a medium-sized book, now nearing completion, on the role of ideology and constitutional ideas in the French Revolution. It is a follow-up to his trilogy of books presenting a new general interpretation of the Western Enlightenment, the third part of which, *Democratic Enlightenment: Philosophy, Revolution and Human Rights 1750–1790,* was published by Oxford University Press in September.

During this year, he chaired an Institute workshop on modern history, which met monthly from October to April, for intensive early evening discussion and debate of work-in-progress papers pre-circulated by Members of the School of Historical Studies working in this area. Each two-hour workshop was followed by informal discussion, drinks, and dinner. Between September and May, Israel also jointly organized and chaired Princeton University's Eighteenth-Century Seminar, together with Professors Linda Colley and David Bell of Princeton's History Department. Featuring a mix of specialists in the field drawn from Princeton University, the Institute, and from other universities, altogether nine research papers were presented and discussed, with good mixed attendance from both the Institute and Princeton University of both Professors and (in the latter case) students.

During 2011–12, Israel delivered public lectures on different aspects of the Enlightenment and French Revolution at the Lantern Theater in Philadelphia, the Siemens Foundation Center in Munich, the Cleveland Museum of Art in Ohio, the Hebrew University of Jerusalem, Beijing Normal University, Oregon State, and the Warburg Institute of the University of London, as well as at the universities of Leeuwarden, Potsdam, Stanford, Utrecht, Halle, and Jena.

Members during teatime outside of Fuld Hall

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Left: Professor Jonathan Israel (right) worked mainly on a book on the role of ideology and constitutional ideas in the French Revolution. Right: Professor Emeritus Giles Constable (right), whose research concerns medieval religious and intellectual history

Israel's main publications during the year, besides *Democratic Enlightenment*, were: "Radical Enlightenment and Revolt in Ibero-America (1770–1809)" in *Religiosity and Clergy in Latin America (1767–1850)*, edited by Peer Schmidt, Sebastian Dorsch, and Hedwig Herold-Schmidt (Köln, 2011); "*Libertas Philosphandi* in the Eighteenth Century: Radical Enlightenment versus Moderate Enlightenment (1750–1776)" in *Freedom of Speech: The History of an Idea*, edited by Elizabeth Powers (Lanham, MD, 2011); "The Philosophical Context of Hermann Samuel Reimarus' Radical Bible Criticism" in *Between Philology and Radical Enlightenment: Hermann Samuel Reimarus (1694–1768),* edited by Martin Muslow in *Brill's Studies in Intellectual History*, edited by Han Van Ruler (Leiden, 2011); "L'Histoire Intellectuelle des Lumières et de la Révolution: Une Incursion Critique" in *La Lettre Clandestine: Diderot et la Littérature Clandestine*, edited by Antony McKenna (PUPS: Paris, 2011); "Kritik af Samfundets Grundlaeggende Vaerdier: Oplysningen og tre Stadier i Udviklingen af Moderne Kritik," in *Kritik*, edited by Frederik Stjernfelt and Lasse Horne Kjaeldgaard (Copenhagen, 2011); and "Spinoza and the Religious Radical Enlightenment," in *The Intellectual Consequences of Religious Heterodoxy 1600–1750*, edited by Sarah Mortimer and John Robertson (Leiden, 2012).

Translations of Israel's *Radical Enlightenment* (Oxford, 2001) appeared during the year in Spanish (Mexico City) and Portuguese (São Paulo).

Professor Bowersock prepared a forthcoming book that will address the rise of Islam within the context of the collapse of the Persian Empire and another that will explore the conflict between southwestern Arabia (modern Yemen) and Ethiopia in the sixth century A.D.

Professor Emeritus **Glen W. Bowersock** went to Paris at the end of October to commemorate his late friend and colleague Jacqueline de Romilly, who had devoted her long and distinguished career to the advocacy of ancient Greek literature and Hellenic studies. During a two-day symposium, Bowersock presented a communication at the Académie des Inscriptions et Belles-Lettres on "Hector and Julian the Apostate." He completed his work as adviser to the Finnish Academy on the publication of the Petra Papyri in a project based at the University of Helsinki and published by the American Center for Oriental Research in Amman (Jordan). He continued his service on the Advisory Committee of the Institute for the Study of the Ancient World at New York University. In spring 2012, he began another cycle of his term as Chair of the Social Sciences and Humanities panel for the European Research Council's Advanced Grants in classics, literature, art, and cultural history.

During the academic year, Bowersock was engaged in preparation and proofreading for two forthcoming books. One, comprising his Stern Lectures in Jerusalem from April 2011, will be titled *Empires in Collision in Late Antiquity* and addresses the rise of Islam within the context of the collapse of the Persian Empire. The other, *Throne of Adulis: Red Sea Wars on the Eve of Islam*, explores the conflict between southwestern Arabia (modern Yemen) and Ethiopia in the

sixth century A.D. He outlined this work in a brief article for a recent issue of the *Institute Letter* (Fall 2011). He also published several pieces in the *New York Review of Books*, including discussions of the classical scholar Richard Bentley, the Oxford historian Hugh Trevor-Roper, and the *Book of Revelation*. As the administrator of the Fonds Louis Robert in Paris, he introduced and supervised the volume *Les Monnaies du Fonds Louis Robert*, published in 2011 and prepared by Fabrice Delrieux and former Institute Member François de Callataÿ. Bowersock also published his keynote lecture for a conference on Dionysus held at the Pergamon Museum in Berlin. His paper considered innovations in representations of the infant Dionysus. In addition, he published in *Studi Storici* a historiographical article about Arnaldo Momigliano, a polemical review of a new work on Muhammad for the *Guardian*, and scholarly reviews in *Gnomon* and the *Journal of Hellenic Studies*.

Professor von Staden lectured at the Bibliotheca Classica Petropolitana in St. Petersburg, Russia, on the relation between soul and body in Galen of Pergamum's theory of the emotions. Much of his research continues to focus on the role of animals in the development of ancient science and medicine.

Since publishing *Christian Materiality* (Zone Books) in spring 2011, Professor Emerita **Caroline Bynum** has continued to work on materiality from a more theoretical and comparative perspective. Currently, she has two articles on the topic in press, one for an art history publication and one for a journal of theology; two more essays are in process, one for an art history conference and one for a volume on the material divine in antiquity. Over the past year, she published several encyclopedia articles, one lengthy; a short essay for the *Harvard Magazine*; and three reviews. She lectured at Notre Dame, at Harvard, at the University of Maynooth, and at Glenstal Abbey in Ireland; spoke on panels at the American Academy of Religion meetings in San Francisco and at the American Academy in Berlin; served as commentator for a conference at New York University on idolatry and one at Columbia University on the future of ancient history; and taught classes to graduate students at Columbia and to docents at the Metropolitan Museum of Art. She chaired the External Committee to Advise President Drew Faust of Harvard on the Study of Religion and served on the Selection Committee for the American Academy in Berlin, where she is also a member of the Board of Trustees. In June, she was elected to the prestigious Orden Pour le Mérite für Wissenschaften und Künste of the Federal Republic of Germany. Bynum has also donned a different hat. Wanting to become more actively involved in New York City, where she now lives full-time, she trained last fall as a Victim's Advocate and works on some evenings or weekends as a volunteer with rape and domestic violence survivors in the emergency departments of two New York hospitals.

Professor Emeritus **Giles Constable** published one book and five articles during the academic year 2011–12. Two books are in course of publication. He spoke at conferences in Berlin (October 2011), Notre Dame (March 2012), and Cáceres, Spain (June 2012), gave a talk to the English-Speaking Union (January 2012), and attended several other meetings. He participated in a doctoral examination at the University of London in October 2011. 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 Gladys Krieble Delmas Foundation.

Professor Emeritus **Christian Habicht** read proofs for volumes V and VI of the bilingual edition of *Polybius* in the Loeb Classical Library Series. He continued his work on the city of Cyzicus and submitted a paper, "The City of Cyzicus: The Evidence of Inscriptions," and another paper, "Die in Messene Verwendete Ära."

His publications were volumes IV (books 9–15) and V (books 16–27) of *Polybius*, published in October 2011 and in March 2012, respectively, and a paper,

ANDREA KANE

Members discussed "From Jacobinism to Black Jacobinism: The Politics of Equality in the Age of Revolution" during an Eighteenth-Century Seminar led by Nick Nesbitt of Princeton University (near right).

"Tullus, A Roman Noble, Resident of Cyzicus," *Hyperboreus* 16–17, 2010–11. Six other papers are awaiting publication.

Professor Emeritus **Irving Lavin** participated in a three-day conference at the Wissenschaftskolleg in Berlin celebrating the publication of Horst Bredekamp's monumental new work on the *Siderius Nuncius* of Galileo, with a paper on Claude Mellan's famous engravings of the moon, which made important enhancements on Galileo's own illustrations. The paper was called "The Obscure Light of Claude Mellan's Paper Moon." From a conference in Rome sponsored by the Vatican, an essay, "Footsteps on the Way to Redemption," on the astonishingly risqué pedestals of Bernini's great Baldacchino in St. Peter's is in press, as is another, "Divine Grace and the Remedy of the Imperfect," from a conference on artists' signatures held at the Bode Museum in Berlin on the enigmatic and much-debated "unfinished" signature Michelangelo inscribed on his Pietà in St. Peter's. Lavin's major work, "Bernini at St. Peter's: The Pilgrimage," is in final proof. A study authored by Lavin and Marilyn Aronberg Lavin on the history and significance of the Institute seal, "Truth and Beauty at the Institute for Advanced Study," will soon be available on the Institute's website and, abbreviated, in the *Institute Letter*.

On October 16, 2011, Professor Emeritus **Peter Paret** gave the keynote address at a meeting of the German Historical Institute in London, marking the completion of the three-year international colloquium on Frederick the Great. He gave a paper and participated in a roundtable at the conference on émigré historians in May at the German Historical Institute in Washington, D.C., gave lectures at the Historische Gymnasium in Bamberg and at the University of North Carolina, and was a visitor at the Deutsche Literaturarchiv in Marbach. In April, Berghahn Books published *Myth and Modernity: Ernst Barlach's Drawings on the Song of the Nibelungen*, a monograph on the interaction of art, ideology, and politics, written in collaboration with Helga Thieme of the Ernst Barlach Stiftung. His talk "Frederick the Great: A Singular Life, Variably Reflected" appeared in *Historically Speaking* (January 2012), and in German translation in *Friedrich der Grosse in Europa*, edited by Bernd Sösemann (Franz

Steiner, 2012). His article "Clausewitz and Schlieffen as Interpreters of Frederick the Great: Three Phases in the History of Grand Strategy" was published in *The Journal of Military History* (July 2012). He also wrote book reviews for *The Journal of Interdisciplinary History* and *Church History*.

In July 2011, Professor Emeritus **Heinrich von Staden** gave a lecture at the University of Heidelberg, Germany, on animal experimentation in ancient Greek biology and medicine. In September, he lectured at the Bibliotheca Classica Petropolitana in St. Petersburg, Russia, on the relation between soul and body in Galen of Pergamum's theory of the emotions. In October, he conducted a series of six seminars on Hellenistic medicine at the German Archaeological Institute in Munich at the invitation of the Commission for Ancient History and Epigraphy, and a lecture on medical theories of anger at Columbia University. In December, he gave a talk at the University of Hamburg on epistemological, rhetorical, and social responses to medical errors, drawing in particular on the Hippocratic writings, and in January 2012, he gave lectures at Humboldt University in Berlin and the University of Erlangen on further aspects of Galen's theory of the emotions. At the invitation of former Institute Visiting Professor Benjamin Elman, he served as a commentator at a conference at Princeton University on medical philology in East Asia in February, and in March he gave a talk on genres and readers at a workshop on genres of scientific writing in Berlin. In May, he participated in a workshop in Italy on Latin translations of works by Galen, and in June, he gave a keynote lecture on the epistemological foundations of experimentation in ancient science and medicine in Halifax, at the biennial meeting of the International Society for the History of Philosophy of Science. Also in June, he gave the opening plenary lecture at the biennial meeting of the Swiss Association of Medieval and Early Modern English Studies at the University of Lausanne; the topic of the meeting was "Literature, Science, and Medicine in the Medieval and Early Modern English Periods," and von Staden's topic was "Writing Science in Antiquity: Aristotle, Pliny the Elder, and Galen." Among his publications were several book reviews and articles, most recently "The Physiology and Therapy of Anger: Galen on Medicine, the Soul, and Nature" in *Islamic Philosophy, Science, Culture, and Religion: Studies in Honor of Dimitri Gutas*, edited by Felicitas Opwis and David Reisman (Leiden/Boston, 2012). Much of his research continues to focus on the role of animals in the development of ancient science and medicine.

Professor Emeritus **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.

ANDREA KANE

Member Charles Sanft (far left) led a discussion on "Constructing the Populace in Early China" during a seminar on East Asian studies.

MEMBERS AND VISITORS

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

Mustafa Aksakal
Ottoman and Turkish History ✦ American University ✦ *s*
Elizabeth and J. Richardson Dilworth Fellow

Anna Anguissola
Classical Art and Archaeology ✦ Ludwig-Maximilians-Universität München ✦ *f*
The Gladys Krieble Delmas Foundation Member

Jérémie Barthas
History, History of Political Thought ✦ University of Johannesburg
Edwin C. and Elizabeth A. Whitehead Fellow

Emmanuel Bermon
Ancient Philosophy ✦ Université Michel de Montaigne Bordeaux 3 and Institut Universitaire de France ✦ *f*

Peter Brooks
Comparative Literature ✦ Princeton University ✦ *f*

Annemarie Weyl Carr
Art History ✦ Southern Methodist University
William D. Loughlin Member

Huaiyu Chen
East Asian Studies ✦ Arizona State University
The Starr Foundation East Asian Studies Endowment Fund Member

Jeremy Cohen
Medieval and Early Modern Jewish History ✦ Tel Aviv University
Funding provided by the National Endowment for the Humanities

James Delbourgo
History of Science, Atlantic History ✦ Rutgers, The State University of New Jersey ✦ *f*
The Herodotus Fund

Lola Nazarsho Dodkhudoeva
Central Asian History ✦ Institute of Oriental Studies and Written Heritage, Academy of Sciences of the Republic of Tajikistan ✦ *s*
Fund for Historical Studies

John Curtis Franklin
Classics, Ancient Near East ✦ The University of Vermont ✦ *f*
Elizabeth and J. Richardson Dilworth Fellow

Robert Geraci
History of Russia ✦ University of Virginia
Elizabeth and J. Richardson Dilworth Fellow

Israel Gershoni
History of Modern Egypt and the Arab Middle East ✦ Tel Aviv University
Agnes Gund and Daniel Shapiro Member

Robert Gerwarth
Early Twentieth-Century History ✦ University College Dublin ✦ *s*
Rosanna and Charles Jaffin Founders' Circle Member

Chad Alan Goldberg
Sociology ✦ University of Wisconsin–Madison
Martin L. and Sarah F. Leibowitz Member

Ruth HaCohen
Musicology ✦ The Hebrew University of Jerusalem ✦ *v, f*

Timothy Harris
Early Modern European History ✦ Brown University
The Andrew W. Mellon Foundation

Paul Antony Hayward
Medieval History ✦ Lancaster University
George William Cottrell, Jr. Member

Samantha Kahn Herrick
Medieval History ✦ Syracuse University

Susan L. Huntington
Art History ✦ The Ohio State University
The Andrew W. Mellon Foundation

Juliette Kennedy
Philosophy and History of Mathematics ✦ University of Helsinki
Otto Neugebauer Fund

Christina Kiaer
Art History ✦ Northwestern University
The Gladys Krieble Delmas Foundation Member

Anne E. Lester
Medieval History ✦ University of Colorado ✦ *s*
The Herodotus Fund

Brandon Look
History of Modern Philosophy ✦ University of Kentucky
Hans Kohn Member

Vasileios Marinis
Art and Architectural History ✦ Yale University
Louise and John Steffens Founders' Circle Member

Louise Marlow
Near Eastern History ✦ Wellesley College ✦ *s*
Willis F. Doney Member; additional funding provided by The Andrew W. Mellon Foundation

James Matthews
Modern European History ✦ Institute for Advanced Study
George Kennan Member

Yair Mintzker
Modern and Early Modern European History ✦ Princeton University
The Andrew W. Mellon Foundation Fellowships for Assistant Professors

William Mulligan
Modern European History ✦ University College Dublin ✦ *s*
The Herodotus Fund

Ioannis Mylonopoulos
Classical Art and Archaeology ✦ Columbia University
Funding provided by the National Endowment for the Humanities

Bilal Orfali
Islamic Studies, Arabic Literature ✦ American University of Beirut
The Herodotus Fund

David Allen Pietz
Modern Chinese History ✦ Washington State University
Willis F. Doney Member

Francisco Pina Polo
Classics ✦ Universidad de Zaragoza ✦ *s*
Fund for Historical Studies

Kenneth Pomeranz
Late Imperial and Modern China ✦ University of California, Irvine
The Andrew W. Mellon Foundation

Adele Reinhartz
First-Century Christianity and Judaism ✦ University of Ottawa
Hetty Goldman Member

Gil H. Renberg
Classical Studies, Ancient History ✦ Institute for Advanced Study
AMIAS Member

Matthias L. Richter
Ancient Chinese Literature and Philosophy ✦ University of Colorado
The Andrew W. Mellon Foundation Fellowships for Assistant Professors

Vimalin Rujivacharakul
East Asian Studies, Art History ✦ University of Delaware
The Andrew W. Mellon Foundation Fellowships for Assistant Professors

Behnam Sadeghi
Islamic History ✦ Stanford University
Friends of the Institute for Advanced Study Member

Charles Sanft
East Asian Studies ✦ Universität Münster ✦ *f*
The Starr Foundation East Asian Studies Endowment Fund Member

Mitra Sharafi
History of Law and Medicine in South Asia ✦ University of Wisconsin Law School ✦ *f*
The Andrew W. Mellon Foundation Fellowships for Assistant Professors

W. Anthony Sheppard
Musicology ✦ Williams College
Edward T. Cone Member in Music Studies; additional funding provided by The Andrew W. Mellon Foundation

Maria Stavrinaki
Art History ✦ Université Paris 1 Panthéon-Sorbonne ✦ *s*
Gerda Henkel Stiftung Member

Christopher Stray
History ✦ Swansea University ✦ *s*
Ralph E. and Doris M. Hansmann Member

Nicola Suthor
Art History ✦ Universität Heidelberg ✦ *f*
Gerda Henkel Stiftung Member

Bella Tendler
Islamic History ✦ Princeton University ✦ *a*

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

Michael van Walt van Praag
Modern International Relations and International Law ✦ Institute for Advanced Study ✦ *vp*

Ping Wang
Early and Medieval Chinese Literature ✦ Princeton University
The Herodotus Fund

Joan Goodnick Westenholz
Ancient Near East ✦ New York University
Felix Gilbert Member

Christopher S. Wood
Art History ✦ Yale University ✦ *f*
Elizabeth and J. Richardson Dilworth Fellow

Marjorie Woods
Medieval Studies ✦ The University of Texas at Austin
Funding provided by the National Endowment for the Humanities

Andrea Worm
Art History, Visual Studies ✦ Universität Augsburg ✦ *f*
Willis F. Doney Member

RECORD OF EVENTS

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October 3
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October 4
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Paul Antony Hayward**, Lancaster University; Member, School of Historical Studies

October 5
East Asian Studies Seminar ✦ *Floating Away Tigers and Domesticating Pheasants: The Political Rhetoric of Local Governance in Medieval Chinese Epigraphy* ✦ **Huaiyu Chen**, Arizona State University; Member, School of Historical Studies

Art History Lunch Seminar ✦ *Introductions* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies

October 10
Historical Studies Lunchtime Colloquia Series ✦ *Flaubert in the Ruins of Paris* ✦ **Peter Brooks**, Princeton University; Member, School of Historical Studies

October 11
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Andrea Worm**, Universität Augsburg; Member, School of Historical Studies

October 12
Eighteenth-Century Seminar ✦ *From Jacobinism to Black Jacobinism: The Politics of Equality in the Age of Revolution* ✦ **Nick Nesbitt**, Princeton University

October 17
Historical Studies Lunchtime Colloquia Series ✦ *Phenomenal Painting: On Rembrandt's "Daubing"* ✦ **Nicola Suthor**, Universität Heidelberg; Member, School of Historical Studies

October 18
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Samantha Herrick**, Syracuse University; Member, School of Historical Studies

October 20
East Asian Studies Seminar ✦ *Researching Water on the North China Plain* ✦ **David Allen Pietz**, Washington State University; Member, School of Historical Studies

October 24
Historical Studies Lunchtime Colloquia Series ✦ *"The Measure of Man": The Perception of the Human Body in Ancient Mesopotamia* ✦ **Joan Goodnick Westenholz**, New York University; Member, School of Historical Studies

October 26
Early Modern History Seminar ✦ *The Failure of the Moderates in the French Revolution: The* Feuillant *Revolution of 1791–92* ✦ **Jonathan Israel**, Professor, School of Historical Studies

Art History Lunch Seminar ✦ *Presentation on Marcel Duchamp* ✦ **Thierry de Duve**, Université Lille 3

October 31
Historical Studies Lunchtime Colloquia Series ✦ *The Early Buddhist Art of India and the Emperor's New Clothes* ✦ **Susan L. Huntington**, The Ohio State University; Member, School of Historical Studies

November 1
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November 2
Art History Lunch Seminar ✦ *Presentation on Fred Sandback* ✦ **Juliette Kennedy**, University of Helsinki; Member, School of Historical Studies

November 3
East Asian Studies Seminar ✦ *Constructing the Populace in Early China* ✦ **Charles Sanft**, Universität Münster; Member, School of Historical Studies

November 7
Historical Studies Lunchtime Colloquia Series ✦ *Copies and Imitation in Roman Art: Language, Methods, Perspectives* ✦ **Anna Anguissola**, Ludwig-Maximilians-Universität München; Member, School of Historical Studies

November 8
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Jeremy Cohen**, Tel Aviv University; Member, School of Historical Studies

November 14
Historical Studies Lunchtime Colloquia Series ✦ *"The Crime of Nazism Against Humanity": Ahmad Hasan al-Zayyat and the Outbreak of the World War II* ✦ **Israel Gershoni**, Tel Aviv University; Member, School of Historical Studies

November 15
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Marjorie Curry Woods**, The University of Texas at Austin; Member, School of Historical Studies

November 16
Art History Lunch Seminar ✦ *Presentation on Byzantine Piety* ✦ **Vasileios Marinis**, Yale University; Member, School of Historical Studies

November 21
Historical Studies Lunchtime Colloquia Series ✦ *Kinyras and the Musical Stratigraphy of Early Cyprus* ✦ **John Franklin**, The University of Vermont; Member, School of Historical Studies

November 22
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Annemarie Weyl Carr**, Southern Methodist University; Member, School of Historical Studies

November 28
Historical Studies Lunchtime Colloquia Series ✦ *A De-ideologized Look at the Spanish Civil War 1936–1939: The Case of Conscripts* ✦ **James Matthews**, Institute for Advanced Study; Member, School of Historical Studies

December 5
Historical Studies Lunchtime Colloquia Series ✦ *The Gospel of John and the 'Parting of the Ways'* ✦ **Adele Reinhartz**, University of Ottawa; Member, School of Historical Studies

December 12
Historical Studies Lunchtime Colloquia Series ✦ *The Reach of Reason: From Leibniz to Kant* ✦ **Brandon Look**, University of Kentucky; Member, School of Historical Studies

December 13
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Andrea Worm**, Universität Augsburg; Member, School of Historical Studies

December 14
Early Modern History Seminar ✦ *Commerce and Nationality in Eighteenth-Century Russia* ✦ **Robert Geraci**, University of Virginia; Member, School of Historical Studies

December 15
East Asian Studies Seminar ✦ *Reincarnating the Disembodied Text: Textual Identity in Early China as Reflected in Newly Discovered Manuscripts* ✦ **Matthias L. Richter**, University of Colorado at Boulder; Member, School of Historical Studies

January 9
Historical Studies Lunchtime Colloquia Series ✦ *Introductions* ✦ **Nicola Di Cosmo**, Luce Foundation Professor in East Asian Studies, School of Historical Studies

January 12
East Asian Studies Seminar ✦ *Reading Visually: The Yuanming Yuan Architectural Archives and Their Ambiguity* ✦ **Vimalin Rujivacharakul**, University of Delaware; Member, School of Historical Studies

January 16
Historical Studies Lunchtime Colloquia Series ✦ *Weeping for Dido: Teaching Rhetoric, Gender, and Emotion* ✦ **Marjorie Woods**, The University of Texas at Austin; Member, School of Historical Studies

January 18
Early Modern History Seminar ✦ *The Rise of Royalism on the Eve of the English Civil War* ✦ **Timothy Harris**, Brown University; Member, School of Historical Studies

January 23
Historical Studies Lunchtime Colloquia Series ✦ *Hellenistic Divine Images and the Power of Tradition* ✦ **Ioannis Mylonopoulos**, Columbia University; Member, School of Historical Studies

January 25
Eighteenth-Century Seminar ✦ *Edmund Burke and Fitzjames Stephen on Imperial Responsibility* ✦ **David Bromwich**, Yale University

Middle Eastern Film Series ✦ *Once Upon a Time in Anatolia* (2011)

January 30
Historical Studies Lunchtime Colloquia Series ✦ *Land Tenure, Statecraft, and 'Development' in Ming-Qing China* ✦ **Kenneth Pomeranz**, University of California, Irvine; Member, School of Historical Studies

February 1
Art History Lunch Seminar ✦ *Presentation on Matisse* ✦ **Yve-Alain Bois**, Professor, School of Historical Studies

Middle Eastern Film Series ✦ *Walk on Water* (2004)

February 6
Historical Studies Lunchtime Colloquia Series ✦ *Power and International Politics in the Early Twentieth Century* ✦ **William Mulligan**, University College Dublin; Member, School of Historical Studies

February 8
Middle Eastern Film Series ✦ *A Separation* (2011)

February 13
Historical Studies Lunchtime Colloquia Series ✦ *Engaging the Past, Envisioning the Future: Solomon ibn Verga's* The Scepter of Judah ✦ **Jeremy Cohen**, Tel Aviv University; Member, School of Historical Studies

February 14
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Jeremy Cohen**, Tel Aviv University; Member, School of Historical Studies

February 15
Early Modern History Seminar ✦ *Kant's Leibniz: A Historical and Philosophical Introduction* ✦ **Brandon Look**, University of Kentucky; Member, School of Historical Studies

Art History Lunch Seminar ✦ *Feeling Socialism in the 1930s: Towards an Aesthetics of Socialist Realist Painting* ✦ **Christina Kiaer**, Northwestern University; Member, School of Historical Studies

Islamicist Seminar ✦ *Early Sufi Poetry* ✦ **Bilal Orfali**, American University of Beirut; Member, School of Historical Studies

February 16
East Asian Studies Seminar ✦ *Mourning as Agency: The Politics of National Emotion in the Ehime Maru Incident* ✦ **David Leheny**, Princeton University

February 22
Middle Eastern Film Series ✦ *Certified Copy* (2010)

February 27
Historical Studies Lunchtime Colloquia Series ✦ *Elevations of the World: World Rhetoric and Architectural Imagination* ✦ **Vimalin Rujivacharakul**, University of Delaware; Member, School of Historical Studies

February 28
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Marjorie Woods**, The University of Texas at Austin; Member, School of Historical Studies

February 29
Islamicist Seminar ✦ *A Hadith Bearing on the Social Tensions in Kufa* ✦ **Behnam Sadeghi**, Stanford University; Member, School of Historical Studies

March 1
East Asian Studies Seminar ✦ *Money and the Morality of Exchange in Han China* ✦ **Tamara Chin**, The University of Chicago

Middle Eastern Film Series ✦ *Aviva, My Love* (2006)

March 5
Historical Studies Lunchtime Colloquia Series ✦ *On the Grundlagenstreit in the Foundations of Mathematics: What Was (and Is) the Controversy?* ✦ **Juliette Kennedy**, University of Helsinki; Member, School of Historical Studies

March 7
Islamicist Seminar ✦ *Greek and Indian Wisdom in a Tenth-Century Arabic Mirror for Princes* ✦ **Louise Marlow**, Wellesley College; Member, School of Historical Studies

March 8
East Asian Studies Seminar ✦ *Surprising Convergences: Natural History in Late-Tokugawa Japan* ✦ **Federico Marcon**, Princeton University

March 12
Historical Studies Lunchtime Colloquia Series ✦ *Apocalyptic Primitivism: Political and Temporal Regimes in Carl Einstein's* Negerplastik *(1915)* ✦ **Maria Stavrinaki**, Université Paris I Panthéon-Sorbonne; Member, School of Historical Studies

March 13
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Paul Antony Hayward**, Lancaster University; Member, School of Historical Studies

March 14
Eighteenth-Century Seminar ✦ *Machiavelli and the Revolutionary Tradition: The Genesis of the Critique of Financial Fetishism* ✦ **Jérémie Barthas**, University of Johannesburg; Member, School of Historical Studies

Art History Lunch Seminar ✦ *Dada Presentism* ✦ **Maria Stavrinaki**, Université Paris I Panthéon-Sorbonne; Member, School of Historical Studies

Islamicist Seminar ✦ *Ottoman Society in the First World War* ✦ **Mustafa Aksakal**, American University; Member, School of Historical Studies

March 15
Middle Eastern Film Series ✦ *Footnote* (2011)

March 19
Historical Studies Lunchtime Colloquia Series ✦ *Our Two Friends: The Making and Remaking of Liddell and Scott's Greek-English Lexicon* ✦ **Christopher Stray**, Swansea University; Member, School of Historical Studies

March 20
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Anne E. Lester**, University of Colorado at Boulder; Member, School of Historical Studies

March 21
Early Modern History Seminar ✦ *The Multiple Deaths of Joseph Oppenheimer, a.k.a. Jud Suss* ✦ **Yair Mintzker**, Princeton University; Member, School of Historical Studies

Art History Lunch Seminar ✦ *Presentation on Ibrahim El Salahi* ✦ **Chika Okeke-Agulu**, Princeton University

March 22
East Asian Studies Seminar ✦ *Locating Expressive Intent: What Does Geographical Writing Have To Do with Poetry?* ✦ **Ping Wang**, Princeton University; Member, School of Historical Studies

Middle Eastern Film Series ✦ *Children of Heaven* (1997)

March 26
Historical Studies Lunchtime Colloquia Series ✦ *The Chronological Order of Qur'anic Passages: A New Approach to an Old Problem* ✦ **Behnam Sadeghi**, Stanford University; Member, School of Historical Studies

March 27
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Vasileios Marinis** ✦ Yale University; Member, School of Historical Studies

March 29
Middle Eastern Film Series ✦ *Jellyfish* (2007)

April 2
Historical Studies Lunchtime Colloquia Series ✦ *An Icon in Time: The Mother of God of Kykkos Monastery, Cyprus* ✦ **Annemarie Weyl Carr**, Southern Methodist University; Member, School of Historical Studies

April 3
Medieval Seminar ✦ *Work in Progress Discussion* ✦ **Samantha Kahn Herrick**, Syracuse University; Member, School of Historical Studies

April 5
Middle Eastern Film Series ✦ *Eternity and a Day* (1998)

April 10
East Asian Studies Seminar ✦ *Bare Sticks and Borderlands: Migrants and Migration Policy on the Qing's Southern Frontiers* ✦ **Kenneth Pomeranz**, University of California, Irvine; Member, School of Historical Studies

April 11
Early Modern History Seminar ✦ *Machiavelli and the Revolutionary Tradition: A Genealogy of the Critique of Financial Fetishism* ✦ **Jérémie Barthas**, University of Johannesburg; Member, School of Historical Studies

Art History Lunch Seminar ✦ *Arthur Dove Meteorology* ✦ **Rachel DeLue**, Princeton University

April 25
Medieval Studies Lecture ✦ *Competition in Early Medieval Societies* ✦ **Régine Le Jan**, Université Paris I Panthéon-Sorbonne

ANDREA KANE

Member Vadim Kaloshin (left) and participants in the year's special program on symplectic dynamics discussed some progress and some problems in symplectic invariants.

School of Mathematics

Faculty

Jean Bourgain, IBM von Neumann Professor

Helmut Hofer

Robert MacPherson, Hermann Weyl Professor

Peter Sarnak

Thomas Spencer

Richard Taylor *(as of January 1, 2012)*

Vladimir Voevodsky

Avi Wigderson, Herbert H. Maass Professor

Professors Emeriti

Enrico Bombieri

Pierre Deligne

Phillip A. Griffiths

Robert P. Langlands

Professor **Thomas Spencer** and long-term Member Mark Goresky organized the Members seminar, which serves as a colloquium-style seminar covering a broad spectrum of mathematics. One of the highlights of this seminar was Professor **Helmut Hofer**'s overview of this year's program in symplectic dynamics. Although most of the speakers were based at the Institute, some external speakers were invited to give reviews. See www.math.ias.edu/seminars/members for a listing of Members seminars.

SPECIAL PROGRAM

During the academic year 2011–12, there was a special program on symplectic dynamics led by Hofer and Member John Mather of Princeton University. The focus of the fall term was finite-dimensional Hamiltonian systems, whereas the focus in the second term shifted to infinite-dimensional systems and partial differential equations.

BACKGROUND

The Hamiltonian systems are an important class of dynamical systems. Examples in finite-dimensions are the system describing the motion of the planets, or the systems describing the movement of a satellite under the influence of the "gravitational tide" of other celestial bodies. The Euler equations of an ideal incompressible fluid is an infinite-dimensional example, as are certain classes of nonlinear Schrödinger equations occurring in optics or the description of water wave problems. These types of problems are generally studied by people working in dynamical systems or partial differential equations. In a series of papers 1998–2003, Hofer and collaborators showed that ideas from a third field, symplectic geometry, can be used to gain insight into dynamical systems questions. The goal of the year's program was to bring leading representatives of these groups together and to foster this interaction.

Hamiltonian systems are interesting since stable behavior occurs side-by-side with unstable behavior. For example, in the moon-earth systems there are the stable Lagrange points where space junk stays forever if it has the

Hamiltonian systems are interesting since stable behavior occurs side-by-side with unstable behavior. For example, in the moon-earth systems there are the stable Lagrange points where space junk stays forever if it has the right momentum. However, if we have space junk away from these spots, we see chaotic behavior.

right momentum. However, if we have space junk away from these spots, we see chaotic behavior. Questions about such systems aim at understanding stable and unstable behavior. Consequently, certain quantities for measuring chaos in a system like topological entropy and measure-theoretic entropy are important. Other related notions, like mixing or weak-mixing, capture related properties of dynamical systems and describe how over the long-run sets of initial states of a system are distributed, or how certain space averages and time averages of important quantities are related.

MINI-COURSES

The following mini-courses were organized.

Instabilities in Hamiltonian systems: Mather gave a mini-course on Aubry-Mather theory and Arnold diffusion. Member Vadim Kaloshin of the Pennsylvania State University gave a mini-course on Arnold diffusion.

Symplectic geometry and complex analysis: Visitor Kai Cieliebak of Ludwig-Maximilians-Universität München gave a mini-course on the existence and flexibility of Stein structures.

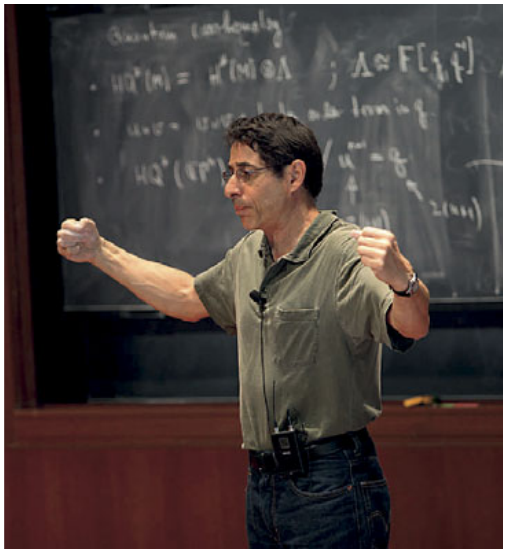
Foundational issues in symplectic geometry: Dusa McDuff of Barnard College and von Neumann Fellow Katrin Wehrheim of the Massachusetts Institute of Technology gave a series of lectures on Kuranishi structures. Hofer gave a mini-course on polyfold theory.

WORKSHOPS

Two workshops related to the special program activities were held during the year. The first workshop in October 2011 was mostly devoted to finite-dimensional Hamiltonian systems. Two of the workshop highlights were: (1) Member Barney Bramham's result on pseudorotations, which constitutes a major step toward the resolution of a problem of Anatole Katok on the approximability of low-dimensional Hamiltonian systems with vanishing topological entropy by integrable systems and (2) McDuff's presentation on her resolution of the symplectic embedding problem for ellipsoids in dimension four resolving a conjecture by Hofer.

In March, a second workshop in symplectic dynamics brought together symplectic geometers and researchers from fluid dynamics and more generally from

Professor Helmut Hofer (left image) organized the year's special program on symplectic dynamics, during which Visitor Victor Ginzburg (right image) gave the lecture "Action-Index Relations for Hamiltonian Dynamical Systems."



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Hamiltonian partial differential equations like certain nonlinear Schrödinger evolution equations. It became quite clear that there is a lot of potential for such an interaction, which might lead to the study of new phenomena and the solution of long-standing problems. The presentation regarding the joint work of James Colliander of the University of Toronto and Terence Tao of the University of California, Los Angeles, et al., on nonlinear Schrödinger operators was particularly stimulating as well as the related presentation by Member Marcel Guardia, explaining some Hamiltonian systems ideas in his joint work with Kaloshin, which sharpen the aforementioned results.

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Member Raghu Meka (left) with Visiting Professor Russell Impagliazzo (right), whose research involves computational complexity and randomness in computation

In general, the fruits of such an interaction take some time to materialize, but there were some important breakthroughs coming from the interaction of finite-dimensional Hamiltonian systems and symplectic geometry. Bramham made important progress on some long-standing questions by Katok about possible approximations of low-dimensional systems by integrable ones. He also moved forward on his work regarding the question of whether certain systems, which are known to be weakly mixing, can actually be strongly mixing.

The methods being used rely on the use of pseudoholomorphic curves as they occur in symplectic field theory (Eliashberg-Givental-Hofer), a theory generalizing Gromov-Witten theory.

COLLABORATIONS

The following information gives a few selected collaborations representing the breadth of the activities of the symplectic dynamics program during the academic year 2011–12.

Boris Khesin of the University of Toronto, Gerard Misiolek of the University of Notre Dame, and Alexander Shnirelman of Concordia University, Montreal, all Members of the School, started a project collecting open problems in geometric fluid dynamics, which will appear as an outgrowth of this program and should benefit the community.

Members Umberto Hryniewicz of Universidade Federal do Rio de Janeiro and Joan Licata, along with Pedro Salomao of the University of São Paulo, worked on the characterization of classes of contact manifolds by their dynamical properties.

Using holomorphic curves methods, von Neumann Fellow Peter Albers of Purdue University, Hryniewicz, and Al Saeed Momin of Purdue University worked on the dynamics of nonconvex billiard tables.

Continuing their previous collaboration, Member Alvaro Pelayo and San Vu Ngoc of the Université de Rennes worked on the semitoric spectral conjecture.

Bramham used novel symplectic ideas to resolve several long-standing problems, in part going back to Katok, about the approximability of low-dimensional Hamiltonian systems by integrable systems. He also showed that ergodic area-preserving disk maps cannot be strongly mixing, which solved another problem in low-dimensional dynamics. Bramham and Pelayo also worked on the use of finite energy foliations in the classification of integrable systems.

Professor Voevodsky and Members Michael Warren and Alvaro Pelayo collaborated on the first steps toward the implementation of the theory of integrable dynamical systems on symplectic manifolds in an interactive proof assistant Coq.

Professor **Vladimir Voevodsky** and Members Michael Warren and Pelayo collaborated on the first steps toward the implementation of the theory of integrable dynamical systems on symplectic manifolds in an interactive proof assistant Coq.

Hofer, together with Members Kris Wysocki of the Pennsylvania State University and Eduard Zehnder of Eidgenössische Technische Hochschule Zürich, continued their work on polyfold theory and the construction of symplectic field theory.

Albers, Member Marian Gidea of Northeastern Illinois University, and Jason James of Rutgers, The State University of New Jersey, worked on numerical methods based on the pseudoholomorphic curves theory to find global surfaces of section.

Gidea and Mather started a collaboration on Aubry Mather theory via foliations.

Kaloshin and Member Ke Zhang continued their work on Arnold diffusion.

Wehrheim and McDuff began a collaboration on Kuranishi structures and Gromov-Witten invariants.

Member Sheila Sandon and Vincent Colin of the Université de Nantes collaborated on a project investigating the metric properties of the contactomorphism group.

COMPUTER SCIENCE AND DISCRETE MATHEMATICS

In June, the computer science and discrete mathematics program hosted a week-long conference on graphs and analysis. The conference, organized by Herbert H. Maass Professor **Avi Wigderson**, Visiting Professor László Lovász of Eötvös Loránd University, Visitor Balazs Szegedy of University of Toronto, and Member Katalin Vesztergombi of Eötvös Loránd University had more than a hundred people in attendance from universities and organizations in the United States as well as outside the country. In addition to the excellent lectures, which covered all aspects of research on graph limits and their applications and connections, there were three participant-organized special sessions on local algorithms, statistical mechanics, and spin-glass models. The schedule of talks intentionally was designed to allow participants to engage in informal interactions of which there were many. More information about the conference may be found at www.math.ias.edu/cga.

CLIFF MOORE

Professor Avi Wigderson gave a talk on randomness and pseudorandomness to the Friends of the Institute in October.

All activities of the computer science and discrete math group (seminars, videos, papers, workshops, etc.) are accessible from the CSDM website, www.ias.edu/csdm.

TOPOLOGY

The workshops on topology were organized again this year by Randall Kamien of the University of Pennsylvania, Hermann Weyl Professor **Robert MacPherson**, and Konstantin Mischikow of Rutgers, The State University of

New Jersey. The talk locations alternated between Rutgers, the University of Pennsylvania, Princeton University, and the Institute. There was a mix of lectures by topologists, by scientists in fields with topological applications, and by specialists doing topological computations. The lectures 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.

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Professor Peter Sarnak gave the talk "Nodal Lines of Maass Forms and Critical Percolation" during a seminar on analysis.

Bryan Chen of the University of Pennsylvania; Radmila Sazdanovic of the University of Pennsylvania; Andrzej Symczak of the Colorado School of Mines; Jorge Kurchan of ESPCI (École Supérieure de Physique et de Chimie Industrielles de la Ville de Paris); Miro Kramar of Rutgers, The State University of New Jersey; Michael Erdmann of Carnegie Mellon University; Carol Modes of the Rockefeller University; William Irvine of the University of Chicago; and Robert Connelly of Cornell University gave talks during the first term.

Second-term lectures were delivered by Paul Steinhardt of the Center for Theoretical Science, Princeton University; Tamal Dey of the Ohio State University; and Mark McConnell of the Center for Communications Research, Institute for Defense Analyses.

OTHER SCHOOL ACTIVITIES

Additional School activities included a learning seminar organized by Professor **Richard Taylor** and Christopher Skinner of Princeton University on Minhyoung Kim's work on integer points on the projective line minus three points. Taylor also continued his collaboration with Member Kai-Wen Lan of Princeton University, Michael Harris of Université Paris 7, and Jack Thorne of Harvard University to construct Galois representations for non-self dual, algebraic automorphic forms. This project was begun last year when all four collaborators were visiting the Institute for the special program on Galois representations and automorphic forms. Taylor also taught a graduate course at Princeton University on abelian varieties during Princeton's second semester.

During the second term, the Institute and Princeton University conducted a joint mathematical physics seminar, which emphasized first passage percolation theory and random matrix theory.

The joint Thursday afternoon Institute and Princeton University seminars on number theory continued to be very busy. Organized by Taylor, Professor **Peter Sarnak**, Veblen Research Instructor Tasho Kaletha, Nicolas Templier of Princeton University, and Skinner, the seminars attracted quality speakers and were attended by Institute Members, Faculty, and students from nearby institutions.

The theory of "thin groups" and its applications—started by former Member Alexander Gamburd, CUNY Graduate Center, together with IBM von

BENTLEY DREZNER

Professor Jean Bourgain was awarded the 2012 Crafoord Prize in Mathematics by the Royal Swedish Academy of Sciences. He shared the prize with Terence Tao of the University of California, Los Angeles.

Neumann Professor **Jean Bourgain** and Sarnak during the 2005–06 special program on Lie Groups, Representations, and Discrete Mathematics, led by Alexander Lubotzky of the Hebrew University of Jerusalem—continued to enjoy many advances by a number of contributors, including Member Chen Meiri as well as former Members. A hot-topics workshop at the Mathematical Sciences Research Institute in February covered most of the developments. The lectures are online at www.msri.org.

Voevodsky collaborated with Members Michael Warren and Nicola Gambino as well as a number of short-term visitors, including Steve Awodey of Carnegie Mellon University, on various issues related to inductive constructions in homotopy type theory. During the second term, he worked on universe polymorphism in Martin-Löf type systems and started to write the specifications for a new proof assistant.

Member Aynur Bulut, together with Bourgain, organized the analysis seminar. Topics in this seminar covered subjects such as hyperbolic partial differential equations, number theory and semi-classical analysis.

Professor **Thomas Spencer** continues to work on the spectral structure of random band matrices by analyzing a dual supersymmetric lattice field theory. Joint work with Margherita Disertori of the Université de Rouen and Martin Zirnbauer of the Institute for Theoretical Physics, University of Cologne, has led to the first results about phase transitions for a vertex reinforced jump process in three dimensions.

During the second term, Goresky continued his joint research with Yungsheng Tai of Haverford College into the theory of real structures on Abelian varieties. They completed their calculation of the number of such varieties and will be preparing the results for publication in the months ahead.

Member Mina Teicher (left, center) gave a personal perspective on topics from algebraic geometry to neural computations during an informal Mathematical Conversation in January.

BENTLEY DREZNER

For the second year, Mathematical Conversations, organized by Albers and Bramham, continued on Wednesday evenings. This informal activity has proved to be successful for attracting Members wishing to broaden their mathematical horizons.

In early November, Claire Voisin of CNRS, Institute de Mathématiques de Jussieu, gave the Hermann Weyl Lectures. The lecture series included four talks covering Chow rings, decomposition of the diagonal, and the topology of families.

The thirty-fourth Marston Morse Memorial Lectures were given by Maryam Mirzakhani of Stanford University during the second term. Mirzakhani gave three talks on the dynamics on the moduli spaces of curves.

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Professor Thomas Spencer (left), one of the organizers of the year's Members seminar, which covered a broad spectrum of mathematics, with Professor Robert MacPherson (right), who organized workshops on topology

Bourgain and Tao were awarded the 2012 Crafoord Prize in Mathematics by the Royal Swedish Academy of Sciences.

Professor Emeritus **Robert P. Langlands** was elected a foreign member of the Russian Academy of Sciences, and Taylor was elected to the American Academy of Arts and Sciences. Sarnak was awarded the Lester R. Ford Prize from the Mathematical Association of America.

OUTREACH

A listing of all School activities may be found at www.math.ias.edu/activities. For the benefit of the entire mathematical community, many of the seminars are also recorded and may be viewed at http://video.ias.edu/sm.

The Atle Selberg archive containing Selberg's unpublished notes will be housed in the Shelby White and Leon Levy Archives Center on the campus of the Institute. The archive is being prepared by Institute staff with assistance from former Member Dennis Hejhal of the University of Minnesota. Part of the archive will be put online, and a number of items are already available at http://publications.ias.edu/selberg.

Claire Voisin, Professor of Mathematics and Director of Research at the Institut de Mathématiques de Jussieu at Université Pierre et Marie Curie, gave the Hermann Weyl Lectures on Chow rings, decomposition of the diagonal, and the topology of families.

The nineteenth annual Program for Women and Mathematics was hosted by the Institute from May 14 to 25, 2012. This year's program focused on twenty-first-century geometry. More information about the program activities follow this report.

In early May 2012, Wigderson gave a series of three talks for the Wolfgang Pauli Lectures at Eidgenössische Technische Hochschule Zürich. His talks may be accessed at www.pauli-lectures.ethz.ch.

In August 2011, Sarnak was awarded the Mahler Lectureship in Australia, and in May 2012, he delivered the Ramanujan Lectures at the Tata Institute of Fundamental Research in Mumbai. The lecture may be viewed at www.icts.res.in/lecture/details/1622.

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MEMBERS AND VISITORS

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

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Funding provided by the National Science Foundation

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Combinatorics ✦ Tel Aviv University ✦ *vp, f*
Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Funding provided by the National Science Foundation

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Mathematics ✦ *Lower Bounds on the Lyapunov Exponent of 1D Schrödinger Operators Using Crude Estimates on the Density of States* ✦ **Mira Shamis**, Member, School of Mathematics ✦ *Sphere Packings, Poisson Statistics, and the Epstein Zeta Function* ✦ **Anders Södergren**, Member, School of Mathematics ✦ *Heegaard Floer Homology and Legendrian Knots* ✦ **Vera Vértesi**, Massachusetts Institute of Technology; Member, School of Mathematics ✦ *The Density of States for Random Band Matrices* **Sasha Sodin**, Member, School of Mathematics

Workshop on Topology: Identifying Order in Complex Systems ✦ *Seeing and Sculpting Defects in Liquid Crystals with the Thom Construction* ✦ **Bryan Chen**, University of Pennsylvania ✦ *Categorification in Topology and Algebra* ✦ **Radmila Sazdanovic**, University of Pennsylvania ✦ *Robust Algorithms for Piecewise Constant Vector Field Topology* ✦ **Andrzej Szymczak**, Colorado School of Mines

October 6

Joint IAS/PU Number Theory Seminar ✦ *Curves With Many Symmetries* ✦ **Noam Elkies**, Harvard University

October 7

Short Talks by Postdoctoral Members ✦ *Differential Cohomology* ✦ **Andrew Stimpson**, Member, School of Mathematics ✦ *Diophantine Geometry* ✦ **Rafael von Känel**, Member, School of Mathematics ✦ *Radiation Field for Einstein Vacuum Equations* ✦ **Fang Wang**, Princeton University; Veblen Research Instructorship, School of Mathematics ✦ *Some Connections Between Homotopy Theory and Logic* ✦ **Michael A. Warren**, Member, School of Mathematics

October 10

Computer Science/Discrete Mathematics Seminar I ✦ *A Little Advice Can Be Very Helpful* ✦ **Arkadev Chattopadhyay**, University of Toronto

Workshop on Symplectic Dynamics ✦ *Symplectic Invariants – Some Progress and Some Problems* ✦ **Dusa McDuff**, Columbia University ✦ *The Free Surface Water Wave Problem as a Hamiltonian System* ✦ **Walter Craig**, McMaster University ✦ *Existence of Transverse Foliations to Identify Isotopies on Surfaces and Applications* ✦ **Patrice Le Calvez**, Université Paris 13 ✦ *A Symplectic Proof of a Theorem of Franks* ✦ **Ely Kerman**, University of Illinois at Urbana-Champaign

October 11

Computer Science/Discrete Mathematics Seminar II ✦ *Limit Theories and Higher Order Fourier Analysis* ✦ **Balazs Szegedy**, University of Toronto; von Neumann Fellowship, School of Mathematics

Workshop on Symplectic Dynamics ✦ *Conservative Homoclinic Bifurcations and the Structure of a Stochastic Sea of the Standard Map* ✦ **Anton Gorodetski**, University of California, Irvine ✦ *On Kolmogorov's Conjecture and Hausdorff Dimension of Oscillatory Motions for Certain Restricted Three Body Problems* ✦ **Vadim Kaloshin**, The Pennsylvania State University; Member, School of Mathematics ✦ *Action-Index Relations for Hamiltonian Dynamical Systems* ✦ **Victor Ginzburg**, University of California, Santa Cruz; Visitor, School of Mathematics ✦ *Resonance Identities and Closed Characteristics on Compact Star-shaped Hypersurfaces in* R^{2n} ✦ **Yiming Long**, Chern Institute of Mathematics, Nankai University ✦ *Generic Symplectic Diffeomorphisms and Partial Hyperbolicity* ✦ **Jairo Bochi**, Pontificia Universidade Católica do Rio Grande do Sul

Joint IAS/Princeton Mathematical Physics Seminar ✦ *Absence of Mobility Edge for the Anderson Random Potential on Tree Graphs at Weak Disorder* ✦ **Simone Warzel**, Technische Universität München

October 12

Workshop on Symplectic Dynamics ✦ *Convergence of Discounted Solutions of the Hamiltonian-Jacobi Equation* ✦ **Albert Fathi**, École Normale Supérieure de Lyon ✦ *Using Pseudo-Holomorphic Curves to Approximate Zero Entropy Hamiltonian Systems by Integrable Ones* ✦ **Barney Bramham**, Member, School of Mathematics ✦ *Regularity of Weak KAM* ✦ **Chong-Qing Cheng**, Nanjing University ✦ *KAM-Tori Accumulating a Diophantine Elliptic Equilibrium Point* ✦ **Hakan Eliasson**, Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics ✦ *Some Intersection and Rigidity Properties in Symplectic Dynamics* ✦ **Jeff Xia**, Northwestern University

October 13

Working Group on Algebraic Number Theory

Workshop on Symplectic Dynamics ✦ *Higher Pentagram Maps and Cluster Algebras* ✦ **Sergei Tabachnikov**, The Pennsylvania State University ✦ *Global Surfaces of Section of Tight Reeb Flows and Applications* ✦ **Umberto Leone Hryniewicz**, Member, School of Mathematics ✦ *Flows with Nested Invariant Sets* ✦ **Krystyna Kuperberg**, Auburn University ✦ *Essential Coexistence of Zero and Nonzero Lyapunov Exponents for Volume Preserving Maps and Flows* ✦ **Yakov Pesin**, The Pennsylvania State University ✦ *K3 and the Planar 4 Body Problem* ✦ **Richard Montgomery**, University of California, Santa Cruz

Joint IAS/PU Number Theory Seminar ✦ *On Real Zeros of Holomorphic Hecke Cusp Forms and Sieving Short Intervals* ✦ **Kaisa Matomäki**, University of Turku, Finland

October 14

Special Seminar ✦ *Quasimorphisms, Almost Complex Structures, and Moment Maps* ✦ **Egor Shelukhin**, Tel Aviv University

Workshop on Symplectic Dynamics ✦ *Generic Existence of an Elliptic Closed Geodesic in the 2-Sphere* ✦ **Gonzalo Contreras**, Centro de Investigacion en Matematicas ✦ *New Contact Anosov Flows Via Foulon Surgery* ✦ **Boris Hasselblatt**, Tufts University ✦ *Entropy Zero Symplectic Diffeomorphisms of* S^2 ✦ **John Franks**, Northwestern University

October 17

Computer Science/Discrete Mathematics Seminar ✦ *On the Number of Hamilton Cycles in Pseudorandom Graphs* ✦ **Michael Krivelevich**, Tel Aviv University

Members Seminar ✦ *How to Construct Topological Invariants via Decompositions and the Symplectic Category* ✦ **Katrin Wehrheim**, Massachusetts Institute of Technology; von Neumann Fellowship, School of Mathematics

October 18

Computer Science/Discrete Mathematics Seminar II ✦ *Rigidity of 3-Colorings of the D-Dimensional Discrete Torus* ✦ **Ohad Feldheim**, Tel Aviv University

Joint IAS/Princeton Mathematical Physics Seminar ✦ *The Universal Relation Between Exponents in First-Passage Percolation* ✦ **Sourav Chatterjee**, Courant Institute of Mathematical Sciences, New York University

October 19

Symplectic Dynamics Seminar ✦ *On the Long-Time Behavior of 2-D Flows* ✦ **Sourav Chatterjee**, Courant Institute of Mathematical Sciences, New York University ✦ *Riemannian Exponential Map on the Group of Volume-Preserving Diffeomorphisms* ✦ **Gerard Misiolek**, University of Notre Dame; Member, School of Mathematics

Mathematical Conversations ✦ *Simple Geodesics on Surface* ✦ **Nancy Hingston**, The College of New Jersey; Member, School of Mathematics

October 20

Joint IAS/PU Number Theory Seminar ✦ *Hodge Correlators, Hodge Symmetries, and Rankin-Selberg Integrals* ✦ **Alexander Goncharov**, Yale University

October 21

Analysis Seminar ✦ *On the Instability for 2D Fluids* ✦ **Serguei Denissov**, University of Wisconsin–Madison; Member, School of Mathematics

Joint IAS/PU Symplectic Geometry Seminar ✦ *Hodge Structures in Symplectic Geometry* ✦ **Tony Pantev**, University of Pennsylvania

October 24

Members Seminar ✦ *The Mathematical Challenge of Large Network* ✦ **László Lovász**, Eötvös Loránd University; Visiting Professor, School of Mathematics

October 25

Analysis Seminar ✦ *On the Rigidity of Black Holes* ✦ **Sergiu Klainerman**, Princeton University

Joint IAS/Princeton Mathematical Physics Seminar ✦ *Fractal Iso-Contours of Passive Scalar in Smooth Random Flows* ✦ **Marija Vucelja**, Courant Institute of Mathematical Sciences, New York University

October 26

Symplectic Dynamics Seminar ✦ *Braids and Flows* ✦ **Alexander Shnirelman**, Concordia University, Montreal; Member, School of Mathematics ✦ *Arnold Diffusion by Variational Methods* ✦ **John Mather**, Princeton University; Member, School of Mathematics

Mathematical Conversations ✦ *On the Square Peg Problem* ✦ **Benjamin Matschke**, Member, School of Mathematics

October 27

Joint IAS/PU Number Theory Seminar ✦ *A New Formulation of the Gross-Zagier Formula* ✦ **Xinyi Yuan**, Princeton University

October 28

Geometry Seminar ✦ *C^0 Limits of Hamiltonian Paths and Spectral Invariants* ✦ **Sobhan Seyfaddini**, University of California, Berkeley

Joint IAS/PU Symplectic Geometry Seminar ✦ *Stochastic Twist Maps and Symplectic Diffusions* ✦ **Fraydoun Rezakhanlou**, University of California, Berkeley

October 31

Computer Science/Discrete Mathematics Seminar I ✦ *Mantel's Theorem for Random Graphs* ✦ **Jeff Kahn**, Rutgers, The State University of New Jersey

Hermann Weyl Lectures: Chow Rings, Decomposition of the Diagonal, and the Topology of Families ✦ *Lecture 1: Introduction to Chow Groups and Coniveau* ✦ **Claire Voisin**, CNRS, Institut de Mathématiques de Jussieu, Université Paris Diderot

November 1

Hermann Weyl Lectures: Chow Rings, Decomposition of the Diagonal, and the Topology of Families ✦ *Lecture 2: On the Generalized Bloch and Hodge Conjectures for Complete Intersections* ✦ **Claire Voisin**, CNRS, Institut de Mathématiques de Jussieu, Université Paris Diderot

Analysis Seminar ✦ *The Defocusing Cubic Nonlinear Wave Equation in the Energy-Supercritical Regime* ✦ **Aynur Bulut**, Member, School of Mathematics

Joint IAS/Princeton Mathematical Physics Seminar ✦ *Characteristic Polynomials of the Hermitian Wigner and Sample Covariance Matrice* ✦ **Tatyana Shcherbina**, B. I. Verkin nstitute for Low Temperature Physics and Engineering, The National Academy of Sciences of Ukraine

November 2

Hermann Weyl Lectures: *Chow Rings, Decomposition of the Diagonal, and the Topology of Familie* ✦ *Lecture 3: Decomposition of the Small Diagonal and the Topology of Families* ✦ **Claire Voisin**, CNRS, Institut de Mathématiques de Jussieu, Université Paris Diderot

Workshop on Topology: Identifying Order in Complex Systems ✦ *Morse Theory and Stochastic Dynamics* ✦ **Jorge Kurchan**, ESPCI ✦ *The Dynamics of Granular Materials* ✦ **Miro Kramar**, Rutgers, The State University of New Jersey ✦ *A Topological Representation of Planning with Uncertainty* ✦ **Michael Erdmann**, Carnegie Mellon University

Symplectic Dynamics Seminar ✦ *Arnold Diffusion by Variational Methods, II* ✦ **John Mather**, Princeton University; Member, School of Mathematics ✦ *Hofer's Geometry of the Space of Diameters* ✦ **Michael Khanevsky**, Member, School of Mathematics

November 3

Hermann Weyl Lectures: *Chow Rings, Decomposition of the Diagonal, and the Topology of Families* ✦ *Lecture 4: Integral Coefficinets: Applications to Birational Invariants* ✦ **Claire Voisin**, CNRS, Institut de Mathématiques de Jussieu, Université Paris Diderot

November 4

Working Group on Symplectic Dynamics ✦ *Aubry Mather Theory from a Topological Viewpoint* ✦ **Marian Gidea**, Northeastern Illinois University; Member, School of Mathematics

November 7

Computer Science/Discrete Mathematics Seminar I ✦ *How Bad Is Forming Your Own Opinion* ✦ **Sigal Oren**, Cornell University

Members Seminar ✦ *Strong and Weak Epsilon Nets and Their Applications* ✦ **Noga Alon**, Tel Aviv University; Visiting Professor, School of Mathematics

November 8

Computer Science/Discrete Mathematics Seminar II ✦ *Vertex Sparsification: An Introduction, Connections, and Applications* ✦ **Ankur Moitra**, Member, School of Mathematics

Joint IAS/Princeton Mathematical Physics Seminar ✦ *A Simplified Proof of the Relation Between Scaling Exponents in First-Passage Percolation* ✦ **Michael Damron**, Princeton University

November 9

Symplectic Dynamics Seminar ✦ *Arnold Diffusion by Variational Methods III* ✦ **John Mather**, Princeton University; Member, School of Mathematics

Working Group on Symplectic Dynamics ✦ *Persistence of Invariant Submanifolds* ✦ **Abed Bounemoura**, Member, School of Mathematics

November 10

Analysis Seminar ✦ *Around the Davenport-Heilbronn Function* ✦ **Enrico Bombieri**, Professor Emeritus, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Subtle Invariants and Traverso's Conjectures for P-Divisible Groups* ✦ **Adrian Vasiu**, Binghamton University, The State University of New York; Member, School of Mathematics

November 11

Geometry Seminar ✦ *Bilinearized Legendrian Contact Homology* ✦ **Frédéric Bourgeois**, Université Libre de Bruxelles

November 14

Computer Science/Discrete Mathematics Seminar I ✦ *Polynomial Time Algorithms for Multi-Type Branching Processes and Stochastic Context-Free Grammars* ✦ **Mihalis Yannakakis**, Columbia University

Members Seminar ✦ *Hilbert's Seventh Problem—A Kaleidoscope* ✦ **Gisbert Wüstholz**, Eidgenössische Technische Hochschule Zürich; Member, School of Mathematics

November 15

Computer Science/Discrete Mathematics Seminar II ✦ *Vertex Sparsification: An Introduction, Connections, and Applications* ✦ **Ankur Moitra**, Member, School of Mathematics

Joint IAS/Princeton Mathematical Physics Seminar: *QED in Half Space* ✦ **Robert Schrader**, Freie Universität Berlin

November 16

Symplectic Dynamics Seminar ✦ *Twist Maps* ✦ **John Mather**, Princeton University; Member, School of Mathematics

Working Group on Symplectic Dynamics ✦ *Morse Theory and n-Categories* ✦ **Sonja Hohloch**, Member, School of Mathematics

Mathematical Conversations ✦ *A Famous Actress, a Bad Boy of Music, and the Development of Spread Spectrum Communications* ✦ **Mark Goresky**, Member, School of Mathematics

November 17

Analysis Seminar ✦ *Tangent Cones to Calibrated Currents* ✦ **Costante Bellettini**, Princeton University; Veblen Research Instructorship, School of Mathematics

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Arithmetic Inner Product Formu* ✦ **Yifeng Liu**, Columbia University

November 18

Geometry Seminar ✦ *How to Construct 3- and 4-Manifold Invariants via Pseudoholomorphic Quilts* ✦ **Katrin Wehrheim**, Massachusetts Institute of Technology; Veblen Research Instructorship, School of Mathematics

Joint IAS/PU Symplectic Geometry Seminar ✦ *Morse Theory and Invariants of (almost) Symplectic Manifolds* ✦ **Tara Holm**, Cornell University

November 21

Computer Science/Discrete Mathematics Seminar I ✦ *An Isoperimetric Inequality for the Hamming Cube and Integrality Gaps in Bounded-Degree Graphs* ✦ **Siavosh Benabbas**, University of Toronto

November 22

Computer Science/Discrete Mathematics Seminar II ✦ *Shorter Long Code and Applications to Unique Games* ✦ **Raghu Meka**, Member, School of Mathematics

Joint IAS/Princeton Mathematical Physics Seminar ✦ *Random Natural Frequencies, Active Dynamics, and Coherence Stability in Populations of Coupled Rotators* ✦ **Giambattista Giacomin**, Université Paris Diderot; Member, School of Mathematics

November 23

Symplectic Dynamics Seminar ✦ *Twist Maps II* ✦ **John Mather**, Princeton University; Member, School of Mathematics

November 28

Computer Science/Discrete Mathematics Seminar I ✦ *Entropy-Based Bounds on Dimension Reduction in L_1* ✦ **Oded Regev**, CNRS, École Normale Supérieure de Paris, and Tel Aviv University

Members Seminar ✦ *Loop Products and Dynamics* ✦ **Nancy Hingston**, The College of New Jersey; Member, School of Mathematics

November 29

Computer Science/Discrete Mathematics Seminar II ✦ *Shorter Long Code and Applications to Unique Games* ✦ **Raghu Meka**, Member, School of Mathematics

Analysis Seminar ✦ *The Energy-Critical Defocusing NLS Settings* ✦ **Alexandru Ionescu**, Princeton University

Joint IAS/Princeton Mathematical Physics Seminar ✦ *Macdonald Processes and Some Applications in Probability and Integrable Systems* ✦ **Ivan Corwin**, Microsoft Research New England and Massachusetts Institute of Technology

November 30

Symplectic Dynamics Seminar ✦ *Twist Maps III* ✦ **John Mather**, Princeton University; Member, School of Mathematics

Mathematical Conversations ✦ *(In)stability of Elliptic Fixed Points* ✦ **Abed Bounemoura**, Member, School of Mathematics

December 1

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *A Second Main Term for Counting Cubic Fields and Biases in Arithmetic Progressions* ✦ **Takashi Taniguchi**, Princeton University

December 2

Geometry Seminar ✦ *On Seifert Fibered 4-Manifolds* ✦ **Weimin Chen**, University of Massachusetts Amherst; Member, School of Mathematics

Joint IAS/PU Symplectic Geometry Seminar ✦ *Ramussen's S-Invariant via Instantons and Other Remarks on Khovanov Homology as Seen by Instanton Floer Homology* ✦ **Tom Mrowka**, Massachusetts Institute of Technology

December 5

Computer Science/Discrete Mathematics Seminar I ✦ *Towards Coding for Maximum Errors in Interactive Communication* ✦ **Mark Braverman**, Princeton University

Members Seminar ✦ *Symplectic Integration Algorithm* ✦ **Scott Tremaine**, Richard Black Professor, School of Natural Sciences

December 6

Computer Science/Discrete Mathematics Seminar II ✦ *Can the Continuum Problem Be Solved?* ✦ **Menachem Magidor**, The Hebrew University of Jerusalem

Analysis Seminar ✦ *On the Ergodic Properties of Square-Free Numbers* ✦ **Francesco Cellarosi**, Member, School of Mathematics

December 7

Workshop on Topology: Identifying Order in Complex Systems ✦ *Why Things Don't Fall Down, How Tensegrities Work* ✦ **Robert Connelly**, Cornell University ✦ *Colloidal Crystals on Curved Surfaces: Pleats and Fractionalization* ✦ **William Irvine**, The University of Chicago ✦ *From Sheets to Shapes: Using Topological Defects to Blueprint Curvature* ✦ **Carl Modes**, The Rockefeller University

Working Group on Symplectic Dynamics ✦ *Aubry Mather Theory from a Topological Viewpoint* ✦ **Marian Gidea**, Northeastern Illinois University; Member, School of Mathematics

December 8

Joint IAS/PU Number Theory Seminar ✦ *Weights in a Serre-Type Conjecture for U(3)* ✦ **Florian Herzig**, University of Toronto

December 9

Joint IAS/PU Symplectic Geometry Seminar ✦ *Bihermitian Metrics and Poisson Deformations* ✦ **Nigel Hitchin**, University of Oxford

December 12

Computer Science/Discrete Mathematics Seminar I ✦ *Monotone Unification Problems* ✦ **Pavel Hrubes**, University of Calgary

Members Seminar ✦ *Towards Symplectic Algebraic Topology* ✦ **Alexandru Oancea**, CNRS and Université de Strasbourg; Member, School of Mathematics

December 13

Computer Science/Discrete Mathematics Seminar II ✦ *Time-Space Tradeoffs in Resolution: Superpolynomial Lower Bounds for Superlinear Space* ✦ **Christopher Beck**, Princeton University

Analysis Seminar ✦ *Two-Point Problem for the Ideal Incompressible Fluid* ✦ **Alexander Shnirelman**, Concordia University, Montreal; Member, School of Mathematics

Special Informal Mathematical Physics Discussion

December 14

Symplectic Dynamics Seminar ✦ *Actions of Higher Rank Abelian Groups: Measure Rigidity, Arithmeticity, and Topology* ✦ **Anatole Katok**, The Pennsylvania State University

Symplectic Dynamics Seminar ✦ *Actions of Higher Rank Abelian Groups: Measure Rigidity, Arithmeticity, and Topology (continued)* ✦ **Anatole Katok**, The Pennsylvania State University

Mathematical Conversations ✦ *Circuit Lower Bounds—A Combinatorial Approach to the P vs. NP Question* ✦ **Shachar Lovett**, Member, School of Mathematics

December 15
Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar: ✦ *Spectral Factors in Endoscopic Transfer* ✦ **Diana Shelstad**, Rutgers, The State University of New Jersey

December 16
Joint IAS/PU Symplectic Geometry Seminar ✦ *Bubbles and Oni* ✦ **Urs Frauenfelder**, Seoul National University

January 5
Joint IAS/PU Number Theory Seminar ✦ *Heights, Discriminants, and Conductor* ✦ **Rafael von Känel**, Member, School of Mathematics

January 12
Joint IAS/PU Number Theory Seminar ✦ *On How the First Term of an Arithmetic Progression Can Influence the Distribution of an Arithmetic Sequence* ✦ **Daniel Fiorilli**, Member, School of Mathematics

January 18
Working Group on Symplectic Dynamics ✦ *Nonregularizability of the Big Bang Singularity Using Blow Up* ✦ **Ed Belbruno**, Courant Institute of Mathematical Sciences, New York University

January 19
Joint IAS/PU Number Theory Seminar ✦ *Poisson Statistics and the Value Distribution of the Epstein Zeta Function* ✦ **Anders Södergren**, Member, School of Mathematics

January 23
Computer Science/Discrete Mathematics Seminar I ✦ *An Optimal Lower Bound for File Maintenance* ✦ **Michael Saks**, Rutgers, The State University of New Jersey

Members Seminar ✦ *The Role of Symmetry in Phase Transitions* ✦ **Thomas Spencer**, Professor, School of Mathematics

January 24
Computer Science/Discrete Mathematics Seminar II ✦ *A Tutorial on the Likely Worst-Case Complexities of NP-Complete Problems* ✦ **Russell Impagliazzo**, University of California, San Diego; Visiting Professor, School of Mathematics

January 25
Symplectic Dynamics Seminar ✦ *On Conjugacy of Convex Billiards* ✦ **Vadim Kaloshin**, The Pennsylvania State University; Member, School of Mathematics

Symplectic Dynamics Seminar ✦ *Symplectic Structures and Dynamics on Vortex Membranes* ✦ **Boris Khesin**, University of Toronto; Member, School of Mathematics

Mathematical Conversations ✦ *From Algebraic Geometry to Neural Computations and Back—A Personal Perspective* ✦ **Mina Teicher**, Bar-Ilan University; Member, School of Mathematics

January 27
Joint IAS/PU Symplectic Geometry Seminar ✦ *Symplectic Inverse Spectral Theory in the Semiclassical Regime for Toric Systems . . . and Beyond* ✦ **San Vu Ngoc**, Université de Rennes I

January 30
Computer Science/Discrete Mathematics Seminar I ✦ *Nearly Optimal Deterministic Algorithms via M-Ellipsoids* ✦ **Santosh Vempala**, Georgia Institute of Technology

January 31
Computer Science/Discrete Mathematics Seminar II ✦ *A Survey of Lower Bounds for the Resolution Proof System* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

February 1
Workshop on Topology: Identifying Order in Complex Systems ✦ *Probabilistic Perspective on Topological Data Analysis* ✦ **Sayan Mukherjee**, Duke University ✦ *The Taming Of the Screw or How I Learned to Stop Worrying and Love Elliptic Functions* ✦ **Elisabetta Matsumoto**, Center for Theoretical Science, Princeton University ✦ *Topological Methods in Discrete Geometr* ✦ **Benjamin Matschke**, Member, School of Mathematics

February 6
Computer Science/Discrete Mathematics Seminar I ✦ *Graphlets: A Spectral Perspective for Graph Limits* ✦ **Fan Chung**, University of California, San Diego

Members Seminar ✦ *Toward Enumerative Symplectic Topology* ✦ **Aleksey Zinger**, Stony Brook University, The State University of New York; von Neumann Fellowship, School of Mathematics

February 7
Computer Science/Discrete Mathematics Seminar II ✦ *Randomness Extraction: A Survey* **David Zuckerman**, The University of Texas at Austin; Member, School of Mathematics

February 8
Symplectic Dynamics Seminar ✦ *Geometric and Numerical Approaches to KAM Theory* ✦ **Rafael de la Llave**, Georgia Institute of Technology

Symplectic Dynamics Seminar ✦ *How Large Is the Shadow of a Symplectic Ball?* ✦ **Alberto Abbondandolo**, Università di Pisa

Mathematical Conversations ✦ *Euler, Riemann, and Chebyshev* ✦ **Daniel Fiorilli**, Member, School of Mathematics

February 9
Joint IAS/PU Number Theory Seminar ✦ *Sup-Norms, Whittaker Periods, and Hypergeometric Sums* ✦ **Nicolas Templier**, Princeton University

February 13
Computer Science/Discrete Mathematics Seminar I ✦ *High-Confidence Predictions Under Adversarial Uncertainty* ✦ **Andrew Drucker**, Massachusetts Institute of Technology

February 14
Computer Science/Discrete Mathematics Seminar II ✦ *On the Colored Tverberg Problem* ✦ **Benjamin Matschke**, Member, School of Mathematics

Analysis Seminar ✦ *On Zaremba's Conjecture on Continued Fractions* ✦ **Jean Bourgain**, IBM von Neumann Professor, School of Mathematics

February 15
Symplectic Dynamics Seminar ✦ *The Inner Equation for Generalized Standard Maps* ✦ **Pau Martin**, Universitat Politècnica de Catalunya

Working Group on Symplectic Dynamics ✦ *Topological Hamiltonian Dynamics and Area-Preserving Homeomorphism Group* ✦ **Yong-Geun Oh**, University of Wisconsin–Madison; Member, School of Mathematics

Mathematical Conversations ✦ *ADE Dynkin Diagrams in Mathematics* ✦ **Anthony Michael Licata**, Member, School of Mathematics

February 16
Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Arithmetic Fake Compact Hermitian Symmetric Spaces* ✦ **Gopal Prasad**, University of Michigan

February 17
Joint IAS/PU Symplectic Geometry Seminar ✦ *Geodesics for the Weil-Petersson Metric* ✦ **Tudor Ratiu**, École Polytechnique Fédérale de Lausanne

February 20

Computer Science/Discrete Mathematics Seminar I ✦ *Lasserre Hierarchy, Higher Eigenvalues, and Graph Partitioning* ✦ **Venkat Guruswami**, Carnegie Mellon University

February 21

Computer Science/Discrete Mathematics Seminar II ✦ *Finding Needles in Exponential Haystacks* ✦ **Joel Spencer**, Courant Institute of Mathematical Sciences, New York University

Analysis Seminar ✦ *Reducibility for the Quasi-Periodic Liner Schrödinger and Wave Equations* ✦ **Hakan Eliasson**, Institut de Mathématiques de Jussieu, Université Paris Diderot; Member, School of Mathematics

February 22

Working Group on Symplectic Dynamics ✦ *On Translated Points of Contactomorphisms* ✦ **Sheila Sandon**, Member, School of Mathematics

February 23

Special Computer Science/Discrete Mathematics Lecture ✦ *Zero Knowledge Proofs and Nuclear Disarmament* ✦ **Boaz Barak**, Microsoft Research New England

Working Group on Algebraic Number Theory

Special Computer Science/Discrete Mathematics Lecture ✦ *Building Expanders in Three Steps* ✦ **Amir Yehudayoff**, Technion–Israel Institute of Technology

Joint IAS/PU Number Theory Seminar ✦ *Modularity Lifting in Non-Regular Weight* ✦ **David Geraghty**, Princeton University; Veblen Research Instructorship, School of Mathematics

February 27

Computer Science/Discrete Mathematics Seminar I ✦ *An Additive Combinatorics Approach to the Log-Rank Conjecture in Communication Complexity* ✦ **Noga Zewi**, Technion–Israel Institute of Technology

Members Seminar ✦ *Weakly Commensurable Arithmetic Groups and Isospectral Locally Symmetric Spaces* ✦ **Gopal Prasad**, University of Michigan; Member, School of Mathematics

February 28

Computer Science/Discrete Mathematics Seminar II ✦ *Complexity, Approximability, and Mechanism Design* ✦ **Christos Papadimitriou**, University of California, Berkeley

Analysis Seminar: *A Centre-Stable Manifold for the Energy-Critical Wave Equation in R^3 in the Symmetric Setting* ✦ **Marius Beceanu**, Rutgers, The State University of New Jersey

February 29

Symplectic Dynamics Seminar ✦ *Stein Structures: Existence and Flexibility* ✦ **Kai Cieliebak**, Ludwig-Maximilians-Universität München; Visitor, School of Mathematics

Working Group on Symplectic Dynamics ✦ *A Simple Proof of the Conley Conjecture for Hamiltonian Diffeomorphisms C^l-Close to the Identity* ✦ **Marco Mazzucchelli**, The Pennsylvania State University

March 1

Symplectic Dynamics Seminar ✦ *Stein Structures: Existence and Flexibility* ✦ **Kai Cieliebak**, Ludwig-Maximilians-Universität München; Visitor, School of Mathematics

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *The Tamagawa Number Formula via Chiral Homology* ✦ **Dennis Gaitsgory**, Harvard University

March 2

Geometry Seminar ✦ *Stein Structures: Existence and Flexibility* ✦ **Kai Cieliebak**, Ludwig-Maximilians-Universität München; Visitor, School of Mathematics

Analysis Seminar ✦ *Global Existence of Surface Waves* ✦ **Jalal Shatah**, Courant Institute of Mathematical Sciences, New York University

March 5

Computer Science/Discrete Mathematics Seminar I ✦ *The Complexity of Distributions* ✦ **Emanuele Viola**, Northeastern University

Members Seminar ✦ *Local Correction of Codes and Euclidean Incidence Geometry* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

March 6

Mini-workshop on Kuranishi Structures and Gromov-Witten Moduli Spaces ✦ *Kuranishi Structures and Gromov-Witten Moduli Spaces, Part I* ✦ **Katrin Wehrheim**, Massachusetts Institute of Technology; von Neumann Fellowship, School of Mathematics

Mini-workshop on Kuranishi Structures and Gromov-Witten Moduli Spaces ✦ *Kuranishi Structures and Gromov-Witten Moduli Spaces, Part II* ✦ **Dusa McDuff**, Columbia University

Computer Science/Discrete Mathematics Seminar II ✦ *Applications of FT-Mollification* ✦ **Jelani Nelson**, Visitor, School of Mathematics

Analysis Seminar ✦ *Various Approaches to Semiclassical Quantum Dynamics* ✦ **George A. Hagedorn**, Virginia Polytechnic Institute and State University

Mini-workshop on Kuranishi Structures and Gromov-Witten Moduli Spaces ✦ *Kuranishi Structures and Gromov-Witten Moduli Spaces, Part III* ✦ **Katrin Wehrheim**, Massachusetts Institute of Technology; von Neumann Fellowship, School of Mathematics ✦ *Kuranishi Structures and Gromov-Witten Moduli Spaces, Part IV* ✦ **Dusa McDuff**, Columbia University

Workshop on Topology: Identifying Order in Complex Systems ✦ *The Search for Natural Quasicrystals* ✦ **Paul Steinhardt**, Center for Theoretical Science, Princeton University ✦ *Computing Homology Cycles with Certified Geometry* ✦ **Tamal Dey**, The Ohio State University ✦ *Lattices, Hecke Operators, and the Well-Rounded Retract* ✦ **Mark McConnell**, Center for Communications Research, Institute for Defense Analyses

Symplectic Dynamics Seminar ✦ *Arnold Diffusion via Normally Hyperbolic Invariant Cylinders and Mather Variational Method, Part I* ✦ **Vadim Kaloshin**, The Pennsylvania State University; Member, School of Mathematics

Mathematical Conversations ✦ *What Is a Polyfold and Why Would One Care?* ✦ **Katrin Wehrheim**, Massachusetts Institute of Technology; von Neumann Fellowship, School of Mathematics

March 8

Introduction to Polyfolds ✦ *Introduction to Polyfolds* **Katrin Wehrheim**, Massachusetts Institute of Technology; von Neumann Fellowship, School of Mathematics ✦ *A Simple Example of an M-Polyfold Relevant to Morse Theory* ✦ **Peter Albers**, Purdue University; von Neumann Fellowship, School of Mathematics

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Mod P Points on Shimura Varieties* ✦ **Mark Kisin**, Harvard University

March 12

Workshop on Symplectic Dynamics II ✦ *Long time, Vanishing Viscosity Limits* ✦ **Peter Constantin**, Princeton University ✦ *The Inexistensible String as a Toy Model of Fluids* ✦ **Steve Preston**, University of Colorado ✦ *Long Time Behavior of Solutions of Vlasov-Like Equations* ✦ **Emanuele Caglioti**, Sapienza Università di Roma ✦ *Large Amplitude Internal Waves and their Stability* ✦ **Roberto Camassa**, The University of North Carolina at Chapel Hill

Computer Science/Discrete Mathematics Seminar I ✦ *Computational Aspects in the Braid Group and Applications to Cryptography* ✦ **Mina Teicher**, Bar-Ilan University; Member, School of Mathematics

March 13

Workshop on Symplectic Dynamics II ✦ *The* h*-Principle for the Euler Equations* ✦ **Laszlo Szekelyhidi**, Universität Leipzig ✦ *The* h*-Principle for the Euler Equations Part 2* ✦ **Camillo De Lellis**, Institut für Mathematik, Universität Zürich ✦ *On the Long-Time Dynamics of Some Infinite-Dimensional Hamiltonian Systems* ✦ **Vladimir Sverak**, University of Minnesota ✦ *On the Local Structure of the Set of Stationary Flows to the 2D Incompressible Euler Equations* ✦ **Antoine Choffrut**, Mathematisches Institut, Universität Leipzig ✦ *Symplectic Techniques for Integrable PDEs* ✦ **Thomas Kappeler**, Institut für Mathematik, Universität Zürich

Computer Science/Discrete Mathematics Seminar II ✦ *Applications of FT-Mollification II* ✦ **Jelani Nelson**, Visitor, School of Mathematics

March 14

Workshop on Symplectic Dynamics II ✦ *Lifting Absolutely Continuous Curves from* $P(T^d)$ *to* $P_2(R^d)$ ✦ **Wilfrid Gangbo**, Georgia Institute of Technology ✦ *Geometry of Diffeomorphism Groups, Complete Integrability, and Optimal Transport* ✦ **Jonatan Lenells**, Baylor University ✦ *Groups of Diffeomorphisms and Geodesics on Them* ✦ **David Ebin**, Stony Brook University, The State University of New York ✦ *Well/Ill-Posedness Results for the Magneto-Geostrophic Equations: The Importance of Being Even* ✦ **Susan Friedlander**, University of Southern California

March 15

Workshop on Symplectic Dynamics II ✦ *Qualitative Features of Periodic Solutions of KdV* ✦ **Peter Topalov**, Northeastern University ✦ *Invariant Tori for the Nonlinear Lattice One-Dimensional Schrödinger Equations with Real Analytic Potential* ✦ **Jiansheng Geng**, Nanjing University ✦ *Quasi Periodic Solutions of Hamiltonian PDEs* ✦ **Massimiliano Berti**, Università degli Studi di Napoli Federico II ✦ *The Generalized Inviscid Proudman Johnson Equation* ✦ **Ralph Saxton**, The University of New Orleans ✦ *On the Blow-Up Problem for the Euler Equations and the Liousville Type Results in the Fluid Equations* ✦ **Dongho Chae**, Sungkyunkwan University

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Hypergeometric Motives* ✦ **Fernando Villegas**, The University of Texas at Austin

March 16

Workshop on Symplectic Dynamics II ✦ *Big Frequency Cascades in the Cubic Nonlinear Schrödinger Flow on the 2-Torus* ✦ **James Colliander**, University of Toronto ✦ *Growth of Sobolev Norms for the Cubic Defocusing Nonlinear Schrödinger Equation in Polynomial Time* ✦ **Marcel Guardia**, Member, School of Mathematics ✦ *Approximate Geodesics on Groups of Volume Preserving Diffeomorphisms and Adhesion Dynamics* ✦ **Yann Brenier**, Université de Nice

Special Lecture ✦ *Ramanujan Graphs and Siran Graphs, Applications to Classical and Quantum Coding Theory* ✦ **Jean-Pierre Tillich**, Institut National de Recherche en Informatique et en Automatique

March 19

Computer Science/Discrete Mathematics Seminar I ✦ *Optimal Estimators for Entropy, Support Size, and Related Properties* ✦ **Gregory Valiant**, University of California, Berkeley

Members Seminar ✦ *Polynomial Methods in Learning and Statistics* ✦ **Ankur Moitra**, Member, School of Mathematics

March 20

Computer Science/Discrete Mathematics Seminar II ✦ *The Quasi-Polynomial Freiman-Ruzsa Theorem of Sanders* ✦ **Shachar Lovett**, Member, School of Mathematics

Analysis Seminar ✦ *Nodal Lines of Maass Forms and Critical Percolation* ✦ **Peter Sarnak**, Professor, School of Mathematics

Special Computer Science/Discrete Mathematics Lecture ✦ *Graph Convergence, Parameter Testing, and Group Actions* ✦ **Miklos Abert**, Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Budapest

March 21

Symplectic Dynamics Seminar ✦ *Arnold Diffusion via Normally Hyperbolic Invariant Cylinders and Mather Variational Method, Part II* ✦ **Ke Zhang**, Member, School of Mathematics

Working Group on Symplectic Dynamics: ✦ *An Instability Mechanism Along the Mean Motion Resonances in the Restricted Three Body Problem* ✦ **Marcel Guardia**, Member, School of Mathematics

March 22

Working Group on Arnold Diffusion ✦ *Arnold Diffusion via Normally Hyperbolic Invariant Cylinders and Mather Variational Method, Part III* ✦ **Vadim Kaloshin**, The Pennsylvania State University; Member, School of Mathematics

Working Group on Arnold Diffusion ✦ *Arnold Diffusion via Normally Hyperbolic Invariant Cylinders and Mather Variational Method, Part IV* ✦ **Ke Zhang**, Member, School of Mathematics

March 26

Computer Science/Discrete Mathematics Seminar I ✦ *Hardness of Randomized Truthful Mechanisms for Combinatorial Auctions* ✦ **Jan Vondrak**, IBM Almaden

Marston Morse Lectures ✦ *Dynamics on the Moduli Spaces of Curves, I* ✦ **Maryam Mirzakhani**, Stanford University

March 27

Computer Science/Discrete Mathematics Seminar II ✦ *Higher-Order Cheeger Inequalities* ✦ **Luca Trevisan**, Stanford University

Analysis Seminar ✦ *Formation of Singularities in Fluid Interfaces* ✦ **Charles Fefferman**, Princeton University

March 28

Marston Morse Lectures ✦ *Dynamics on the Moduli Spaces of Curves, II* ✦ **Maryam Mirzakhani**, Stanford University

Symplectic Dynamics Seminar ✦ *Closed Reeb Orbits on the Sphere and Symplectically Degenerate Maxima* ✦ **Viktor Ginzburg**, University of California, Santa Cruz; Visitor, School of Mathematics

March 29

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Modularity in Weight (1,1,…,1) via Overconvergent Hilbert Modular Forms* ✦ **Payman Kassaei**, King's College London

March 30

Marston Morse Lectures ✦ *Dynamics on the Moduli Spaces of Curves, III* ✦ **Maryam Mirzakhani**, Stanford University

Special Number Theory Seminar ✦ *Cup Products in Automorphic Cohomology* ✦ **Matthew Kerr**, Washington University in St. Louis

April 2

Computer Science/Discrete Mathematics Seminar I ✦ *Rational Proofs* ✦ **Pablo Azar**, Massachusetts Institute of Technology

Members Seminar ✦ *The Heisenberg Algebra in Symplectic Algebraic Geometry* ✦ **Anthony Michael Licata**, Member, School of Mathematics

April 3

Computer Science/Discrete Mathematics Seminar II ✦ *Better Pseudorandom Generators from Milder Pseudorandom Restrictions* ✦ **Parikshit Gopalan**, Microsoft Research Silicon Valley

April 4

Mini-Course on Polyfolds ✦ *Polyfolds I, Polyfolds II, Polyfolds III, Polyfolds IV* ✦ **Helmut Hofer**, Professor, School of Mathematics

Workshop on Topology: Identifying Order in Complex Systems ✦ *Structure of the Afferent Terminals in Terminal Ganglian of a Cricket and Persistent Homology* ✦ **Tomas Gedeon**, Montana State University ✦ *Hodge Decomposition and Online Ranking on Random Graphs* ✦ **Lek-Heng Lim**, The University of Chicago ✦ *Self-Assembly of Spherical Colloidal Particles at Low N* ✦ **Natalie Arkus**, The Rockefeller University

Mathematical Conversations ✦ *Some New Inner Models for Set Theory* ✦ **Juliette Kennedy**

April 5

Mini-Course on Polyfolds ✦ *Polyfolds V, Polyfolds VI, Polyfolds VII, Polyfolds VIII* ✦ **Helmut Hofer**, Professor, School of Mathematics

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Constructible Functions, Inegrability, and Harmonic Analysis on p-adic Groups* ✦ **Julia Gordon**, The University of British Columbia

April 9

Special Computer Science/Discrete Mathematics Seminar Lecture ✦ *Random Local Algorithms* ✦ **Endre Csóka**, Eötvös Loránd University

Members Seminar ✦ *Computations of Heegaard Floer Homologies* ✦ **Andras Istvan Stipsicz**, Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Budapest

April 10

Computer Science/Discrete Mathematics Seminar II ✦ *List-Decoding Multiplicity Codes* ✦ **Swastik Kopparty**, Rutgers, The State University of New Jersey; Visitor, School of Mathematics

Joint IAS/PU Number Theory Seminar ✦ *Local Models of Shimura Varieties* ✦ **Xinwen Zhu**, Harvard University

April 13

Joint IAS/PU Symplectic Geometry Seminar ✦ *A Mathematical Theory of Quantum Sheaf Cohomolog* ✦ **Ron Donagi**, University of Pennsylvania

April 16

Computer Science/Discrete Mathematics Seminar I ✦ *Near-Linear Time Approximation Algorithm for Balanced Separator* ✦ **Sushant Sachdeva**, Princeton University

April 17

Computer Science/Discrete Mathematics Seminar II ✦ *Nondeterministic Property Testing* ✦ **László Lovász**, Eötvös Loránd University; Visiting Professor, School of Mathematics

Analysis Seminar ✦ *Sub-Weyl Subconvexity and Short p-adic Exponential Sums* ✦ **Djordje Milićević**, University of Michigan

April 19

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Multiple Zeta Values* ✦ **Francis Brown**, CNRS, Institut de Mathématiques de Jussieu, Université Paris Diderot

April 23

Computer Science/Discrete Mathematics Seminar I ✦ *Computational Entropy* ✦ **Salil Vadhan**, Harvard University; Visiting Researcher, Microsoft Research Silicon Valley; Visiting Scholar, Stanford University

April 24

Computer Science/Discrete Mathematics Seminar II ✦ *Pseudorandom Generators for Read-Once ACC^0* ✦ **Srikanth Srinivasan**, Visitor, School of Mathematics

April 26

Working Group on Algebraic Number Theory

Joint IAS/PU Number Theory Seminar ✦ *Deligne-Lusztig Theory for Unipotent Groups and the Local Langlands Correspondence* ✦ **Mitya Boyarchenko**, University of Michigan

April 30

Computer Science/Discrete Mathematics Seminar I ✦ *Randomized Greedy Algorithms for the Maximum Matching Problem With New Analysis* ✦ **Mario Szegedy**, Rutgers, The State University of New Jersey

May 1

Computer Science/Discrete Mathematics Seminar II ✦ *Lower Bounds for Matching Vector Codes* ✦ **Abhishek Bhowmick**, The University of Texas at Austin

Joint IAS/PU Number Theory Seminar ✦ *Eisenstein Series on Exceptional Groups, Graviton Scattering Amplitudes, and the Unitary Dual* ✦ **Stephen D. Miller**, Rutgers, The State University of New Jersey

May 7

Computer Science/Discrete Mathematics Seminar I ✦ *Topology of Norms Defined by Systems of Linear Forms* ✦ **Pooya Hatami**, The University of Chicago

May 8

Computer Science/Discrete Mathematics Seminar II ✦ *Pseudorandomness from Shrinkage* ✦ **Raghu Meka**, Member, School of Mathematics

May 10

Joint IAS/PU Number Theory Seminar ✦ *Some Canonical Constructions in Arithmetic Invariant Theory* ✦ **Jack Thorne**, Harvard University

May 14

Computer Science/Discrete Mathematics Seminar I ✦ *Are Lattice Based Cryptosystems Secure Enough?* ✦ **Nisheeth Vishnoi**, Microsoft Research India

May 15

Computer Science/Discrete Mathematics Seminar II ✦ *From Irreducible Representations to Locally Decodable Codes* ✦ **Klim Efremenko**, Tel Aviv University

June 4

Conference on Graphs and Analysis ✦ *Graph Limit Theory: An Overview* ✦ **László Lovász**, Eötvös Loránd University; Visiting Professor, School of Mathematics ✦ *Samplings and Observables; Limits of Measured Metric Spaces* ✦ **Gabor Elek**, Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Budapest ✦ *Random Orderings and Unique Ergodicity of Automorphism Groups* ✦ **Russell Lyons**, Indiana University

June 5

Conference on Graphs and Analysis ✦ *Graph Invariants and Some Algebra, Geometry, and Analysis* ✦ **Lex Schrijver**, Centrum Wiskunde & Informatica ✦ *Graph Regularity and Counting Lemmas* ✦ **Jacob Fox**, Massachusetts Institute of Technology ✦ *Limits of Permutation Sequences* ✦ **Yoshi Kohayakawa**, University of São Paulo

June 6

Conference on Graphs and Analysis ✦ *Statistical Analysis of Exponential Random Graph Models* ✦ **Persi Diaconis**, Stanford University ✦ *My Favorite Open Problems on Graph Limits* ✦ **Vera Sós**, Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Budapest

June 7

Conference on Graphs and Analysis ✦ *Graph vs Euclidean Metric* ✦ **Itai Benjamini**, Weizmann Institute of Science ✦ *Groups and Graph Limits* ✦ **Miklos Abert**, Alfréd Rényi Institute of Mathematics, Hungarian Academy of Sciences, Budapest ✦ *Exchangeable Random Arrays* ✦ **Tim Austin**, Courant Institute of Mathematical Sciences, New York University

June 8

Conference on Graphs and Analysis ✦ *A Unifying Approach* ✦ **Jaroslav Nesetril**, Charles University, Prague ✦ *Graph Norms and Erdos-Simonovits-Sidorenko's Conjecture* ✦ **Hamed Hatami**, McGill University ✦ *Limit Structures on Abelian Groups* ✦ **Balázs Szegedy**, University of Toronto; Visitor, School of Mathematics

Program for Women and Mathematics

The nineteenth annual Program for Women and Mathematics was held at the Institute for Advanced Study from May 14 to 25, 2012. Program activities were sponsored by the Institute and Princeton University and generously supported by the National Science Foundation.

The goal of the program is to encourage undergraduate and graduate students to continue their math education. Research mathematicians give talks and seminars, which focus on a particular topic. This year's program was "Twenty-First-Century Geometry." Mentoring, discussions regarding peer relations, and an introduction to career opportunities were also part of the program.

This year's program attracted fifty-five participants: sixteen undergraduates, twenty-six graduate students, and thirteen postdoctoral mathematicians. Except for those participants living near Princeton, everyone was accommodated in the Institute housing complex.

Visiting Professor Karen Uhlenbeck of the University of Texas at Austin and Eleny Ionel of Stanford University designed the 2012 program. Advanced course lectures were given by Ionel and Lisa Traynor of Bryn Mawr College. Beginning course lectures were given by Joan Licata, Member in the School of Mathematics, and Margaret Symington of Mercer College.

Penka Georgieva of Princeton University and Sheila Sandon, Member in the School of Mathematics, acted as advanced course teaching assistants and Patricia Cahn of Dartmouth College and Joanna Nelson of the University of Wisconsin served as beginning course assistants.

Research seminars were as follows: Jennifer Hom, Columbia University, "Applications of the Knot Floer Complex to Concordance"; Radmilla Sazdanovic, University of Pennsylvania, "Categorification and Khovanov Link Homology"; Doris Hein, University of California, Santa Cruz, "Arnold Conjecture for Clifford Symplectic Pencils"; Sayonita Ghosh Harjra, University of Georgia, "A Proof of the Classification Theorem of Over-Twisted Contact Structures on a Closed Oriented 3-manifold"; Elif Dalyan, Hitit University, "Open Book Decomposition of Links of Quotient Surface Singularities and Support Genus Problem"; Laura Starkston, The Universtiy of Texas at Austin, "Symplectic and Stein Fillings of Contact 3-Manifolds"; Milena Pabiniak, Cornell University, "Lower Bounds for Gromov Width in the Unitary and Special Orthogonal Coadjoint Orbits"; Sinem Celik Onaran, Hacettepe University, "Invariants of Legendrian Knots"; Marta Batoreo, University of California, Santa Cruz, "On the Rigidity of the Maslov Index for Coisotropic Submanifolds"; Kate Kearny, Louisiana State University, "An Obstruction to Knots Bounding Möbius Bands in B^4"; Allison Gilmore, Princeton University, "Knot Floer Homology and $gl(1/1)$ Quantum Invariants"; and Juanita Pinzón-Caicedo, Indiana University, "Independence in the Smooth Concordance Groups through SO(3)-Chern-Simons Invariants."

The first of the four Women-in-Science seminars included introductions. Additional seminars were Rhonda Hughes of Bryn Mawr College gave the talk "Bringing Diversity to Mathematics"; Jennifer Slimowitz of the National Science Foundation who spoke on "An Introduction to the National Science Foundation and

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Member Joan Licata (right) gave beginning course lectures as part of the Program for Women and Mathematics to encourage undergraduate and graduate students (left) to continue their math education.

Funding Opportunities"; and the final seminar, which summarized the program activities.

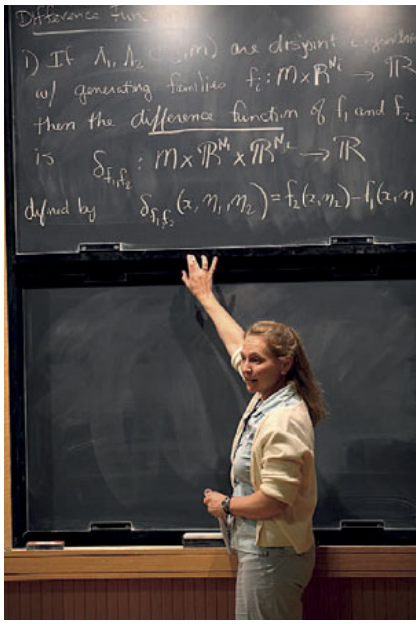
Colloquia were given by Helmut Hofer, Professor in the School of Mathematics, "At the Interface of Dynamics and Symplectic Geometry"; Dusa McDuff of Barnard College, "Embedding Symplectic Ellipsoids and Continued Fractions"; and von Neumann Fellow Katrin Wehrheim of the Massachusetts Institute of Technology, "How to Construct Topological Invariants via Decompositions and the Symplectic Category."

During two of the informal dinners, there were discussions regarding how to apply to graduate schools, to the Institute's School of Mathematics, and other issues regarding career paths.

On Friday, May 18, participants visited the campus of Princeton University where they heard "An Introduction to Knot Floer Homology" by Zoltan Szabo and a talk on "Geodesic Laminations on Hyperbolic Surfaces" by Conan Wu. Following lunch, there was a panel discussion organized by Heather Macbeth, a graduate student at Princeton, with senior and graduate students about "What is the Next Step?"

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

At the conclusion of the workshop activities, participants were asked for their comments regarding the material level of the lectures. Surveys were distributed to obtain participant opinions regarding the quality of the Institute's facilities and the structure and organization of the activities. The responses indicated that both the undergraduates and graduate students appreciated being offered the opportunity to participate in the program and left the Institute with a renewed sense of excitement about their future in mathematics.



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Lisa Traynor of Bryn Mawr College gave the advanced lecture course, "The Flexibility and Rigidity of Lagrangian and Legendrian Submanifolds."

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A review session of a beginning course lecture by Member Joan Licata was held in the White–Levy Room.

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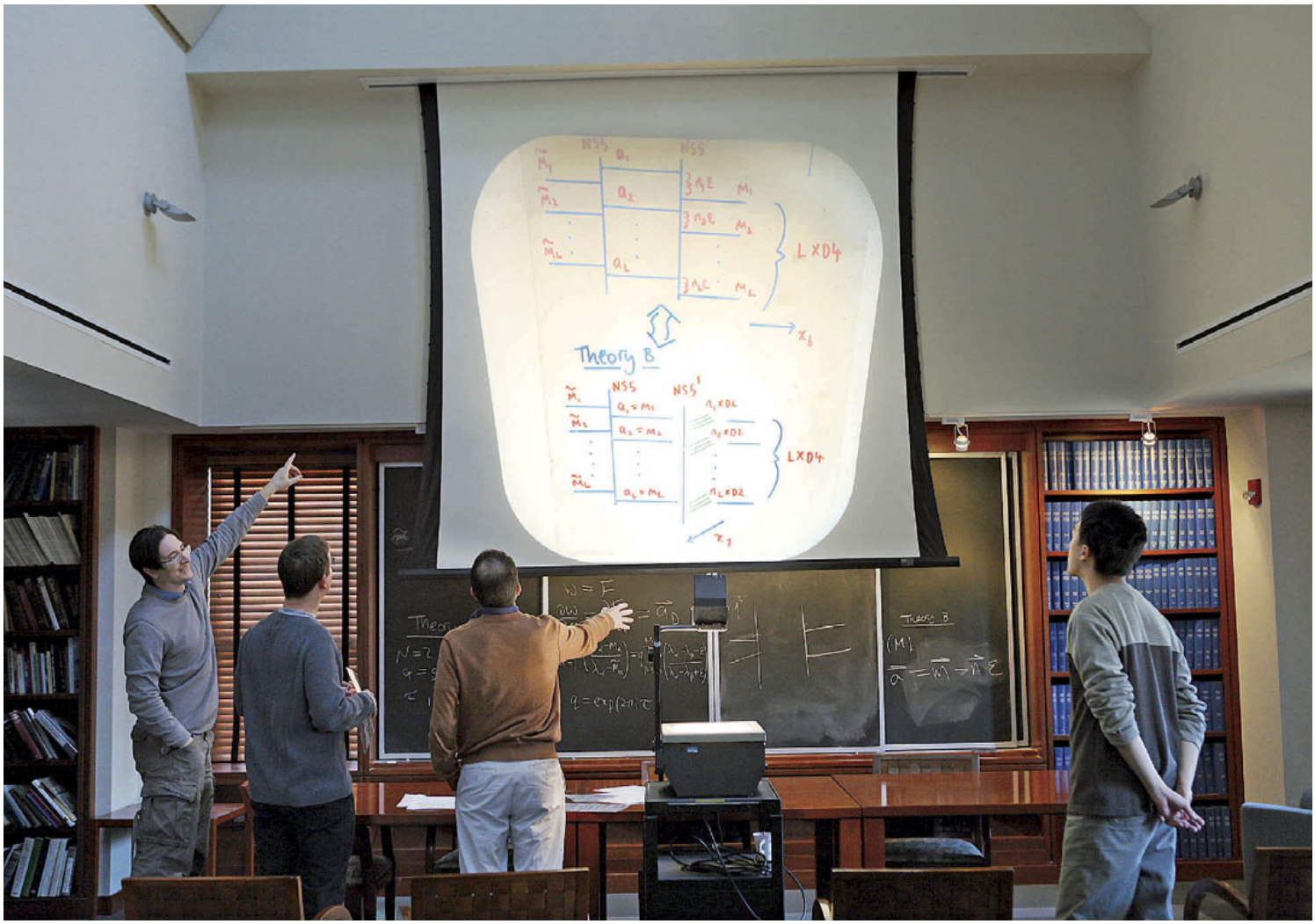
Mentoring, discussions regarding peer relations, and an introduction to career opportunities were also a part of the program.



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Member Nick Dorey (second from left) led a physics group meeting on four-dimensional quiver gauge theories and quantum spin chains.

School of Natural Sciences

Faculty

Nima Arkani-Hamed

Stanislas Leibler

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

Arnold J. Levine

Over the past year, Professor **Nima Arkani-Hamed** has worked on two parallel tracks, responding to the wealth of new data generated by the Large Hadron Collider (LHC) on the one hand, and continuing the exploration of remarkable new mathematical structures in scattering amplitudes on the other.

The most exciting development in particle physics has been the plausible discovery of the Higgs boson, weighing around 135 times the mass of the proton. This turns out to be an especially interesting value for the Higgs mass, with many implications for the structure of possible physics beyond the Standard Model. It is consistent with a range for the Higgs mass predicted by a version of supersymmetry known as "split SUSY," which Arkani-Hamed proposed with collaborators in the mid-2000s. He has returned to explore this scenario in more detail in light of the new Higgs data, pointing out new "smoking gun" experimental signals for this theory at the LHC.

In the early Higgs data, there are hints of discrepancies of the properties of the Higgs from what we expect in the Standard Model. It is plausible that these hints will disappear when more data is analyzed, but with a number of Institute Members, Arkani-Hamed showed that the persistence of these hints with more gathered data would have dramatic consequences for new physics, demanding the presence of light new charged particles, well within reach of the LHC, and unambiguously ruling out large classes of new theories for new physics, including all possible versions of the split SUSY idea.

Around three years ago, Arkani-Hamed and his collaborators stumbled onto a rich mathematical structure that underlies much of the physics of scattering amplitudes in gauge theories, involving some beautiful algebraic geometry in the space of k dimensional planes in n dimensions, known as the "Grassmannian" G(k,n). Over the past year, they decided to understand the deeper physical and mathematical origins of this object, which led them on a long adventure before coming to fruition. After a number of months of discussions with Professor Emeritus Pierre Deligne and Robert MacPherson, Hermann Weyl Professor in the School of Mathematics, Arkani-Hamed and his collaborators started to realize that the mathematical structure they ran into was, completely coincidentally, also being explored by mathematicians over the past ten years, and is an active area of

current research in areas ranging from algebraic geometry to combinatorics. Arkani-Hamed and his collaborators started interacting intensively with some of the mathematicians working actively in this area, including Alexander Goncharov at Yale University and Alexander Postnikov at the Massachusetts Institute of Technology.

The central physical objects of the story are known as "on-shell diagrams," which arise from gluing together elementary particle interactions in a new way, discarding the notion of "virtual particles." The backbone of the new mathematical object is a structure in combinatorics, representing a novel way of thinking about permutations. This is, in turn, related to a number of other objects—configurations of vectors in projective spaces, and the so-called "positive Grassmannian," which is a generalization of the basic notion of a "simplex." These structures have shed major light on important physical properties of scattering amplitudes. The underlying physics also gives new ways of thinking about the mathematics, simplifying many of the derivations and generalizing them to new areas that mathematicians did not anticipate.

During the 2011–12 academic year, Professor **Stanislas Leibler** continued his studies on the functional constraints in proteins and nucleic acids, as well as on a study of error correction in biological systems. The latter topic was studied in collaboration with Member Arvind Murugan. In addition to the study of kinetic proofreading, a classical example of error correction, Leibler and Murugan tried to address the more general question of global proofreading in extended systems. Member Tiberiu Tesileanu collaborated on this work on functional constraints in proteins and associated "protein sectors."

Finally, Leibler proceeded with his work on various theoretical aspects connected to the experiments performed by his collaborators in the Laboratory of Living Matter at the Rockefeller University.

Professor Juan Maldacena (left) spent much of his time researching quantum field theories that have higher spin symmetry and quark anti-quark potential in N=4 Super Yang-Mills theory. Among other areas of research, Professor Nathan Seiberg (right) analyzed a phenomenon physically distinct from ordinary spontaneous supersymmetry breaking.

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During the 2011–12 academic year, Professor **Juan Maldacena** spent most of his time researching two topics. One was the study of quantum field theories that have higher spin symmetry. The other was the study of the quark anti-quark potential in N=4 Super Yang-Mills theory.

The study of quantum field theories with higher spin symmetry was done with Alexander Zhiboedov, a graduate student at Princeton University. This resulted in two papers. Theories with exactly conserved higher spin symmetries were studied. It was found that the higher spin symmetries constrain the theories to be essentially free theories. More precisely, assuming that there exists only one conserved spin, two current and a conserved current of spin $s>2$, then, in $d=3$, they proved that there is an infinite number of conserved currents and that their correlation functions are those of the free theory. A motivation for this study was the Vasiliev higher spin gravity theories in AdS_4. By AdS/CFT, these theories lead to higher spin theories on the boundary, and the goal was to understand how many such theories there were. This gravity theory appears to evade the Coleman Mandula theorem. Their results are an extension of the Coleman Mandula theorem to conformal field theories or to AdS gravity theories.

Separately, they considered the case of a large N theory where the higher spin symmetry is slightly broken, by 1/N effects. In this case, they computed all three point functions of the currents to leading

order in the 1/N expansion. This was done by thinking about the slightly broken current conservation identities. An interesting field theory of this kind is a theory of N fermions or bosons coupled to an O(N) Chern Simons gauge field. This analysis allowed them to compute the three point functions in the planar limit for these theories.

The other topic of study was the analysis of the quark anti-quark potential in N=4 Super Yang-Mills. This resulted in three papers covering different aspects of the problem. This was done with Amit Sever and Johannes Henn, who are Members at the IAS, and also with Diego Correa, who was a Visitor at the IAS.

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Faculty and Members in the Schools of Natural Sciences and Mathematics: clockwise from left, Elke Markert, John Hopfield, Arvind Murugan, Mina Teicher, Tsvi Tlusty, Arnold Levine, and Tiberiu Tesileanu

Maldacena and his collaborators considered a quark and an anti-quark sitting on an S^3 (and extended in the time direction). When the two are at antipodal points, the configuration is BPS and the potential vanishes. For a small deviation from that configuration they computed the leading deviation term exactly as a function of $\lambda=g^2N$ and N. This was done by relating it to a supersymmetric Wilson loop computation, which was previously done by other authors. This also allowed them to compute the radiation emitted by a moving quark exactly as a function of the coupling. They also did the same for other near BPS configurations.

They considered various perturbative computations. First, they gave the full three loop answer which is valid for any angle. They also discussed other perturbative computations, which can be resumed for all values of the coupling. Finally, they presented a set of integral equations that determine the potential in the planar limit for all values of the 't Hooft coupling. The equations were expanded perturbatively and checked against the results of their previous paper. The integral equations are very similar to the equations that determine the dimensions of general operators in N=4 Super Yang-Mills.

One interesting aspect of the quark anti-quark potential on S^3 is that it is also related to the cusp anomalous dimension for any angle. This is an object that appears in scattering amplitudes for massive particles. Thus these computations are also computing, exactly in λ, some small piece of some scattering amplitudes. In particular, the functions of the angles that appear have a similar structure to those that appear in amplitudes. Thus, this gives a rough idea of what we could expect for a general answer for scattering amplitudes.

Thomas T. Dumitrescu and Professor **Nathan Seiberg** systematically analyzed all possible supersymmetry multiplets that include the supersymmetry current and the energy-momentum tensor in various dimensions, focusing on N=1 in four dimensions. The most general such multiplet is the S-multiplet, which includes sixteen bosonic and sixteen fermionic operators. In special situations it can be decomposed, leading to smaller multiplets with 12+12 or even 8+8 operators. Physically, these multiplets give rise to different brane charges in the supersymmetry algebra. The S-multiplet is needed when the algebra contains both string and domain wall charges. In lower dimensions (or in four-dimensional N=2 theories) the algebra can include space-filling brane charges, which are associated with partial supersymmetry breaking. This phenomenon is physically distinct from ordinary spontaneous supersymmetry breaking. This

After a number of months of discussions with Professors Deligne and MacPherson in the School of Mathematics, Professor Arkani-Hamed and his collaborators started to realize that the mathematical structure they ran into was, completely coincidentally, also being explored by mathematicians over the past ten years, and is an active area of current research in areas ranging from algebraic geometry to combinatorics.

analysis leads to new results about the dynamics of supersymmetric field theories. These include constraints on the existence of certain charged branes and the absence of magnetic charges in U(1) gauge theories with a Fayet-Iliopoulos term.

Guido Festuccia and Seiberg presented a uniform treatment of rigid supersymmetric field theories in a curved spacetime, focusing on four-dimensional theories with four supercharges. Their discussion was significantly more simple than earlier treatments, because it used classical background values of the auxiliary fields in the supergravity multiplet. The new procedure was demonstrated in several examples. For anti-de-Sitter space, the known results in the literature were reproduced. A supersymmetric Lagrangian on a four-sphere exists, but unless the field theory is conformal, it is not reflection positive. They derived the Lagrangian for a three-sphere cross time and noted that the time direction can be rotated to Euclidean signature and be compactified on a circle 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. A similar discussion of R-invariant N=2 theories on a three-sphere was presented and clarified with a few points.

Following up on this work, Dumitrescu, Festuccia, and Seiberg systematically analyzed Riemannian manifolds M that admit rigid supersymmetry, focusing on four-dimensional N=1 theories with a $U(1)_R$ symmetry. They found that M admits a single supercharge, if and only if it is a Hermitian manifold. Then they considered the restrictions imposed by the presence of additional supercharges. Two supercharges of opposite R-charge exist on certain fibrations of a two-torus over a Riemann surface. Upon dimensional reduction, these give rise to an interesting class of supersymmetric geometries in three dimensions. They further showed that compact manifolds admitting two supercharges of equal R-charge must be hyperhermitian. Finally, four supercharges imply that M is locally isometric to $M_3 \times \mathbf{R}$, where M_3 is a maximally symmetric space.

Cyril Closset, Dumitrescu, Festuccia, Zohar Komargodski, and Seiberg studied contact terms of conserved currents in three-dimensional quantum field theory. They are associated with Chern-Simons terms of background gauge fields. Typically, contact terms are ambiguous and depend on the definition of the theory. But here only the integer part of the contact term is ambiguous, while its fractional part is physical. Hence, it is a new observable in the theory. In supersymmetric theories these observables that are associated with R-currents

Left: Member Gregory Moore (left), a mathematical physicist, and Member Davide Gaiotto (right), who works on black hole physics

Right: Astrophysicists attend a Bahcall Lunch.

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are particularly subtle and lead to a new anomaly. In superconformal theories some of the contact terms of the R-current are not superconformal and when the theory is placed on a curved space in a supersymmetric fashion they lead to violations of unitarity. These contact terms can be canceled by adding appropriate counter terms, but then the functional integral is not invariant under large gauge transformations of background gauge fields. This understanding resolves several paradoxes in the studies of these three-dimensional theories.

Closset, Dumitrescu, Festuccia, Komargodski, and Seiberg considered three-dimensional N=2 superconformal field theories on the three-sphere and analyzed their free energy F as a function of background gauge and supergravity fields. A crucial role is played by certain local terms in these background fields, including several Chern-Simons terms. The presence of these terms clarifies a number of subtle properties of F. This understanding allows a proof of the conjectured F-maximization principle. It also explains why computing F via localization leads to a complex answer, even though the answer is expected to be real in unitary theories. Several corollaries of these results and comments on the relation to the F-theorem were also presented.

One of the most remarkable advances in astronomy in the past two decades has been the discovery of gas giant planets that are similar to Jupiter in size and mass, but orbit more than one hundred times closer to their host star than Jupiter. Forming such planets in situ appears to be impossible, so most astronomers believe that these "hot Jupiters" formed at much larger distances and migrated inward. There are two major ways for planets to migrate. The first is "disk migration," in which gravitational torques from the gaseous protoplanetary disk extract angular momentum from the planet's orbit, causing it to spiral inwards. The second is "high-eccentricity migration," in which close encounters between planets scatter a planet onto a high-eccentricity orbit, which brings it close enough to the host star once per orbit that tidal dissipation causes the orbit to decay and eventually circularize close to the host star. If high-eccentricity migration occurs, there should be a steady-state "pipeline" of planets on extremely elongated and slowly decaying orbits. With Members Subo Dong, Boaz Katz, and Aristotle Socrates, Richard Black Professor **Scott Tremaine** has shown that the ongoing planet survey by NASA's Kepler spacecraft should detect several of these high-eccentricity planets, which can be identified by follow-up spectroscopy. Motivated by this prediction, a group at Harvard University has already found one candidate with an eccentricity of 0.8, larger than 98 percent of known exoplanets. The centers of most galaxies contain black holes of masses between one million and one billion times the mass of the Sun. The black hole masses appear to be strongly correlated with properties of the host galaxy, such as luminosity and kinematics of the stars; this correlation suggests that there is an intimate, but still obscure, relation between galaxy and black hole formation. With Andreas Burkert of the University Observatory in Munich, Tremaine has examined the correlation between black hole mass and the population of star clusters in nearby galaxies. Based on a limited sample (only thirteen galaxies), this correlation appeared to be a better predictor of black hole mass than any of its competitors. A possible explanation is that both large black hole masses and large cluster populations are associated with recent major mergers between galaxies. Subsequent studies by others have confirmed and strengthened this correlation. Among the most important windows we have on planet formation are the debris disks—extended disks of small solid bodies orbiting nearby stars, which are visible because of thermal radiation emitted by the dust and small particles

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created when these solid bodies collide. It is likely that planets are built up by similar collisions; thus the bodies creating the dust are also the building blocks of planets ("planetesimals"). With Mir Abbas Jalali of the Sharif Institute of Technology, Tremaine has studied the dynamical evolution of such disks. They find that such disks support large-scale non-axisymmetric density waves or modes, which may be regularly excited by the passage of neighboring stars in the dense stellar clusters in which most stars are born. Many of the non-axisymmetric features commonly seen in debris disks (clumps, eccentricity, spiral waves) that are attributed to planets could instead arise from these waves; the two hypotheses can be definitively distinguished by decade-scale measurements of the motion of the features.

Charles Simonyi Professor **Edward Witten** has spent most of the academic year 2011–12 working on perturbative superstring theory. This is a rather classic subject that was intensively developed in the 1980s, but there have always been a few nagging gaps in the way that it is understood. Witten's goal in his current efforts has been to put the subject on a clearer and more systematic basis. The main idea is that perturbative superstring theory can be best understood by working on the moduli space of super Riemann surfaces, rather than by reducing to ordinary Riemann surfaces. While this is not a new idea, it has not been systematically implemented in the past. Witten's goal for the year has been to implement this program, while also making it accessible to a relatively wide audience by writing up the foundational material in a detailed and understandable fashion. This is taking the form of a trilogy of papers—two concerning background material on supermanifolds and super Riemann surfaces and one on superstring perturbation theory per se—that are nearing completion.

Warren Brown of the Smithsonian Astrophysical Observatory gave an astrophysics seminar on hypervelocity stars.

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Witten has also continued with a few other projects during the current academic year. With two students at Stanford University, Daniel Harlow and Jonathan Maltz, he completed a study of the analytic continuation of Liouville quantum field theory in two dimensions. With his current graduate student Victor Mikhaylov, he is extending to supergroups the work that he did in 2009–11 on a new approach to Chern-Simons gauge theory. One expected outcome is to better understand the categorification of the Alexander polynomial, as developed in the mathematical literature; another possible goal is to get a quantum field theory perspective on what has been called "odd" Khovanov homology, as opposed to ordinary Khovanov homology, which Witten studied from a physics point of view in his previous work. The last goal is simply to enrich our picture of the workings of nonperturbative dualities in gauge theory and string theory.

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Professor Edward Witten (right), pictured with Professor Emeritus Pierre Deligne (left), spent most of the year working on perturbative superstring theory and the idea that it can best be understood by working on the moduli space of super Riemann surfaces, rather than by reducing to ordinary Riemann surfaces.

In 2011–12, Professor **Matias Zaldarriaga** worked on a variety of topics in cosmology, ranging from early universe cosmology to the study of the large-scale structure in the distribution of matter in the present Universe. With Leonardo Senatore and Guilherme L. Pimentel, he studied loop corrections to inflationary observables with particular emphasis on infrared factors. They are important to understanding the consistency of the inflationary theory, its predictivity, and to establishing the existence of the slow-roll eternal inflation phenomena and its recently found volume bound. They proved that the two-point correlation function of density fluctuations is time-independent at one-loop level in single clock inflation. To show this result they had to study the squeezed limit of (N+1)-point functions of primordial correlation functions and showed that in general it can be inferred from the spatial variation of locally measured N-point function. They also studied the projection effects induced by the coupling between modes of very different scales. They showed that the coupling leads to changes in the relation between the scale that a mode of interest will appear in the post-inflationary universe, and the time of horizon crossing of that mode, and that some of these effects are enhanced by a factor of the number of e-folds of inflation between horizon crossing and reheating.

Together with Member Rafael Porto and collaborators Diana Lopez Nacir and Senatore, Zaldarriaga continued the study of the phenomenology of various inflationary models. They generalized the effective field theory of single-clock inflation to include dissipative effects. They showed, for example, that under quite general conditions large dissipative effects on the inflaton lead to an increased level of non-Gaussianities that should be detectable by the next generation of CMB experiments. They also generalized the so-called consistency condition for the three-point function in single field inflation to the case of dissipative, multi-field, single-clock models. Thus, departures from this condition in forthcoming experiments would rule out not only single field, but also a large class of multi-field models.

With Nico Hamaus, Uros Seljak, and Jaiyu Yoo, Zaldarriaga studied redshift space distortions on large scales, close to our Hubble horizon, which will become relevant for the next generation of galaxy surveys. Several new terms are important in this regime, and although some of these terms can be described using Newtonian dynamics, others require proper general relativistic description. Accounting for these terms in galaxy clustering is the first step

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Visiting Professor Rashid Sunyaev, whose research concerns physical cosmology and high energy physics, with Members Boaz Katz and Subo Dong

toward testing general relativity on horizon scales. They also demonstrated that the general relativistic effects are not degenerate with the primordial non-Gaussian signature in galaxy bias.

With Harvard University postdoctoral fellow Svetlin Tassev and Princeton University student Blake Sherwin, Zaldarriaga studied the dynamics of density perturbations in the mildly non-linear regime. This regime is important for future galaxy surveys, which intend to use the so-called Baryon Acoustic Oscillations to constrain the expansion history of the Universe and its late time acceleration. They developed new analytic tools to understand how the baryon oscillations are affected by the non-linear evolution, and techniques to significantly speed up the way that clustering statistics are estimated from numerical simulations.

Together with Princeton University postdoctoral fellow Enrico Pajer, Zaldarriaga studied spectral distortions of the cosmic microwave background. Spectral distortions provide a unique opportunity to probe primordial perturbations on very small scales by performing large-scale measurements. They calculated the transfer function for these distortions and showed that their study could be used to constrain the very squeezed limit of the primordial three-point function of density fluctuations, thus gaining information about the inflationary epoch.

With collaborators, Professor Zaldarriaga studied redshift space distortions on large scales, close to our Hubble horizon, which will become relevant for the next generation of galaxy surveys. Several new terms are important in this regime, and although some of these terms can be described using Newtonian dynamics, others require proper general relativistic description. Accounting for these terms in galaxy clustering is the first step toward testing general relativity on horizon scales.

Professor Emeritus **Stephen L. Adler**'s principal project during the past three years has been 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.

The programs are now online, and are free for university research use, at www.pamir-integrate.com. (The acronym for the programs is PAMIR: Parameterized Adaptive Multidimensional Integration Routines.) Adler has also completed a book on the PAMIR programs, both a manual for their use and an explanation of the theory behind the algorithms, which will be published by World Scientific.

Adler's secondary project has been continuation of work on a 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 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 introduces further constraints from satellite data that are *not* satisfied, so the model does not work, as reported by Adler in an arXiv posting. Adler is putting this work aside until after the 2013 Juno flyby, which

has the potential to confirm or refute the original flyby anomaly data.

Professor Emeritus **Freeman J. Dyson** did some research this year with William Press, Professor of Computer Science and Integrative Biology at the University of Texas, and current President of the American Association for the Advancement of Science. Press and Dyson discovered new strategies for the prisoner's dilemma game, which has been studied for fifty years by game theorists and biologists as a model for the evolution of cooperation by Darwinian selection in a population of initially uncooperative individuals. The essential features of the model are: each individual has only two choices, to grab or to share; the game is played many times against the same opponent; each individual survives better by grabbing in the short run, but survives better by sharing in the long run. The new strategies unexpectedly allow each player to enforce unilaterally an unfair share of rewards. The results were published by Press and Dyson in a paper, "Iterated Prisoner's Dilemma Contains Strategies that Dominate Any Evolutionary Opponent," in the *Proceedings of the National Academy of Sciences* (May 22, 2012). William Poundstone, author of the book *The Prisoner's Dilemma*, commented as follows: "Robert Axelrod's 1980 tournaments of iterated prisoner's dilemma strategies have been condensed into the slogan, 'Don't be too clever, don't be unfair.' Press and Dyson have shown that cleverness and unfairness triumph after all."

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Professor Emeritus Freeman Dyson (center) discovered new strategies for the prisoner's dilemma game, which has been studied for fifty years by game theorists and biologists as a model for the evolution of cooperation by Darwinian selection in a population of initially uncooperative individuals.

During the 2011–12 academic year, Professor Emeritus **Peter Goldreich** investigated the stochastic excitation of modes of stellar oscillations. Observations by the Kepler satellite have greatly increased the number and variety of stars in which stochastically excited modes are detected.

A stellar mode achieves energy equipartition with the kinetic energy of convective eddies whose correlation times are comparable to its period. The energies of the most visible modes are similar to those of individual granules, or equivalently to the stellar flux that passes through a granule during its lifetime. Interactions that excite and damp an acoustic mode take place above the mode's acoustic cavity; they merely tickle the mode's evanescent tail. As a consequence, the mode's line width is much smaller than its frequency and the modal peak rises above the level of the convective noise in velocity and intensity power spectra.

Scaling observational properties of stochastically excited modes from helioseismology to asteroseismology implicitly assumes that the maximum convective Mach number, M, is the same in all stars with convective envelopes. For some properties, such as the frequency of maximum visibility, this works pretty well; M is expected to be of order a few tenths and only enters to the first power. Other observational quantities depend more sensitively on M. Peaks of low degree modes rise by of order M^{-4} above the convective noise in velocity and intensity power spectra formed from observations of an unresolved star, and the ratio of linewidth to mode frequency depends on even higher powers of M. Scaling of velocity is more direct than that of intensity since the latter is sensitive to the opacity.

During the academic year 2011–12, Professor Emeritus **Arnold J. Levine** pursued projects in the fields of epigenetics, virology, and cancer. In a study undertaken with Members Sergio Lukic and Jean-Claude Nicolas concerning Transposable Elements (TEs)—DNA sequences that are able either to change

With Member Benjamin Greenbaum and former Member Raúl Rabadán, Professor Levine has continued studies of the general problem of viral reassortment. Looking at it as an information exchange problem, they brought to bear the language of information theory on this important basic science and public health problem.

their relative position or to increase their copy number in a host genome—published experimental data was used to address the question of how a host organism adapts to recognize and silence invading TEs, which are ubiquitous parasites in eukaryotic genomes. In the soma, DNA methylation and repressive chromatin keep the majority of this parasitic DNA transcriptionally silent. KRAB associated protein 1 is a transcriptional intermediary factor that drives the epigenetic repression of many different loci in mammalian genomes. The experimental data suggested that human KRAB associated protein 1 is recruited to TE-coding DNA by KRAB-containing zinc finger transcription factors (TFs), and that these TE-repressors are located in clusters associated with human chromosome 19. This is a Copy Number Variation (CNV) hotspot that contributes to the generation of a huge diversity of TFs. Additionally, a computational study of the different endogenous retroviruses (TEs that are remnants of ancient retroviral infections) that invaded the human genome during primate evolution, revealed candidate zinc finger repressors for each endogenous retrovirus family. It appears that these repressors gained their binding affinity at the same time that their targets invaded the human lineage and are preferentially located on chromosome 19.

With Member Benjamin Greenbaum and former Member Raúl Rabadán, he has continued studies of the general problem of viral reassortment. The collaborators looked at this problem as an information exchange problem. This brings to bear the language of information theory on this important basic science and public health problem.

Together with former Member and current Visitor Alexei Vazquez and Member Elke Markert, he has been working on a new approach to classifying cancers based on two major requirements for cancer development: cell proliferation and tissue remodeling, and the metabolic demands of those two fundamental processes, which require both energy and building blocks. Another project with Vazquez is focused on a methodology to suggest the optimal subset of drugs for the treatment of a particular cancer patient, based on the pattern of molecular alterations that characterize the patient's tumor.

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Stephen Goff of Columbia University gave a seminar at the Simons Center for Systems Biology on retroviral restriction factors and new aspects of innate immunity.

MEMBERS AND VISITORS

f First Term ✦ *s* Second Term ✦ *m* Long-term Member ✦ *v* Visitor ✦ *vp* Visiting Professor

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Tsvi Tlusty
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Funding provided by NASA

RECORD OF EVENTS

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July 12
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August 1
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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Princeton University/Institute for Advanced Study Transients Discussion ✦ *SN 2011fe in M101: Constraints on the Progenitor System and Explosion Mechanism of a Nearby Type Ia Supernova* ✦ Organizers: **Rodrigo Fernandez**, Member, School of Natural Sciences, and **Brian Metzger** and **José Prieto**, Princeton University

November 1
Astrophysics Seminar ✦ *New Developments in Spiral Structure Theory* ✦ **Jerry Sellwood**, Rutgers, The State University of New Jersey

November 3
Astrophysics Informal Seminar ✦ *Constructing a Hubble Diagram with Baryon Oscillations* ✦ **Nikhil Padmanabhan**, Yale University

November 8
Astrophysics Seminar ✦ *Decoding Gravitational Wave Signals from Double Compact Objects* ✦ **Will Farr**, Northwestern University

November 10
Astrophysics Informal Seminar ✦ *A Physical Mechanism for Deflagration-to-Detonation Transitions (DDTs)* ✦ **Doron Kushnir**, Weizmann Institute of Science

November 14
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Measurements of Non-Gaussianity and the CIB Fluctuations High Redshift Sources* ✦ **Joseph Smidt**, University of California, Irvine

November 15
Astrophysics Seminar ✦ *Universality in Multifield Inflation* ✦ **Liam McAllister**, Cornell University

November 17
Astrophysics Informal Seminar ✦ *Simulating Granular Dynamics in Low Gravity* ✦ **Derek Richardson**, University of Maryland

November 22
Astrophysics Seminar ✦ *Galactic-Scale Star Formation Rates: An Efficient Market* ✦ **Eve Ostriker**, University of Maryland

November 28
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *A 2% Measurement of the BAO in SDSS DR7 Using Reconstruction* ✦ **Xiaoying Xu**, University of Arizona

Princeton University/Institute for Advanced Study Transients Discussion ✦ *General Topic—Neutron Star and Black Hole Binary Mergers* ✦ Discussion Leader: **Will East**, Princeton University

November 29
Astrophysics Seminar ✦ *Statistical Properties of the Population of Super-Earths and Neptune-type Planets* ✦ **Michel Mayor**, University of Geneva

December 1
Astrophysics Informal Seminar ✦ *Roche Accretion of Stars Close to Massive Black Holes* ✦ **Lixin (Jane) Dai**, Stanford University

December 6
Astrophysics Seminar ✦ *Formalism and Function with the CMB* ✦ **Marc Kamionkowski**, Johns Hopkins University

December 14
Astrophysics Blackboard Talk ✦ *Some Neat Stuff about Kerr Geodesics* ✦ **Gabe Perez-Giz**, New York University

December 19
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 5
Astrophysics Informal Seminar ✦ *Magnetorotational-Instability-Driven Accretion in Protoplanetary Disks* ✦ **Xuening Bai**, Princeton University

January 6
Astrophysics Informal Seminar ✦ *A Global Model for Galaxy Evolution: Simplicity and its Consequences* ✦ **Yingjie Peng**, Eidgenössische Technische Hochschule Zürich

January 9
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Newtonian and Relativistic Cosmologies* ✦ **Stephen Green**, The University of Chicago

January 12
Astrophysics Informal Seminar ✦ *Liquid Water Oceans on Sub-Neptune Exoplanets* ✦ **Leslie Rogers**, Massachusetts Institute of Technology

January 19
Princeton University/Institute for Advanced Study Transients Discussion ✦ *General Topic: Swift 1644+57 and Jets from Tidal Disruption Events* ✦ Organizers: **Rodrigo Fernandez**, Member, School of Natural Sciences, and **Brian Metzger** and **José Prieto**, Princeton University

January 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

January 31
Astrophysics Seminar ✦ *The Empirical Case For 10 GeV Dark Matter* ✦ **Dan Hooper**, Fermi National Accelerator Laboratory

February 1
Astrophysics Blackboard Talk ✦ *High-Contrast Imaging of Planets Around Other Stars* ✦ **Bob Vanderbei**, Princeton University

February 2
Astrophysics Informal Seminar ✦ *Galaxy Clusters: Beyond Spherical Cows* ✦ **Joanne Cohn**, University of California, Berkeley

February 6
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

February 7
Astrophysics Seminar ✦ *Redshift Space Distortions and the Growth of Cosmic Structure* ✦ **Martin White**, University of California, Berkeley

February 9
Astrophysics Informal Seminar ✦ *Planetary Population Synthesis: Comparing Planet Formation Theory and Observation* ✦ **Christoph Mordasini**, Max-Planck-Institut für Astronomie

February 14
Astrophysics Seminar ✦ *The Spiral Structure and Kinematics of the Milky Way* ✦ **Mark Reid**, Harvard-Smithsonian Center for Astrophysics

February 15
Astrophysics Blackboard Talk ✦ *Nothing, and the Quantum Creation of the Universe from Nothing* ✦ **Adam Brown**, Princeton University

February 16
Astrophysics Informal Seminar ✦ *The Astronomical Multipurpose Software Environment and the Ecology of Star Clusters* ✦ **Simon Portegies Zwart**, Leiden University

Astrophysics Informal Seminar Demonstration ✦ *AMUSE Demonstration* ✦ **Simon Portegies Zwart** and **Arjen van Elteren**, Leiden University

February 21
Astrophysics Seminar ✦ *OGLE-IV: The Fourth Phase of the OGLE Survey* ✦ **Andzrej Udalski**, Astronomical Observatory, Warsaw University

February 23
Astrophysics Informal Seminar ✦ *A New Window on Primordial Non-Gaussianity* ✦ **Enrico Pajer**, Princeton University

February 27
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

February 28
Astrophysics Seminar ✦ *Supernova Forensics* ✦ **Alicia Soderberg**, Harvard-Smithsonian Center for Astrophysics

March 1
Astrophysics Informal Seminar ✦ *The Climate and Atmospheric Circulation of Earth-like Exoplanets* ✦ **Tim Merlis**, Princeton University

March 6
Astrophysics Seminar ✦ *The Physics of Feedback During Galaxy Formation* ✦ **Elliot Quataert**, University of California, Berkeley

March 8
Astrophysics Informal Seminar ✦ *The Tractor: Using Forward Modeling to Measure Objects in Astronomical Images* ✦ **Dustin Lang**, Princeton University

March 12
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *From Massive Gravity to Multi-metric Gravity* ✦ **Rachel Rosen**, Columbia University

March 13
Astrophysics Seminar ✦ *The Cosmic Energy Inventory: The Problems Posed by the Inventory and Those Solved* ✦ **Masataka Fukugita**, Institute for the Physics and Mathematics of the Universe, Kashiwa, Japan

March 15
Astrophysics Informal Seminar ✦ *Asymmetric Higgsino Dark Matter* ✦ **Kfir Blum**, Member, School of Natural Sciences

March 20
Astrophysics Seminar ✦ *Hypervelocity Stars* ✦ **Warren Brown**, Harvard-Smithsonian Center for Astrophysics

March 21
Astrophysics Blackboard Talk ✦ *Designing Small Telescope Surveys* ✦ **Gaspar Bakos**, Princeton University

March 22
Astrophysics Informal Seminar ✦ *The Electro-Weak Scale: Key to the Origin of Visible and Dark Matter?* ✦ **Stefano Profumo**, University of California, Santa Cruz

March 27
Astrophysics Seminar ✦ *Atmospheric Circulation of Extrasolar Giant Planets* ✦ **Adam Showman**, The University of Arizona

March 29
Astrophysics Informal Seminar ✦ *Phenomenology of Axion Monodromy Inflation* ✦ **Raphael Flauger**, Member, School of Natural Sciences

April 3
Astrophysics Seminar ✦ *Hunting for Dark Matter in Anisotropies of the Gamma-ray Sky: Predictions and First Observational Results from Fermi-LAT* ✦ **Eiichiro Komatsu**, The University of Texas at Austin

April 5
Astrophysics Informal Seminar ✦ *Dynamical Tides in Binaries: Merging White Dwarfs, Kepler KOI-54, and Hot Jupiter Systems* ✦ **Dong Lai**, Cornell University

April 9
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Odd Parity in the CMB and Stringy Topologies* ✦ **Assaf Ben-David**, Tel Aviv University

April 10
Astrophysics Seminar ✦ *Superluminous Supernovae* ✦ **Roger Chevalier**, University of Virginia

April 12
Astrophysics Informal Seminar ✦ *Large-scale Structure with the Lyman-Alpha Forest from BOSS* ✦ **Jordi Miralda Escudé**, Universitat de Barcelona

April 17
Astrophysics Seminar ✦ *The Persistence of Methane Through Time on Saturn's Moon Titan* ✦ **Jonathan Lunine**, Cornell University

April 19
Astrophysics Informal Seminar ✦ *Origin, Evolution, and Destiny of Close-in Planets* ✦ **D.N.C. Lin**, University of California, Santa Cruz, and Kavli Institute for Astronomy and Astrophysics at Peking University

April 23
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Constraints on Resonant Non-Gaussianity* ✦ **Mehrdad Mirbabay**, New York University

April 24
Astrophysics Seminar ✦ *Spectral Distortions of the CMB and What We Might Learn About Early Universe Physics* ✦ **Jens Chluba**, Canadian Institute for Theoretical Astrophysics

April 26
Astrophysics Informal Seminar ✦ *Planet-disk Interaction: From Theories to Observations* ✦ **Zhaohuan Zhu**, Princeton University

May 1
Astrophysics Seminar ✦ *Probing Dark Matter and Dark Energy with Lyman Alpha Emitting Galaxies* ✦ **Eric Gawiser**, Rutgers, The State University of New Jersey

May 3
Astrophysics Informal Seminar ✦ *Hamiltonian Dynamics and Symplectic Invariants* ✦ **Helmut Hofer**, Professor, School of Mathematics

May 7
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Conformal Consistency Relations for Single Field Inflation* ✦ **Jorge Noreña**, Institut de Ciències del Cosmos, Universitat de Barcelona

May 8
Astrophysics Seminar ✦ *Ultrahigh Energy Cosmic Rays: What Are They? Where Do They Come From? What Can They Teach Us?* ✦ **Glennys Farrar**, New York University

May 10
Astrophysics Informal Seminar ✦ *New Light on Stellar Astrophysics with Kepler* ✦ **Lucianne Walkowicz**, Princeton University

May 11
Astrophysics Special Informal Seminar ✦ *Searching for Eccentric Proto-Hot Jupiters* ✦ **John Johnson**, California Institute of Technology

May 15
Astrophysics Seminar ✦ *Radiation Magnetohydrodynamics of Accretion Disks and Feedback* ✦ **James Stone**, Princeton University

May 21
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Non Gaussianities and Lensing* ✦ **Ruth Pearson**, University of Sussex and Stanford University

May 22
Astrophysics Seminar ✦ *The Dynamics and Afterglow Radiation of Gamma Ray Bursts* ✦ **Andrew MacFadyen**, New York University

May 29
Astrophysics Seminar ✦ *Modeling the Interstellar Medium in Star Forming Galaxies* ✦ **Dieter Breitschwerdt**, Technische Universität Berlin

June 11
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ Paper Discussion ✦ Discussion Leader: **Simeon Paul Bird**, Member, School of Natural Sciences

June 14
Astrophysics Informal Seminar ✦ *Dark Matter Halos* ✦ **Neal Dalal**, University of Illinois at Urbana-Champaign

June 19
Astrophysics Informal Seminar ✦ *Planet-Disk Interaction and Orbital Evolution of Planets* ✦ **Wilhelm Kley**, Eberhard Karls Universität Tübingen

June 21
Astrophysics Informal Seminar ✦ *Correlation Between Black Hole Masses and Bulge Luminosities Not Fundamental* ✦ **Glenn van de Ven**, Max-Planck-Institut für Astronomie

June 25
Princeton University/Institute for Advanced Study Early Universe/Cosmology Lunch Discussion ✦ *Sgoldstino Inflation* ✦ **Sander Mooij**, National Institute for Subatomic Physics (NIKHEF)

Particle Physics Activities

September 16
High Energy Theory Seminar ✦ *Flux Tubes, Integrability and the S-matrix of N=4 SYM* ✦ **Amit Sever**, Perimeter Institute for Theoretical Physics; Member, School of Natural Sciences

September 19
High Energy Theory Seminar ✦ *On the Classification of Massive Phases of Gauge Theories* ✦ **Anton Kapustin**, California Institute of Technology

September 21
Physics Group Meeting ✦ *Irregular Conformal Blocks and Argyres Douglas Theories* ✦ **Davide Gaiotto**, Member, School of Natural Sciences

September 30
High Energy Theory Seminar ✦ *Four Dimensional Superconformal Theories and Macdonald Polynomials* ✦ **Shlomo S. Razamat**, Member, School of Natural Sciences

October 3
High Energy Theory Seminar ✦ *Carving Out the Space of 4D CFTs* ✦ **David Simmons-Duffin**, Harvard University

October 5
Physics Group Meeting ✦ *Irregular Conformal Blocks and Argyres Douglas Theories* ✦ **Davide Gaiotto**, Member, School of Natural Sciences

October 14
High Energy Theory Seminar ✦ *Signatures of Supersymmetry from the Early Universe* ✦ **Daniel Green**, Member, School of Natural Sciences

October 17
High Energy Theory Seminar ✦ *Superconformal Technicolor and Partial Higgs Compositeness* ✦ **Markus Luty**, University of California, Davis

October 19
Physics Group Meeting ✦ *The Story of the Antipode* ✦ **Simon Caron-Huot**, Member, School of Natural Sciences

October 27
Phenomenology Seminar ✦ *Monopoles and Electroweak Symmetry Breaking* ✦ **John Terning**, University of California, Davis

October 28
High Energy Theory Seminar ✦ *3-Manifolds, 3d Gauge Theory, and Supersymmetric Indices* ✦ **Tudor Dan Dimofte**, Member, School of Natural Sciences

October 31
High Energy Theory Seminar ✦ *The Harmony of Superstring Disk Amplitudes* ✦ **Oliver Schlotterer**, Max-Planck-Institut für Gravitationsphysik

November 1
Informal High Energy Theory Seminar ✦ *Holographic Uniformizaion* ✦ **Christopher Beem**, Simons Center for Geometry and Physics, Stony Brook University, The State University of New York

November 2
Physics Group Meeting ✦ *All Possible Symmetries of CFTs* ✦ **Alexander Zhiboedov**, Princeton University

November 4
High Energy Theory Seminar ✦ *Rigid Supersymmetry in Curved Superspace* ✦ **Guido Festuccia**, Member, School of Natural Sciences

November 8
Informal Phenomenology Seminar ✦ *Hidden Beauty of Correlation Functions in N=4 SYM* ✦ **Emery Sokatchev**, CERN

November 14
High Energy Theory Seminar ✦ *Line Bundle Standard Models* ✦ **Lara Anderson**, Harvard University

November 16
Physics Group Meeting ✦ *Analytic Results for Scattering Amplitudes in N=4 Super Yang-Mills* ✦ **Johannes Henn**, Member, School of Natural Sciences

November 18
High Energy Theory Seminar ✦ *Corrections to D-Brane and O-Plane Actions from String Amplitudes* ✦ **Daniel Robbins**, Texas A&M University

November 22
Informal High Energy Theory Seminar ✦ *Generalized Geometry in AdS/CFT and Volume Minimization* ✦ **Maxime Gabella**, University of Oxford

November 28
High Energy Theory Seminar ✦ *Many-Jet Physics at the LHC with BlackHat and Sherpa* ✦ **David Kosower**, Commissariat à l'Énergie Atomique et aux Énergies Alternatives

November 29
Informal High Energy Theory Seminar ✦ *Hunting De Sitter Holography from the Bottom Up* ✦ **Matthew Baumgart**, Johns Hopkins University

November 30
Physics Group Meeting ✦ *Multi-Lepton Signals of the Higgs Boson* ✦ **Nathaniel Craig**, Member, School of Natural Sciences

December 6
Informal High Energy Theory Seminar ✦ *From Trees to Two Loops by Maximal Unitarity* ✦ **Kasper Larsen**, Commissariat à l'Énergie Atomique et aux Énergies Alternatives

December 7
Physics Group Meeting ✦ *Instanton Counting for Quiver Gauge Theories* ✦ **Vasily Pestun**, Member, School of Natural Sciences

December 9
High Energy Theory Seminar ✦ *Cluster Algebra from N=2 Field Theory* ✦ **Dan Xie**, Member, School of Natural Sciences

December 12
High Energy Theory Seminar ✦ *Predictions from the Multiverse: Successes and Failures* ✦ **Ben Freivogel**, Massachusetts Institute of Technology

December 14
Physics Group Meeting F ✦ *General Argyres-Douglas Theories* ✦ **Dan Xie**, Member, School of Natural Sciences

December 16
High Energy Theory Seminar ✦ *Jumpstarting the All-Loop S-matrix of N=4 Super Yang-Mills* ✦ **Simon Caron-Huot**, Member, School of Natural Sciences

January 25
Physics Group Meeting ✦ *Domain Walls for Two-Dimensional Renormalization Group Flows* ✦ **Davide Gaiotto**, Member, School of Natural Sciences

January 31
Informal High Energy Theory Seminar ✦ *Connecting Strings to Things* ✦ **Jonathan Jacob Heckman**, Member, School of Natural Sciences

February 1
Physics Group Meeting ✦ *4d Quiver Gauge Theories and Quantum Spin Chains* ✦ **Nicholas Dorey**, University of Cambridge; Member, School of Natural Sciences

February 6
High Energy Theory Seminar ✦ *The Large N Limit of Tensor Models* ✦ **Razvan Gurau**, Perimeter Institute for Theoretical Physics

February 7
Informal High Energy Theory Seminar ✦ *Integrabliity and the AdS3/CFT2 Correspondence* ✦ **Bogdan Stefanski**, City University London

February 10
High Energy Theory Seminar ✦ *Scattering Amplitudes and the Positive Grassmannian* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

February 15
Physics Group Meeting ✦ *Scattering Amplitudes and the Positive Grassmannian II* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

February 22
Physics Group Meeting ✦ *Scattering Amplitudes and the Positive Grassmannian III* ✦ **Nima Arkani-Hamed**, Professor, School of Natural Sciences

February 24
High Energy Theory Seminar ✦ *Absence of Three-Loop Four-Point Divergences in N=4 Supergravity* ✦ **Tristan Dennen**, University of California, Los Angeles

March 5
High Energy Theory Seminar ✦ *Counting in 4,5,6 Dimensions* ✦ **Kimyeong Lee**, Korea Institute for Advanced Study

March 9
High Energy Theory Seminar ✦ *Jet Quenching at RHIC and the LHC* ✦ **Simon Caron-Huot**, Member, School of Natural Sciences

March 14
Physics Group Meeting ✦ *Higher Spin Black Holes from CFT* ✦ **Thomas Hartman**, Member, School of Natural Sciences

March 19
High Energy Theory Seminar ✦ *AdS_5 x S^5 Superstring at Small Radius* ✦ **Nathan Berkovits**, Universidade Estadual Paulista

March 23
High Energy Theory Seminar ✦ *The Quark Anti-Quark Potential in N=4 Super Yang-Mills* ✦ **Juan Maldacena**, Professor, School of Natural Sciences

March 28
Physics Group Meeting ✦ *Super-W(Infinity) Asymptotic Symmetry of Higher-Spin AdS(3) Supergravity* ✦ **Marc Henneaux**, Université Libre de Bruxelles

April 2
High Energy Theory Seminar ✦ *Current Results from the LHC and Plans for 8 TeV* ✦ **Chris Tully**, Princeton University

April 9
High Energy Theory Seminar ✦ *Progress in dS/CFT* ✦ **Andrew Strominger**, Harvard University

April 10
Informal High Energy Theory Seminar ✦ *Dualities and Quark-Gluon Plasmas* ✦ **Edward Shuryak**, Stony Brook University, The State University of New York

April 13
High Energy Theory Seminar ✦ *MFV SUSY: A Natural Alternative to R-parity* ✦ **Csaba Csaki**, Cornell University

April 17
High Energy Theory Informal Seminar ✦ *Strong Subadditivity of Entanglement Entropy and Quantum Field Theory* ✦ **Horacio Casini**, Centro Atómico Bariloche

April 20
High Energy Theory Seminar ✦ *2 Higgs or not 2 Higgs* ✦ **Kfir Blum**, Member, School of Natural Sciences

April 23
High Energy Theory Seminar ✦ *Loop Quantum Gravity: Recent Results and Open Problems* ✦ **Carlo Rovelli**, Centre de Physique Théorique, Aix-Marseille Université

April 26
Informal High Energy Theory Seminar ✦ *Unificaxion* ✦ **Alessandro Strumia**, Università di Pisa

May 4
High Energy Theory Seminar ✦ *Instantons, Twistors, and 4D Gravity* ✦ **Jonathan Heckman**, Member, School of Natural Sciences

May 7
High Energy Theory Seminar ✦ *New Applications of the Analytic S-matrix in String Theory* ✦ **Rutger Boels**, Deutsches Elektronon-Synchrotron

May 16
Physics Group Meeting ✦ *Spontaneous Breaking of Conformal Symmetry and an Alternative Point of View on RG Flows* ✦ **Zohar Komargodski**, Weizmann Institute of Science; Member, School of Natural Sciences

May 18
High Energy Theory Seminar ✦ *Integrability of the Deformed CP^{N-1} Sigma Model* ✦ **Adam Rej**, Member, School of Natural Sciences

May 21
High Energy Theory Seminar ✦ *Light Stops from Seiberg Duality* ✦ **Lisa Randall**, Harvard University

May 24
Informal Phenomenology Seminar ✦ *From Top A_{FB} to Charm Delta A_{CP}* ✦ **Yonit Hochberg**, Weizmann Institute of Science

June 14
Informal High Energy Theory Seminar ✦ *Uniqueness of Two-Loop Master Contours* ✦ **Kasper Larsen**, Commissariat à l'Énergie Atomique et aux Énergies Alternatives and Uppsala University

The Simons Center for Systems Biology Activities

July 19
The Simons Center for Systems Biology Seminar ✦ *Bis-peptides—Synthetic Organic Macromolecules with Programmable Shapes and Functional Group Display as Ligands for Mdm2* ✦ **Chris Schafmeister**, Temple University

August 2
The Simons Center for Systems Biology Seminar ✦ *Genome Sequences Reveal Inter-Strain Diversity in Virulent and Vaccine Strains of Alpha-Herpesviruses* ✦ **Moriah Szpara**, Princeton University

September 13
The Simons Center for Systems Biology Seminar ✦ *Linear Algebra and the Shapes of Bird Beaks* ✦ **Michael P. Brenner**, Harvard University

September 23
The Role of Systems Biology in Personalized Medicine Symposium ✦ *The Role of Cancer Stem Cells in Breast and Prostate Cancers* ✦ **Arnold J. Levine**, Professor Emeritus, School of Natural Sciences ✦ *Breast Cancer Treatment by Molecular Insights: Biology Trumps Stage?* ✦ **Laura van't Veer**, University of California, San Francisco ✦ *Why Are There No Companion Diagnostics and What Can We Do About It?* ✦ **David de Graaf**, Selventa ✦ *A Systems Approach to Breast Cancer Management—Omics and Beyond* ✦ **Joe W. Gray**, Oregon Health and Science University ✦ *Metabolomics: Fat Management by Human Cytomegalovirus* ✦ **Thomas Shenk**, Princeton University ✦ *Immune Profiling with High-Throughput Sequencing* ✦ **Harlan Robins**, Fred Hutchinson Cancer Research Center and Adaptive TCR Corporation

October 5
The Simons Center for Systems Biology Seminar ✦ *Molecular Motor Driven Self-Organization in Bacteria* ✦ **Joshua Shaevitz**, Princeton University

October 6
The Simons Center for Systems Biology Seminar ✦ *Computational Models of Plant Architecture* ✦ **Przemyslaw Prusinkiewicz**, University of Calgary

October 12
The Simons Center for Systems Biology Seminar ✦ *Retroviral Restriction Factors: ZAP, ZFP809, and New Aspects of Innate Immunity* ✦ **Stephen P. Goff**, Columbia University

October 19
The Simons Center for Systems Biology Seminar ✦ *Systems Biology of a Simple Organism: On* E. coli's *Memory and Computation* ✦ **Yuhai Tu**, IBM Thomas J. Watson Research Center, Yorktown Heights, New York

October 20
The Simons Center for Systems Biology Seminar ✦ *Characterizing Transcriptomes from High Throughput Sequencing Data: From Yeast to Mammals* ✦ **Moran Yassour**, The Hebrew University of Jerusalem

October 27
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Arvind Murugan**, Member, School of Natural Sciences

December 8
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Vijay Balasubramanian**, University of Pennsylvania

December 9
The Simons Center for Systems Biology Seminar ✦ *Populations in Lineage Perspective: Ages, Phenotypes, and Bacteria* ✦ **Edo Kussell**, New York University

January 5
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Benjamin Greenbaum**, Member, School of Natural Sciences

January 12
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Arnold J. Levine**, Professor Emeritus, School of Natural Sciences

January 26
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Sahand Jamal Rahi**, The Rockefeller University

February 2
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Jean-Claude Nicolas**, Université Pierre et Marie Curie; Member, School of Natural Sciences

February 9
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Dimitry Rinberg**, Janelia Farm Research Campus, Howard Hughes Medical Institute

February 10
The Simons Center for Systems Biology Seminar ✦ *Molecular Genetics of Melanoma* ✦ **Julide T. Celebi**, Columbia University

February 16
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Sergio Lukic**, Member, School of Natural Sciences

February 22
The Simons Center for Systems Biology Seminar ✦ *Non-Equilibrium Physics* ✦ **D. Eric Smith**, Santa Fe Institute

February 23
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **David S. Spiegel**, Member, School of Natural Sciences

The Simons Center for Systems Biology Seminar ✦ *The Logic of Metabolism Reflected in the Emergence, Organization, and Long-term Evolution of the Biosphere* ✦ **D. Eric Smith**, Santa Fe Institute

March 8
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Elisha Moses**, Weizmann Institute of Science

March 14
The Simons Center for Systems Biology Seminar ✦ *Genetic Consequences of Selfing in* C. elegans ✦ **Matthew Rockman**, New York University

March 20
The Simons Center for Systems Biology Seminar ✦ *Using Large Sets of Sequences to Predict Protein Structure* ✦ **Lucy Colwell**, Harvard University

March 21
Joshua Lederberg–John von Neumann Symposium ✦ *Scaling Pattern with Size during Development* ✦ **Naama Barkai**, Weizmann Institute of Science ✦ *Large Numbers and Evolutionary Dynamics* ✦ **Daniel S. Fisher**, Stanford University ✦ *Strategies of Stem Cell Fate in Adult Tissues* ✦ **Benjamin D. Simons**, University of Cambridge ✦ *Biological Evolution as a Form of Learning* ✦ **Leslie G. Valiant**, Harvard University ✦ *Abstraction for Quantitative Design: How a Computer Scientist Can Program Molecular Systems* ✦ **Erik Winfree**, California Institute of Technology

March 22
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Mina Teicher**, Bar-Ilan University; Member, School of Mathematics

April 5
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Tiberiu Tesileanu**, Member, School of Natural Sciences

The Simons Center for Systems Biology Seminar ✦ RB *Collaborators in Cancer* ✦ **David MacPherson**, Carnegie Institution for Science

April 12
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Vinod Krishna**, University of Texas Southwestern Medical Center

April 19
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Luca Peliti**, Università degli Studi di Napoli Federico II

Governor's Conference on Effective Partnering in Cancer Research ✦ *Histone Methylation Regulation and Recognition* ✦ **Yang Shi**, Boston Children's Hospital, Harvard Medical School ✦ *Epigenetic Regulation of the Genome* ✦ **Shelley L. Berger**, University of Pennsylvania ✦ *Stem Cell Signatures in Cancer* ✦ **Arnold J. Levine**, Professor Emeritus, School of Natural Sciences ✦ *Transcription, Chromatin, Epigenetics, and Cancer* ✦ **Ali Shilatifard**, Stowers Institute for Medical Research ✦ *DNA Methylation, Gene Silencing, and the Cancer Epigenome* ✦ **Stephen Baylin**, Johns Hopkins University School of Medicine

April 20
The Simons Center for Systems Biology Seminar ✦ *Fluctuation Theory for Cell Biology* ✦ **Johan Paulsson**, Harvard Medical School

The Simons Center for Systems Biology Seminar ✦ *TRIM33-Mediated Regulation of the PARP-Dependent DNA Repair Response* ✦ **Shridar Ganesan**, The Cancer Institute of New Jersey

April 26
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Rami Pugatch**, Weizmann Institute of Science

May 3
The Simons Center for Systems Biology Talks on Abstract/Conceptual/Quantitative Aspects of Biology ✦ **Arvind Murugan**, Member, School of Natural Sciences

May 9
The Simons Center for Systems Biology Seminar ✦ *The Ribosome: the Engine of the Living von Neumann's Constructor* ✦ **Tsvi Tlusty**, Weizmann Institute of Science; Member, School of Natural Sciences

May 14
The Simons Center for Systems Biology Seminar ✦ *p53 and Germline Mutation* ✦ **Chang S. Chan**, The Cancer Institute of New Jersey

The Simons Center for Systems Biology Seminar ✦ *Exploring the Viral Universe and the Panviral Proteome* ✦ **James M. Pipas**, University of Pittsburgh

June 13
The Simons Center for Systems Biology Seminar ✦ *Mechanisms and Models of Distal Enhancers in Inducible Gene Expression* ✦ **Martin Hemberg**, Boston Children's Hospital, Harvard Medical School

June 21
The Simons Center for Systems Biology Seminar ✦ *The Internal Rheology of Enzymes* ✦ **Giovanni Zocchi**, University of California, Los Angeles

The Simons Center for Systems Biology Seminar ✦ *PTEN in Prostate Epithelial Morphogenesis and Cancer* ✦ **Tamara Lotan**, Johns Hopkins University School of Medicine

June 28
The Simons Center for Systems Biology Seminar ✦ *X and the Art of Crossover Maintenance* ✦ **Judith L. Yanowitz**, Magee-Womens Research Institute, University of Pittsburgh School of Medicine

Prospects in Theoretical Physics

The 2012 Prospects in Theoretical Physics (PiTP) program gathered graduate students and postdoctoral scholars from around the world to the Institute for Advanced Study from July 9 to 20 to investigate "Computation and Biology." This marked the eleventh anniversary of the annual summer program and the first time it has addressed topics at the interface of theoretical computer science, statistical physics, and quantitative biology.

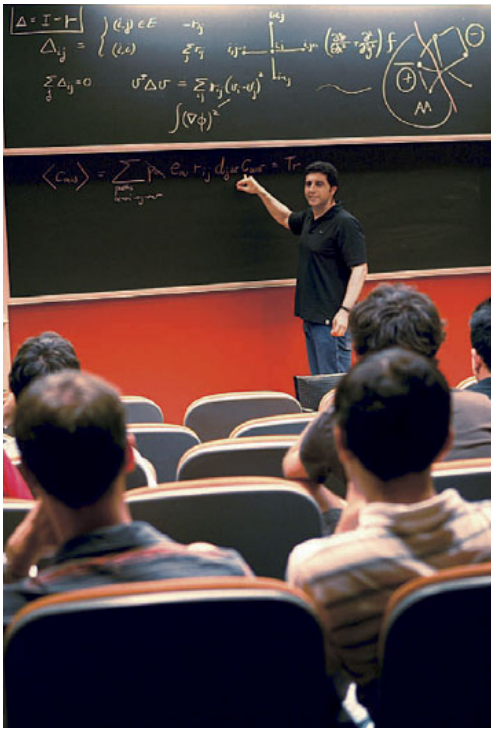
The program took an interdisciplinary view of science and explored exciting new links between biology, physics, and computing. PiTP builds on the strong relationship of the research groups at the Institute and Princeton University, and faculty members from both institutions are involved in the program.

The intensive two-week residential program was intended for graduate students and postdoctoral scholars from any of three fields: computer science, theoretical physics, and quantitative biology. More than eighty participants from some ten countries, including the United States, attended the lecture series on viruses and immunity, errors and codes, natural algorithms, growth and form, and learning and robotics. In addition to the lectures, participants worked through related problems in daily homework and discussion sessions.

PiTP, first held at the Institute in 2002, seeks to help the physics community train the next generation of scholars in various areas of theoretical physics. In past years, the program has covered a range of topics including cosmology, supersymmetry, astrophysics, and the physics of the Large Hadron Collider. A special effort is made to reach out to 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.

Prospects in Theoretical Physics 2012 was organized by Stanislas Leibler, a Professor in the Simons Center for Systems Biology in the Institute's School of Natural Sciences, together with Professors Bernard Chazelle and David Huse of Princeton University.

In addition to Arnold J. Levine, Professor Emeritus in the Simons Center for Systems Biology at the Institute, and Tsvi Tlusty, Member in the School of Natural Sciences, other lecturers were: Guillaume Bonfante (Université de Nancy); Arup Chakraborty (Massachusetts Institute of Technology); Enrico Coen (John Innes Centre, Norwich); Jean-Louis Deneubourg (Université Libre de Bruxelles); Måns Ehrenberg (Uppsala University); Dario Floreano (École Polytechnique Fédérale de Lausanne); Hod Lipson (Cornell University); Przemyslaw Prusinkiewicz (University of Calgary); and Guy Theraulaz (Université de Toulouse III-Paul Sabatier).



Graduate students and postdoctoral scholars from around the world gathered for the 2012 Prospects in Theoretical Physics program on computation and biology. The program explored new links between biology, physics, and computing. Lecturers included Member Tsvi Tlusty (top) and Professor Emeritus Arnold Levine (center photo, far right).

PHOTO CREDITS, TOP TO BOTTOM: AMY RAMSEY, AMY RAMSEY, KATHERINE BELYI

ANDREA KANE

A seminar, “On Borders,” was organized with the Collège de France as part of a multi-year collaborative program with the Institute.

School of Social Science

Faculty

Danielle S. Allen, UPS Foundation Professor

Didier Fassin, James D. Wolfensohn Professor

Eric S. Maskin, Albert O. Hirschman Professor *(through December 31, 2011)*

Joan Wallach Scott, Harold F. Linder Professor

Professors Emeriti

Albert O. Hirschman

Michael Walzer

The School of Social Science invited twenty-four scholars from a pool of 231 applicants from the United States and abroad to be part of the School's scholarly community as Members for the 2011–12 academic year. Ten Visitors also participated in the year's activities. Fields of inquiry of the group included anthropology, economics, sociology, history, political science, law, philosophy, American studies, and film and media studies. Funding for Memberships and other School activities from Carnegie Corporation, the Leon Levy Foundation, the Friends of the Institute, and AMIAS, and endowment funding provided by Deutsche Bank, Roger W. Ferguson Jr. and Annette L. Nazareth, Richard B. Fisher, the Florence Gould Foundation, and the Wolfensohn Family Foundation, is gratefully acknowledged.

During the 2011–12 academic year the School conducted four seminar series: the Social Science Thursday Luncheon Seminar; the Morals and Moralities Seminar led by Professor Didier Fassin; a Reading Group led by Professor Joan Scott; and the IAS Economics Seminar led by Professor Eric Maskin during the fall term and continued under the direction of Member W. Bentley MacLeod during the spring term. 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/publications.

Danielle S. Allen, UPS Foundation Professor, was on leave in the fall term. During the rest of the year, she worked on several book manuscripts, including "The Art of Association," on the relationship between late twentieth-century changes in the law of association in the United States and practices of citizenship; "E-publics," on the impact of new media on the public sphere; and "Education and Equality," to be given as a series of lectures at Harvard University in spring 2013. She hosted two workshops at the Institute on youth, new media, and citizenship and gave lectures and papers at IAS, the University of Virginia, and Cardozo Law School.

Didier Fassin, James D. Wolfensohn Professor, led the School's theme seminar on Morals and Moralities, which brought together scholars from anthropology, sociology, history, law, political science, and philosophy. He gave courses on moral anthropology at Princeton University and on moral economies at the École des Hautes Études en Sciences Sociales in Paris. He gave lectures on critical moral anthropology at Harvard University; the empire of trauma at Rutgers, The State University of New Jersey and the Pontificia Universidade Católica de São Paulo; the global situation of refugees at the University of Hong Kong and the Centro Cultural Banco do Brasil; and the politics of humanitarianism at Fordham University, the University of Chicago, and Peking University. On other moral issues, he delivered the Political and Legal Anthropology Distinguished Lecture at the American Anthropological Association annual meeting in Montreal and the Roger Allan Moore Lecture at Harvard Medical School. He coedited *Économies Morales Contemporaines* (La Découverte) and completed the collective volume "Moral Anthropology," forthcoming from Wiley-Blackwell, as well as several papers on justice,

truth, and resentment. As part of the "Ideas" Advanced Grant that he was awarded by the European Research Council, he organized an international conference, "In the Heart of the State: How Institutions Treat their Public," in Paris, and published *La Force de l'Ordre: Une Anthropologie de la Police des Quartiers* (Le Seuil), which is based on the ethnography of the police he conducted in France during the time of the riots. The reception of the book in the media and the talks he gave to non-academic audiences became the matter of a reflection on the place of the social sciences in the public sphere, which he addressed for the first Walter Goldschmidt Lecture at the University of California, Los Angeles. Other presentations included lectures on the theory of ideology and on the politics of human rights at Princeton University. Finally, a seminar, "On Borders," was organized with the Collège de France as part of a multi-year collaborative program with the Institute.

Eric S. Maskin, Albert O. Hirschman Professor, gave keynote addresses last summer at meetings of the European Association of Environmental and Resource Economists in Rome, and the Asian Law & Economics Association in Hong Kong. He also spoke on "Recent Developments in Mechanism Design" at the sixteenth World Congress of the International Economic Association in Beijing. In August, he gave lectures on "Elections and Strategic Voting: Condorcet and Borda" in Seoul at the Asian Meeting of the Econometric Society and at a meeting of Nobel Laureates in Lindau, Germany. In September, he spoke on "Implementation in Sub Game Perfect Equilibrium" at the National Research University in Moscow, before receiving an honorary doctorate from Azerbaijan State Economic University. In October, Maskin lectured at the Global Economic Symposium in Kiel, Germany, and at the Salamanca Social Science Festival in Spain, and participated in a panel discussion on "Research and Creativity" in Brussels as part of the

Faculty and Members participated in the Morals and Moralities seminar organized by Professor Didier Fassin (far center).

CLIFF MOORE

hundredth anniversary of the Solvay Conference on Physics. In November, he participated in the fourth Annual Festival of Thinkers in Abu Dhabi, as well as panel discussions at Stanford University and at the Nobels Colloquia in Venice. Having served as the first Albert O. Hirschman Professor in the School of Social Science since 2000, Maskin stepped down at the end of 2011 to take a position at Harvard University.

ANDREA KANE

Member Sherine Hamdy (center), whose research focused on transformations in Egypt's sociopolitical landscape, Adrian Favell (left), Professor of Sociology at Sciences Po, and Member Elizabeth Bernstein (right), who studied the construction of "sex trafficking" as a moral and political issue

Joan Wallach Scott, Harold F. Linder Professor, published *The Fantasy of Feminist History* (Duke University Press) in the fall. In October, she participated in a colloquium in Paris that focused on her work: "Actualités du genre: sur et avec Joan W. Scott." In June, she was awarded an Honorary Doctorate of Humane Letters at Princeton University's commencement. She gave the keynote address at a conference on "Emancipation" at the University of Amsterdam. She gave a series of lectures at Södertörn University in Sweden and at the American University in Cairo. She lectured at the University of Konstanz in Germany, Brown University, New York University, the University of Wisconsin-Madison, and York University in Canada. She served on a fellowship selection committee for the American Council of Learned Societies, and continued her work as an editor of the new journal *History of the Present*, now in its second year. And she continues to be active, along with a group of New York-based writers and scholars, in a protest against a major plan to restructure the New York Public Library.

During the academic year 2011–12, Professor Emeritus **Michael Walzer** completed *In God's Shadow: Politics in the Hebrew Bible* (Yale University Press). Four of his previous volumes were published in additional languages: *Exodus and Revolution* in Romanian; *Thick and Thin* in Polish and Farsi; *Politics and Passion* in Albanian; and *Arguing about War* in Chinese. During a four-month period in Israel, May through August 2011, Walzer gave lectures on just war theory at Bar-Ilan University, the Hebrew University of Jerusalem, and at the Center for Interdisciplinary Studies. In October, Walzer delivered the Shepard Lee Lecture at the University of Southern Maine on the idea of social justice, and in November, he participated in a panel on Paul Goodman at the U.S. Intellectual History Conference at the Graduate Center, The City

Left: Fuhito Kojima of Stanford University (left) led an Economics Workshop on promoting school competition through a market design approach. Right: The focus of Member Kabir Tambar's (right) research was the stakes of challenging, as well as of yielding to, the seductions of modernity in the contemporary Muslim world.

ANDREA KANE

ANDREA KANE

Member Peter Vanderschraaf gave a Lunch Seminar on convention and natural law.

University of New York. Also in November, Walzer gave a Rider University lecture on the ethics of war, and in January, he gave the keynote address at the Society of Jewish Ethics meeting on "The Idea of Peace in the Hebrew Bible." In March, he gave the keynote lecture at a Kean University conference on just war, titled "Can the Good Guys Win?" and in April, he gave the Aaron Roland Endowed Lecture at the Taube Center for Jewish Studies at Stanford University, and also lectured for the Stanford Philosophy Department on just war theory. In May, he was the keynote speaker at a YIVO Institute for Jewish Research conference on "Jews and the Left," and in June, he gave a lecture on "Visions of Peace in the Hebrew Bible" at Drexel University. Walzer was awarded an honorary doctor of letters, honoris causa, by the Jewish Theological Seminary in May. 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 and on a book about the politics of national liberation. Walzer continues as coeditor of *Dissent* magazine.

MEMBERS AND VISITORS

s Second Term ✦ *v* Visitor

Celeste Arrington
Political Science ✦ The George Washington University
Ginny and Robert Loughlin Founders' Circle Member

Asli Ü. Bâli
Law ✦ University of California, Los Angeles ✦ *v, s*

Gail Bederman
History ✦ University of Notre Dame

Elizabeth Bernstein
Sociology ✦ Barnard College

Andreas Blume
Economics ✦ University of Pittsburgh
Roger W. Ferguson Jr. and Annette L. Nazareth Member

Jonathan Caverley
Political Science ✦ Northwestern University ✦ *v*

Wendy Hui Kyong Chun
New Media Studies ✦ Brown University

Thomas J. Csordas
Anthropology ✦ University of California, San Diego

Jeremiah Dittmar
Economics ✦ American University
Deutsche Bank Member

James Doyle
Philosophy ✦ Institute for Advanced Study ✦ *v*

Sherine F. Hamdy
Anthropology ✦ Brown University
The Wolfensohn Family Member

Alexander L. Hinton
Anthropology ✦ Rutgers, The State University of New Jersey

Beth Kiyoko Jamieson
Political Science ✦ Institute for Advanced Study ✦ *v*

Janis H. Jenkins
Anthropology ✦ University of California, San Diego

Andrew Johnston
Architecture, Cultural Geography ✦ Xi'an Jiaotong-Liverpool University, Suzhou, China ✦ *v*

Amy Kaplan
American Studies ✦ University of Pennsylvania

Eugene Kontorovich
Constitutional and International Law ✦ Northwestern University School of Law
Deutsche Bank Member

Jennifer S. Light
History ✦ Northwestern University

Jennifer A. London
Political Science ✦ Institute for Advanced Study ✦ *v*

Steven Lukes
Sociology ✦ New York University

W. Bentley MacLeod
Economics ✦ Columbia University
Leon Levy Foundation Member

Karuna Mantena
Political Science ✦ Yale University

Eric S. Maskin
Economics ✦ Harvard University ✦ *v, s*

Andrew Moravcsik
Political Science, International Relations, European Studies ✦ Princeton University ✦ *v*

Angel Adams Parham
Sociology ✦ Loyola University, New Orleans

In-Uck Park
Economics ✦ University of Bristol
Richard B. Fisher Member

Nancy Scheper-Hughes
Anthropology ✦ University of California, Berkeley

Jessica E. Sewell
Architectural History ✦ Institute for Advanced Study

Judith Surkis
History ✦ Institute for Advanced Study ✦ *v*

Kabir Tambar
Anthropology ✦ Stanford University

Kimberly Theidon
Anthropology ✦ Harvard University

Peter Vanderschraaf
Philosophy ✦ University of California, Merced

Justus von Daniels
Law and Religion, Sociology of Law ✦ Benjamin N. Cardozo School of Law, Yeshiva University ✦ *v*

Jarrett Zigon
Anthropology ✦ University of Amsterdam
AMIAS Member

RECORD OF EVENTS

September 21
Morals and Moralities Seminar ✦ Planning Meeting

September 29
Social Science Thursday Lunch Seminar ✦ *Egypt's Organ Transplant Debate and the Scale of Morality* ✦ **Sherine F. Hamdy**, Brown University; Member, School of Social Science

October 3
Economics Workshop ✦ *Robust Predictions in First Price Auctions* ✦ **Stephen E. Morris**, Princeton University

October 5
Morals and Moralities Seminar ✦ *Durkheim on Morals and Moralities* ✦ **Steven Lukes**, New York University; Member, School of Social Science

October 6
Social Science Thursday Lunch Seminar ✦ *An Anthropology of Moralities: Going Beyond Good and Evil* ✦ **Jarrett Zigon**, University of Amsterdam; Member, School of Social Science

October 12
Morals and Moralities Seminar ✦ *Anthropology of Morality: Between Reproduction and Freedom* ✦ **Joel Robbins**, University of California, San Diego

October 13
Social Science Thursday Lunch Seminar ✦ *Financial Crises: Why They Occur and What to Do about Them* ✦ **Eric S. Maskin**, Albert O. Hirschman Professor, School of Social Science

October 17
Economics Workshop ✦ *Contagion and Uninvadability in Social Networks with Bilingual Option* ✦ **Satoru Takahashi**, Princeton University (joint work with Daisuke Oyama)

October 19
Morals and Moralities Seminar ✦ *Discussion of readings focused on the theme "Moral Economies"* ✦ **Didier Fassin**, James D. Wolfensohn Professor, and **Joan Wallach Scott**, Harold F. Linder Professor, School of Social Science

October 20
Social Science Thursday Lunch Seminar ✦ *Incentives Writ Large: On Economics, Causality and Education* ✦ **W. Bentley MacLeod**, Columbia University; Member, School of Social Science

October 26
Reading Group ✦ Planning Meeting

October 27
Social Science Thursday Lunch Seminar ✦ *Power, Sex, and Furniture: Masculinity and the Bachelor Pad in 1950s–60s America* ✦ **Jessica E. Sewell**, Member, School of Social Science

October 31
Economics Workshop ✦ *Contract Language* ✦ **Andreas Blume**, University of Pittsburgh; Member, School of Social Science

November 2
Morals and Moralities Seminar ✦ *Discussion of readings focused on the themes "Trafficking" and "Trafficking: Sex and Kidneys"* ✦ **Elizabeth Bernstein**, Barnard College, and **Nancy Scheper-Hughes**, University of California, Berkeley; Members, School of Social Science

November 3
Social Science Thursday Lunch Seminar ✦ *Convention and Natural Law* ✦ **Peter Vanderschraaf**, University of California, Merced; Member, School of Social Science

November 6
Reading Group ✦ *The Vexed Relationship of Emancipation and Equality* ✦ **Joan Wallach Scott**, Harold F. Linder Professor, School of Social Science

November 9–11
Media, Youth, and Citizenship Workshop ✦ Organized by **Danielle S. Allen**, UPS Foundation Professor, School of Social Science

November 10
Social Science Thursday Lunch Seminar ✦ *The Ghosts of Montes de Oca: Naked Life and the Medically Disappeared: A Hidden Subtext of the Argentine Dirty War and its Sequelae* ✦ **Nancy Scheper-Hughes**, University of California, Berkeley; Member, School of Social Science

November 14
Economics Workshop ✦ *On Continuous-Time Modeling of (otherwise) Finite Games* ✦ **In-Uck Park**, University of Bristol; Member, School of Social Science

November 17
Social Science Thursday Lunch Seminar ✦ *Big Fish or Big Pond?: Intra-organization Inequality and Formation of Hierarchical Organizations* ✦ **In-Uck Park**, University of Bristol; Member, School of Social Science

November 21
Economics Workshop ✦ *Relational Incentive Contracts with Persistent Private Information* ✦ **James Malcomson**, University of Oxford

November 28
Reading Group ✦ *Discussion of book proposal* ✦ **Amy Kaplan**, University of Pennsylvania; Member, School of Social Science

Economics Workshop ✦ *Alliance Formation and Coercion in Networks* ✦ **Timo Hiller**, University of Oxford

November 30
Morals and Moralities Seminar ✦ *Discussion of readings focused on the theme "Philosophies of Morality"* ✦ **James Doyle**, Visitor, School of Social Science

December 1
Social Science Thursday Lunch Seminar ✦ *Pro-Life, Pro-Choice, and the Limits of Individualism: Thinking Historically about US Abortion Controversies* ✦ **Gail Bederman**, University of Notre Dame; Member, School of Social Science

December 5
Reading Group ✦ *Practice Job Talk* ✦ **Judith Surkis**, Visitor, School of Social Science

December 7
Roundtable Discussion ✦ *Occupy Wall Street*

December 8
Social Science Thursday Lunch Seminar ✦ *Angry Boy, Angry Girl: Rage as a Moral Emotion among Troubled Adolescents* ✦ **Thomas J. Csordas**, University of California, San Diego; Member, School of Social Science

December 12
Economics Workshop ✦ *Promoting School Competition Through School Choice: A Market Design Approach* ✦ **Fuhito Kojima**, Stanford University

December 14
Morals and Moralities Seminar ✦ *Discussion of readings focused on the theme "Individual Choice"* ✦ **Sherine F. Hamdy**, Brown University, and **Janis H. Jenkins**, University of California, San Diego; Members, School of Social Science

December 15
Reading Group ✦ *Discussion of a book chapter* ✦ **Gail Bederman**, University of Notre Dame; Member, School of Social Science

January 18
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Perpetrators, Bystanders, and Collaborators," Part I* ✦ **Alexander Hinton**, Rutgers, The State University of New Jersey, and **Kimberly Theidon**, Harvard University; Members, School of Social Science

January 19
Social Science Thursday Lunch Seminar ✦ *Meaning in Games: Indeterminacy and Communication Failure* ✦ **Andreas Blume**, University of Pittsburgh; Member, School of Social Science

Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Perpetrators, Bystanders, and Collaborators," Part II* ✦ **Jan T. Gross**, Princeton University

January 20
Reading Group ✦ *Discussion of* American Routes ✦ **Angel Adams Parham**, Loyola University, New Orleans; Member, School of Social Science

January 23
Economics Workshop ✦ *Behavioral Competitive Equilibrium and Extreme Prices* ✦ **Wolfgang Pesendorfer**, Princeton University (joint work with Faruk Gul and Tomasz Strzalecki)

January 26
Social Science Thursday Lunch Seminar ✦ *From Pirates to Pinochet and Back: The Paradox of Universal Jurisdiction* ✦ **Eugene Kontorovich**, Northwestern University School of Law; Member, School of Social Science

February 1
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Evil"* ✦ **Thomas J. Csordas**, University of California, San Diego; Member, School of Social Science

February 2
Social Science Thursday Lunch Seminar ✦ *Historical Critique and the Limits of Political Modernity in Turkey* ✦ **Kabir Tambar**, Stanford University; Member, School of Social Science

February 6
Economics Workshop ✦ *Trade and Inequality: From Theory to Estimation* ✦ **Oleg Itskhoki**, Princeton University

February 9
Social Science Thursday Lunch Seminar ✦ *Who Are We? What Louisiana Can Teach Us about Being American* ✦ **Angel Adams Parham**, Loyola University, New Orleans; Member, School of Social Science

February 10
Reading Group ✦ *Discussion of book proposal for "Bachelor Modern: Imagining the Masculine Interior in Postwar America"* ✦ **Jessica E. Sewell**, Member, School of Social Science

February 15
Morals and Moralities Seminar ✦ *Ethical Subjects* ✦ **Michael Lambek**, University of Toronto

February 16
Social Science Thursday Lunch Seminar ✦ *The Transitional Justice Imaginary: Uncle San, Aunty Yan, and the Khmer Rouge Tribunal* ✦ **Alexander L. Hinton**, Rutgers, The State University of New Jersey; Member, School of Social Science

February 22
Economics Workshop ✦ *What Do Judges Do? Recent Theoretical Advances* ✦ **Charles M. Cameron**, Princeton University and New York University School of Law; **Nolan M. McCarty**, Princeton University; and **Lewis A. Kornhauser**, New York University School of Law

February 23
Social Science Thursday Lunch Seminar ✦ *Zionism as Anti-Colonialism: The Case of* Exodus ✦ **Amy Kaplan**, University of Pennsylvania; Member, School of Social Science

February 29
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Morality and Politics in Tension," followed by a screening of the Iranian film* A Separation ✦ **Karuna Mantena**, Yale University; Member, School of Social Science

March 1
Social Science Thursday Lunch Seminar ✦ *Markets and Morals* ✦ **Steven Lukes**, New York University; Member, School of Social Science

March 5
Economics Workshop ✦ *Behavioral Competitive Equilibrium* ✦ **Faruk Gul**, Princeton University (joint work with Wolfgang Pesendorfer and Tomasz Strzalecki)

March 8
Social Science Thursday Lunch Seminar ✦ *Building the Virtual to Save the Real: The Junior Republic Movement, 1895–1945* ✦ **Jennifer S. Light**, Northwestern University; Member, School of Social Science

March 9
Reading Group ✦ *Discussion of work-in-progress* ✦ **Celeste Arrington**, The George Washington University; Member, School of Social Science

March 14
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Critical Studies of Good and Right(s)"* ✦ **Jarrett Zigon**, University of Amsterdam; Member, School of Social Science

March 15
Social Science Thursday Lunch Seminar ✦ *Information Technology and Economic Change: The Impact of the Printing Press* ✦ **Jeremiah Dittmar**, American University; Member, School of Social Science

March 19
Economics Workshop ✦ *The Welfare Impact of a New Good: The Printed Book* ✦ **Jeremiah Dittmar**, American University; Member, School of Social Science

March 22
Social Science Thursday Lunch Seminar ✦ *Gandhi and the Means-Ends Question in Politics* ✦ **Karuna Mantena**, Yale University; Member, School of Social Science

March 28
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Moral Argument and Politics"* ✦ **Michael Walzer**, Professor Emeritus, School of Social Science

March 29
Social Science Thursday Lunch Seminar ✦ *Tainted Blood and the Politics of Redress in Japan and South Korea* ✦ **Celeste Arrington**, The George Washington University; Member, School of Social Science

April 2
Economics Workshop ✦ *Moral Hazard and Long-Run Incentives* ✦ **Yuliy Sannikov**, Princeton University

April 11
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Moral Criticism, Between Secularism and Religion"* ✦ **Kabir Tambar**, Stanford University; Member, School of Social Science

April 12
Social Science Thursday Lunch Seminar ✦ *Brokered Subjects: Sex, Trafficking, and the Politics of Freedom* ✦ **Elizabeth Bernstein**, Barnard College; Member, School of Social Science

A Conversation with French Rapper Hamé ✦ *The Evolution of French Rap Music and its Relation to Politics in France* ✦ Moderated by **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science

April 13
Reading Group ✦ *Discussion of work-in-progress* ✦ **Angel Adams Parham**, Loyola University, New Orleans; Member, School of Social Science

April 18
Reading Group ✦ *After KONY 2012* ✦ **Asli Ü. Bâli**, University of California, Los Angeles; Visitor, School of Social Science

April 19
Social Science Thursday Lunch Seminar ✦ *Patterns of Precariousness: Trauma and Social Danger* ✦ **Janis H. Jenkins**, University of California, San Diego; Member, School of Social Science

April 25
Morals and Moralities Seminar ✦ *Human Rights Between Morality and Politics* ✦ **Samuel Moyn**, Columbia University

April 26
Social Science Thursday Lunch Seminar ✦ *Imagined Networks, Glocal Connections* ✦ **Wendy Hui Kyong Chun**, Brown University; Member, School of Social Science

April 30
Economics Workshop ✦ *An Approach to Equilibrium Based on Stability and Concertation* ✦ **Bruno Strulovici**, Northwestern University

May 3
Social Science Thursday Lunch Seminar ✦ *Speaking of Silences: Gender, Violence, and Redress in Peru* ✦ **Kimberly Theidon**, Harvard University; Member, School of Social Science

May 9
Morals and Moralities Seminar ✦ *Discussion of readings on the theme "Moralities and Politics"* ✦ **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science

May 10
Social Science Thursday Lunch Seminar ✦ *Plato and Moral Psychology* ✦ **James Doyle**, Visitor, School of Social Science

May 14
Economics Workshop ✦ *One-Sided Uncertainty and Delay in Reputational Bargaining* ✦ **Dilep Abreu**, Princeton University

June 4–5
Seminar with Collège de France ✦ *On Borders* ✦ Organized by **Didier Fassin**, James D. Wolfensohn Professor, School of Social Science

June 13–15
Media, Youth, and Citizenship Workshop ✦ Organized by **Danielle S. Allen**, UPS Foundation Professor, School of Social Science

ANDREA KANE

Barney Bramham, Member in the School of Mathematics, in the Mathematics–Natural Sciences Library in Fuld Hall

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 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 Library contains a collection of Mongolian and East Asian materials, the library of Walther Heissig, a noted Central Asian studies scholar, which came from the Princeton University East Asian Studies Department and Princeton University Library. The Library holds Giorgio Tonelli's collection of Enlightenment materials as well as collections from past Professors including Ernst H. Kantorowicz, Erwin Panofsky, Kirk Varnedoe, Oleg Grabar, Clifford Geertz, and Harry Woolf. The microfilm collections of the HS–SS Library include a large selection from *Manuscripta*, a collection of early printed books from the Vatican Library, and a microfilm copy of the slips presented for the *Thesaurus Linguae Latinae* from the Bavarian Academy, with additional recent material on CD. The Library has microfilm copies of the papers of Simone Weil.

The Library houses the Shelby White and Leon Levy Archives Center (Christine Di Bella, Archivist). The records in the collection 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 and oral history collections. Digitized copies of many photographs, documents, and other materials from the archives are available online at http://cdm.itg.ias.edu. The reading room for the archives 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.

The Mathematics–Natural Sciences Library supports the three outreach programs of the Institute, namely Women and Mathematics, Prospects in Theoretical Physics, and the IAS/Park City Mathematics Institute held annually, the first two at the Institute and the third in Park City, Utah. Books relevant to the assigned research areas of these programs are collected and made available to the participants.

Both of the Institute's libraries provide individualized services, access to databases, and environments to facilitate research. The Libraries participate in the OCLC Research Libraries Partnership, which affords Institute scholars access to an extensive interlibrary loan system. The Institute's online catalogue is accessible via http://library.ias.edu. Scanners and other support peripherals are available in the Libraries.

All scholars affiliated with the Institute enjoy the same privileges as Princeton University faculty in the Princeton University Library system and 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, ancient DNA analysis, the very latest developments in string theory, the mathematical basis of computer security, morals and morality in contemporary society, and the implications of the discovery of a Higgs-like boson.

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 array of concerts, lectures, and programs as listed on the following pages. In addition, the Institute offers numerous and varied activities for Members, Visitors, and their families. In the 2011–12 academic year, these included films, play readings, clay modeling and beading classes, yoga, tennis lessons, jazz evenings, trips to museums and other cultural sites, and activities for children in the Institute community.

A range of events is also organized for the Friends of the Institute, including Friends Forums, Fireside Chats, a Culture and Cuisine Series, monthly breakfasts and lunches with IAS Members, a holiday reception, and the annual picnic hosted by the Director. Several special gatherings are also held during the year for members of the Founders', Chairman's, and Director's Circles.

ANDREA KANE

RECORD OF EVENTS

September 20
Member Welcome Reception

September 23
AMIAS Family Barbecue

October 3
Public Lecture ✦ *Our Words, and Theirs: A Reflection on the Historian's Craft Today* ✦ **Carlo Ginzburg**, Professor Emeritus, University of California, Los Angeles

October 5
Friends Forum ✦ *Randomness and Pseudo-randomness* ✦ **Avi Wigderson**, Herbert H. Maass Professor, School of Mathematics

October 9
Princeton Symphony Orchestra Concert ✦ *Brass Quintet* ✦ **Jerry Bryant** and **Wayne du Maine**, trumpets; **Andrew Bove**, tuba; **RJ Kelley**, horn; **Brian Mahany**, trombone

October 15
American Repertory Ballet Family Program ✦ *Romeo and Juliet*

October 21
Friends Culture and Cuisine ✦ *The Queen of Fats: Why We Still Don't Understand the Importance of Omega-3's* ✦ **Susan Allport**, Science Writer, Lecturer

October 28
Public Lecture ✦ *Knots and Quantum Theory* ✦ **Edward Witten**, Charles Simonyi Professor, School of Natural Sciences

November 4–5
Edward T. Cone Concert Series ✦ *The Composer Performs* ✦ **Timothy Andres**, piano; **Derek Bermel**, clarinet; **Harumi Rhodes**, violin

Edward T. Cone Concert Series Talk ✦ **Timothy Andres** and **Derek Bermel**, Artist-in-Residence

November 8
Writers Conversation ✦ *Conversation with Stephen Sondheim* ✦ **Stephen Sondheim**, Composer and Lyricist

November 9
Friends Forum ✦ *Ecocultural Rights and Resistance: Stories from the North and South* ✦ **Subhankar Banerjee**, Director's Visitor, Photographer, Activist

November 11
AMIAS Lecture ✦ *Objectivity: The Limits of Scientific Sight* ✦ **Peter L. Galison**, Joseph Pellegrino University Professor, Harvard University

November 16
Public Lecture ✦ *Education and Equality* ✦ **Danielle S. Allen**, UPS Foundation Professor, School of Social Science

November 18
Friends Fireside Chat ✦ *Arts and Crafts: The American Experience* ✦ **David Rago**, Founder, Rago Arts and Auction Center

November 20
Princeton Symphony Orchestra Concert ✦ *French Music for Winds and Piano* ✦ **William Amsel**, clarinet; **Nicholas Masterson**, oboe; **Natalya Rose Vrbsky**, bassoon; **Amy Yang**, piano

November 30
Public Policy Lecture ✦ *The Global Water Crisis and the Coming Battle for the Right to Water* ✦ **Maude Barlow**, Chair, The Council of Canadians, and Chair, Food and Water Watch

December 2–3
Edward T. Cone Concert Series ✦ *From Two Sides* ✦ **Uri Caine**, piano, and **Mario Laginha**, piano

Edward T. Cone Concert Series Talk ✦ **Uri Caine**, **Mario Laginha**, and **Derek Bermel**, Artist-in-Residence

December 7
Public Lecture ✦ *Survival in the Face of the Unknown: Lessons from Bacteria* ✦ **Stanislas Leibler**, Professor, School of Natural Sciences

December 13
Children's Holiday Party

December 15
Mulled Wine and Mince Pie Reception

January 19
Member Welcome Reception

January 20
Writers Conversation ✦ *Conversation with Will Eno* ✦ **Will Eno**, Playwright

January 22
Princeton Symphony Orchestra Concert ✦ *Violin Recital* ✦ **Soyeon Lee**, piano; **Sunghae Anna Lim**, violin

January 24
Art and Its Spaces Lecture Series ✦ *I Sell the Shadow to Support the Substance* ✦ **Darcy Grimaldo Grigsby**, Professor, University of California, Berkeley

February 1
Public Lecture ✦ *Primes and Equations* ✦ **Richard Taylor**, Professor, School of Mathematics

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ALL PHOTOS ANDREA KANE

February 10
Friends Fireside Chat ✦ *A Geographer and Some Ambling Footsteps* ✦ **Helen Goddard**, Sixth Form Geography Teacher

February 17–18
Edward T. Cone Concert Series ✦ **Jeremy Denk**, piano

Edward T. Cone Concert Series Talk ✦ **Jeremy Denk** and **Derek Bermel**, Artist-in-Residence

February 25
Midwinter Party for Faculty, Members, and Staff

March 4
Princeton Symphony Orchestra Concert ✦ *Music Inspired by Literature* ✦ **Emilie-Anne Gendron**, violin; **Stephanie Griffin**, viola; **Michael Haas**, cello; **Asmira Woodward-Page**, violin

March 7
Public Lecture ✦ *Celebrating Modern Democracy's Beginning: The "British Club" in Paris (1789–93)* ✦ **Jonathan Israel**, Professor, School of Historical Studies

March 9
Friends Culture and Cuisine ✦ *Baby Food and the Industrialization of Taste* ✦ **Amy Bentley**, Associate Professor, New York University

March 16
Institute Talk ✦ *The First Five Kilobytes are the Hardest: Alan Turing, John von Neumann, and the Origins of the Digital Universe at the IAS* ✦ **George Dyson**, Science and Technology Historian

March 23–24
Edward T. Cone Concert Series ✦ *Sounds of the Dragon: A Chinese-American Musical Harvest* ✦ **Music from Copland House** and **Music from China**

Edward T. Cone Concert Series Talk ✦ **Michael Boriskin**, **Susan Cheng**, **Wang Guowei**, **Du Yun**, and **Derek Bermel**, Artist-in-Residence

March 30
Friends Forum ✦ *The Middle Ages: Modern European Nationalism and the Fight to Control the Past* ✦ **Patrick Geary**, Professor, School of Historical Studies

April 3
Art and Its Spaces Lecture Series ✦ *Crowded Walls: Twentieth-Century Nostalgia for Nineteenth-Century Installation* ✦ **Martha Ward**, Associate Professor, The University of Chicago

April 14
Princeton Symphony Orchestra BRAVO! Family Concert ✦ *Woodwind Trio*

April 17
Art and Its Spaces Lecture Series ✦ *Sperm Bomb: Art, Feminism, and the American War in Vietnam* ✦ **Mignon Nixon**, Professor, The Courtauld Institute of Art

April 23
Institute Community Concert ✦ *The Institute Plays! A Showcase of IAS Musicians* ✦ **Derek Bermel**, clarinet; **Robert Geraci**, piano; **Steven Lukes**, piano; **Eric S. Maskin**, clarinet; **Stacey Stimac**, flute; **Christina von Döbeln**, cello

April 25
Friends Forum ✦ *Who's Got the Knife? The Role of Surgeons in Transnational Trafficking* ✦ **Nancy Scheper-Hughes**, University of California, Berkeley; Member, School of Social Science

April 26
Leon Levy Lecture ✦ *Pay for Performance or Performance for Pay: The Economics of the Employment Contract from Roman Times to Our Time* ✦ **W. Bentley MacLeod**, Columbia University; Member, School of Social Science

May 4
Public Lecture ✦ *Secularism and Gender Equality* ✦ **Joan Wallach Scott**, Harold F. Linder Professor, School of Social Science

May 7
Writers Conversation ✦ *John Collins, Gatz, and the Elevator Repair Service* ✦ **John Collins**, Founder and Artistic Director, Elevator Repair Service

May 23
Friends Annual Meeting and Picnic

June 12
Staff Picnic

After Hours Conversations

The After Hours Conversations program, launched in February 2008 to encourage inter-School conversations in an informal and relaxed environment, continued in 2011–12. Talks were 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. The program was organized by a group of four IAS Faculty members, Nicola Di Cosmo of the School of Historical Studies, Didier Fassin of the School of Social Science, Helmut Hofer of the School of Mathematics, and Piet Hut of the Program in Interdisciplinary Studies. The program was chaired by Piet Hut, with all four Faculty members taking turns moderating the discussions. 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 black holes swallowing stars to using game theory to think about Chinese characters, dilemmas in prostate cancer, who pays for wars in a democracy, and purifying randomness. A webpage (www.ids.ias.edu/after-hours-conversations) provides information on dates, speakers, and topics. The program will continue in 2012–13.

BENTLEY DREZNER

Peter Goddard, Director (2004–2012), spoke at an After Hours Conversation on challenges facing the Institute.

BENTLEY DREZNER

Working materials of Director's Visitor Tom Phillips

Special Programs

Program in Interdisciplinary Studies

Piet Hut continued to divide his time between his research in astrophysics and his responsibilities as head of the Program in Interdisciplinary Studies. The latter program had sixteen visitors, with durations of their visits ranging from days to weeks to months to a year, in fields including mathematical physics, astrophysics, computer science, philosophy, science writing, cognitive science, media studies, classical music, and literature.

During the year, Hut organized a series of After Hours Conversations with colleagues Nicola Di Cosmo from the School of Historical Studies, Didier Fassin from the School of Social Science, and Helmut Hofer from the School of Mathematics. These conversations 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.

In astrophysics, together with colleagues Ataru Tanikawa and Jun Makino, Hut published a paper that described the formation of the first tight double star in the core collapse of a dense stellar system. While this process had been observed indirectly in stellar dynamics simulations going back to the 1960s, as yet nobody had been able to show in microscopic detail how such a double star comes into being, through exactly what cascade of encounters with other stars in the core. When they showed the details of this process, through the development and application of several new software algorithms, they found that two major aspects of conventional wisdom in the formation of such double stars needed to be replaced. One was related to the unexpectedly strong role of simultaneous many-body effects, and the other to the large jumps in binding energy of double stars jockeying for position in becoming tight enough to survive.

Also in astrophysics, Hut continued to co-organize further meetings by the MODEST consortium (for MOdeling DEnse Stellar Systems) that he cofounded ten years earlier. The first was the MODEST-10d workshop in Kobe, Japan, titled "High-Level Languages for Hugely Parallel Astrophysics Simulations: Dialogues between Computer Scientists and (Astro)physicists," where Hut gave the introductory talk. The second one was the MODEST-11 workshop in Leiden, Holland. The third one was the MODEST-11a workshop in Tokyo, Japan, titled "New Mathematical Techniques for High Performance Computing," where he also gave the introductory talk.

Examples of Hut's activities in the Program in Interdisciplinary Studies are a short series of weekly lectures by Visitors that he organized, including talks by Monica Manolescu about "Ways of (Not) Knowing: Cartography, Art, Literature," and by Philip Ording about "Variations on a Proof: Mathematical Exercises in Style." Another example is a talk given by Jacob Bourjaily on "The Geometry of Quantum Field Theory," in preparation for a TED talk on "Transforming the Universe" that he was asked to give later in spring 2012. Hut also gave the annual William Witherspoon Lecture in Theology and Science at the Center for Theological Inquiry in Princeton.

As part of his ongoing research of virtual worlds, Hut explored OpenSim, an alternative environment, 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 (www.mica-vw.org) and for the Kira Institute (www.kira.org), focused on interdisciplinary collaborations. As an example of the power of virtual worlds to reach larger audiences, in October 2011, Hut gave a lecture, followed by a discussion, on "Exploring the Use of Virtual Worlds for Interdisciplinary Research," in a mixed virtual/real event organized at Exeter University in the United Kingdom in "real life" and in the European University campus in Second Life.

Artist-in-Residence Program

The Artist-in-Residence program, established in 1994, creates a musical presence at the Institute. In 2011–12, **Derek Bermel**, a composer and clarinetist, continued as the Institute's Artist-in-Residence, organizing the Edward T. Cone Concert Series as well as a series of Writers Conversations and a concert featuring musicians from the Institute community.

The Edward T. Cone Concert Series continued its "Harmonic Series," developed by Bermel to explore a wide variety of aesthetic perspectives in art music, especially of the twentieth and twenty-first centuries, through concerts and related talks. The series is open to the public as well as the Institute community and drew capacity crowds throughout the season. The season opened with *The Composer Performs*, with Bermel on clarinet and Timothy Andres on piano performing, with the violinist Harumi Rhodes, their own compositions in a prism of compositions by Aaron Copland, Charles Ives, Francis Poulenc, and Robert Schumann. In the next concerts, *From Two Sides*, Uri Caine and Mario Laginha, world-renowned jazz pianists and composers, reinterpreted baroque forms at the border of composition and improvisation. The season continued with solo piano concerts by Jeremy Denk, who performed works by Bach and Beethoven, as well as Book 1 of György Ligeti's *Études*. In *Sounds of the Dragon: A Chinese-American Musical Harvest*, the final Edward T. Cone Concert of the season, the groups Music from Copland House and Music from China initiated a collaboration featuring works written for hybrid ensembles of Western and Chinese instruments. The concert included world premieres by Bermel and Du Yun.

BENTLEY DREZNER

Stephen Sondheim (left) discussed his life and work as a composer and lyricist in a conversation with Artist-in-Residence Derek Bermel (right).

Three Writers Conversations took place during the year, continuing a series of discussions centered on the creative process. In the first, Stephen Sondheim discussed his life and work in musical theater as a composer and lyricist. In January, the playwright Will Eno read from his work and explained his writing process. In the final Writers Conversation of the year, John Collins, the founder and Artistic Director of the theater ensemble Elevator Repair Service, described the ensemble's unique approach to creating theater, including *Gatz*, an acclaimed six-hour enactment of *The Great Gatsby*.

In April, Bermel organized a concert of musicians from the Institute community, including the duo Robert Geraci, Member in the School of Historical Studies, on piano, and Stacey Stimac, the Institute's Pastry Chef, on flute; Steven Lukes, Member in the School of Social Science, playing jazz piano; Christina von Döbeln, the spouse of School of Mathematics Member Anders Södergren, performing on cello; and a clarinet duet by Bermel and Eric Maskin, Albert O. Hirschman Professor in the School of Social Science.

In addition to serving as the Institute's Artist-in-Residence, Bermel continued as Creative Advisor to the American Composers Orchestra and Composer-in-Residence with the Los Angeles Chamber Orchestra. His compositional work during the year included *Orbit Design*, a collaboration with Helmut Hofer, Professor in the School of Mathematics, inspired by symplectic geometry. The piece was commissioned by and performed at the Look and Listen Festival in New York as a tribute to John Cage. Bermel also collaborated with Yasiin Bey (the hip-hop artist formerly known as Mos Def) to create arrangements for orchestra of Bey's songs. Bey and the Brooklyn Philharmonic performed the works in a concert at Bedford-Stuyvesant Restoration Plaza in Brooklyn. The Young People's Chorus of New York City presented Bermel's *A Child's War*, based on a text by his father, Albert Bermel, in New York and Stockholm. Bermel's performances included serving as soloist in Aaron Copland's Clarinet Concerto with the American Composers Orchestra at Carnegie Hall.

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.

BENTLEY DREZNER

Tom Phillips, painter, writer, and composer

Tom Phillips

Tom Phillips shall miss the Institute. His times there in the last few years have hugely enlarged the scope of his ignorance.

Subhankar Banerjee

When Subhankar Banerjee arrived at the Institute, he was editing the anthology *Arctic Voices: Resistance at the Tipping Point*. He had hoped for a quiet and contemplative environment. He got that, and much more—the woods were only a few steps away, and the silence was broken every day by loud calls of geese around dawn and around dusk that reminded him of the many birds that connect the Arctic to every land and to the oceans of our earth. After giving six talks at the Institute and Princeton University, walks in the woods, and conversations with colleagues, he completed edits for the book and began writing his introduction. *Arctic Voices*, with thirty-nine written pieces and works by sixteen artists, was published in July 2012.

Louise Dolan

Louise Dolan spent the academic year at the Institute working on aspects of string theories and gauge theories. She published a paper with Peter Goddard on constructing a complete equivalence between tree-level gluon-scattering amplitudes in twistor string theory and Yang-Mills gauge theory.

BENTLEY DREZNER

Photographs of the Arctic by Subhankar Banerjee were exhibited in the Institute's Simons Hall.

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 in Park City, Utah, the three-week Summer Session combines high-quality lectures and seminars with activities and events designed to foster all-institute interaction. The unique interaction at PCMI creates strong bonds throughout the mathematical community and increases awareness of the roles and the contributions of all professionals in mathematics-based occupations.

In addition to the Annual Summer Session, PCMI offers year-round professional development outreach activities to secondary school mathematics teachers around the nation through the Committee on Teachers as Professionals Project and through PCMI's Professional Development and Outreach Groups.

Another method of outreach is through the publications offered by PCMI. The Graduate Summer School lectures are collected in their own volumes, the Park City Mathematics Series, published by the American Mathematical Society (AMS) 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-second Summer Session was held July 1–21, 2012, in Park City and attracted some four hundred participants combined in all programs.

The following programs comprised the Summer Session (except as noted, all programs met for the entire three weeks):

Graduate Summer School
High School Student Mathematics Camp (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 2012 the topic was "Geometric Group Theory." The topic "Making Mathematical Connections" provided the focus for the Secondary School Teachers Program and the High School Student Mathematics Camp.

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.

Graduate Summer School and Research Program

TODD ROYAL HICKEN

PCMI is a program of professional development for the mathematics community, including research mathematicians, graduate and undergraduate students, undergraduate faculty, and mathematics teachers at the secondary school level.

The Graduate Summer School and the Research Program in Mathematics were organized by Professors Mladen Bestvina, University of Utah; Michah Sageev, Technion–Israel Institute of Technology; and Karen Vogtmann, Cornell University. This year's theme, "Geometric Group Theory," is a very broad area of mathematics whose objective is to study groups using diverse tools from topology, geometry, algebra, analysis, and dynamics, and the Graduate Summer School lecture series reflected this diversity. The Research Program's centerpiece was a series of lectures on the recent breakthrough by Ian Agol and Dani Wise on the geometry of hyperbolic cube complexes that solved the last major three-manifold conjectures.

Graduate Summer School

The 2012 Graduate Summer School had nine lecture series (with a total of thirty-six lectures), each on a particular aspect of geometric group theory. 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 within a single university. Attendance at all lectures was very high and included participants from all schools and programs.

Graduate Summer School Lecture Series 2012

"Topology and Geometry of Outer Space," Mladen Bestvina

"Property T, Expanders, and Approximate Groups," Emmanuel Breuillard

"Structure of CAT(0) Spaces and their Isometry Groups," Pierre-Emmanuel Caprace

"Arithmetic Groups, Locally Symmetric Manifolds, and some Asymptotic Invariants," Tsachik Gelander

"Rotating Families, Dehn Fillings, and Small Cancellation," Vincent Guirardel

"Quasi-Isometric Rigidity," Michael Kapovich

"Some Arithmetic Groups that Do Not Act on the Circle," Dave Morris

"CAT(0) Cube Complexes," Michah Sageev

"Geometric Rigidity and the Geodesic Flow in Negative Curvature," Amie Wilkinson

The Research Program in Mathematics

A broad spectrum of highly active researchers in the field of geometric group theory were recruited to participate in this year's research program. A significant number of them stayed the entire three weeks of the Summer Session.

The main formal activity of the research program consisted of nine hours of research talks each week. The 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

TODD ROYAL HICKEN

The Summer Session attracted some four hundred participants across all programs.

conversations wherever they could find space. Many of these conversations are likely to develop into new collaborations.

The highlight of this year's program consisted of the exposition of the recent breakthrough in the theory of special cube complexes by Ian Agol and Dani Wise. Agol gave two formal talks and a third informal lecture after dinner. Agol's collaborator Jason Manning, as well as Wise's collaborator Piotr Przytycki, gave one formal and two informal talks each. One of the graduate lectures by Michah Sageev covered the background material on cube complexes.

The speakers in the Research Seminar and their talk titles were:

"The Virtual Haken Conjecture, Part I and Part 2," Ian Agol

"Recognition Problems, Profinite Completions of Groups, and Cube Complexes," Martin Bridson

"Bounded Cohomology with Coefficients and Groups Acting on Quasi-Trees," Ken Bromberg

"Finiteness Properties of the Braided Thompson's Group V_{br}," Kai-Uwe Bux

"Outer Space for Right-Angled Artin Groups," Ruth Charney

"A Stability Conjecture for the Unstable Cohomology of Mapping Class Groups, $SL_n\mathbb{Z}$, and Aut(F_n)," Tom Church

"Hairy Graphs and the Homology of Out(F_n)," Jim Conant

"Permutations and Polynomiality in Algebra and Topology," Benson Farb

"Subsurface Projection in the Out(F_n)-Setting," Mark Feighn

"Rigidity of Actions on CAT(0) Cube Complexes," Alessandra Iozzi

"Realization and Dismantlability," Sebastian Hensel

"Canonical Quasi-Trees for Right-Angled Artin Groups," Thomas Koberda

"Mapping Class Groups, Kleinian Groups, and Convex Cocompactness," Chris Leininger

"Relative Hyperbolicity and Hierarchies for Finitely Presented Groups," Lars Louder

"Relatively Hyperbolic Dehn Filling," Jason Manning

"Hyperbolicity of the Free Splitting Complex of F_n (joint work with Michael Handel)," Lee Mosher

"Invariant Measures and Divisibility," Piotr Przytycki

"Mixed 3-manifolds are Virtually Special," Shahar Mozes

"Totally Disconnected Groups (Not) Acting on Three-Manifolds," John Pardon

"On Fully Irreducible Elements of the Outer Automorphism Group of a Free Group," Alexandra Pettet

"Measure-Preserving Words are Primitive," Doron Puder

(Title unpublished), Iddo Samet

(Title unpublished), Bill Thurston

"Cohomology of Arithmetic Groups," Kevin Wortman

Clay Senior Scholars in Residence

Through the generous support of the Clay Mathematics Institute, PCMI is able to nominate two Senior Scholars in Residence for each Summer Session. The Scholars are nominated from among the international leadership in the research topic, are required to be in residence at PCMI for the entire three weeks as part of the Research Program, and give a public all-institute lecture while at PCMI. The 2012 Clay Scholars at PCMI were Alex Lubotzky of the Hebrew University of Jerusalem and William Thurston of Cornell University. Due

to Thurston's ill health, Martin Bridson from the University of Oxford was awarded the status of Senior Scholar-in-Residence and gave the public all-institute lecture. Since the Summer Session ended, Thurston passed away on August 21, 2012; PCMI was honored to have him in residence for two weeks and to be a part of his final work. Thanks go to Thurston's son, Dylan, for accompanying his father to PCMI and assisting with his talk, and to Martin Bridson for his willingness to assume the responsibilities of the Clay Scholar.

Secondary School Teachers Program

The 2012 Secondary School Teachers Program (SSTP) attracted sixty-four teachers from all levels. The participants followed an intense daily schedule that included learning mathematics, reflecting on the practice of teaching mathematics in today's classrooms, and working together in groups to create products to be shared with their colleagues.

Participants took part in a daily two-hour mathematics problem-solving course; this year's course was entitled "Moving Things Around: Card Shuffles, Repeating Decimals, and Geometric Transformations." By focusing on symmetry and group theory, the course provided a connection with PCMI's Research Program topic of "Geometric Group Theory." Beginning with the problem of why eight repeated perfect shuffles of a deck of cards return the cards to their original positions, participants pursued this problem for decks of various size, investigating specific examples using modular arithmetic (especially the group of units in $\mathbb{Z}_n$) and repeating decimals (and repeating binary expansions), making surprising connections to remainders in the long division algorithm on the way. The course connected these ideas to symmetry groups of regular polygons and polyhedra and arrived at the construction and application of several Cayley graphs, an important concept for the "Geometric Group Theory" topic. On the last day, the course ended with a brief, elegant proof that there exist only five regular polyhedra.

The materials for the mathematics problem-solving courses were created by a team led by Al Cuoco and Bowen Kerins from the Educational Development Center (EDC); instructors for the course were Darryl Yong of Harvey Mudd College and Kerins, a mathematics educator from EDC and a former math teacher.

In the daily "Reflecting on Practice" session, participants considered research related to teaching and learning mathematics with a particular focus on questioning and how it impacts instruction. The discussion was grounded in the research literature as participants worked collaboratively to better understand why questions are an important component of instruction and how they can use questioning in their own classrooms to promote student understanding. A staff of six teacher-leaders designed and led the sessions under the guidance and supervision of the SSTP leadership team. Videos of classrooms from the United States and other countries, transcripts, research findings, articles, assessment results, and student work were used to prompt an analysis of effective questioning and how it can be enacted in classrooms.

Every afternoon, each of the participants took part in one of seven working groups on data analysis, functions, geometry, discrete mathematics, lesson study, preparing for the implementation of the Common Core State Standards, and a group that took part in the mathematics course given as part of PCMI's Undergraduate Faculty Program. In this last working group, participants not only learned about the research topic "Geometric Group Theory," but also wrote reflections on how the mathematics of the course related to their own teaching at the high school level. These and abstracts of the other working group reports can be found at

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Participants in the Secondary School Teachers Program took part in a daily two-hour mathematics problem-solving course; this year's course was titled "Moving Things Around: Card Shuffles, Repeating Decimals, and Geometric Transformations."

http://mathforum.org/pcmi/hstp/sum2012/abstracts.html. The working group on functions focused on preparing a matrix of examples to enable their colleagues to understand the role of functions in the Common Core State Standards in Mathematics. 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. The SSTP publications editor, Bob Stein, met with the working groups, individual teachers, and working group leaders who have projects nearing completion. The lesson study group's report and the work of the functions group were immediately processed for review and potential publication.

The c-TaP Project

New this year is the Committee on Teachers as Professionals project (c-TaP), which is composed of representatives of eleven organizations associated with mathematics education in the United States. The c-TaP project supports the concept that it is mathematics teachers who should have a leadership role in implementing the Common Core State Standards in Mathematics (CCSSM) from the beginning, and that this role should expand as the CCSSM are implemented across the nation. To promote this concept, three c-TaP working groups in the SSTP drafted professional development activities and a facilitator's guide for workshops on implementing the CCSSM at the elementary, middle, and high school levels. These workshops were piloted in July and August by some of the developers who were participants at PCMI.

Other Connected Programs

The Service, Teaching, and Research (STaR) project for new faculty in mathematics education, organized by Robert and Barbara Reys from the University of Missouri, met during the third week of PCMI. The structured conversation at lunch among the SSTP participants and the STaR participants from similar geographic areas was a productive and informative opportunity for the two communities to interact.

A high school student Math Camp was a pilot feature at PCMI in 2012. Organized by Troy Jones, a teacher from Westlake High School in Alpine, Utah, with funding from IM Flash Technologies, the program enabled twelve select high school students to attend PCMI for the second week. The students, chaperoned by a subset of parents, worked in their own classroom on the same mathematical problem sets as the SSTP participants in the morning and had a series of afternoon speakers from nearby universities, industries, or from other PCMI programs. They also attended and took part in the cross-program activities (e.g., Clay Mathematics Institute lectures, pizza and problem solving session) and attended the SSTP sessions held in late afternoon or evening (e.g., origami building). In addition to their own class work and homework, the students functioned as the laboratory for the first teaching done by the SSTP's lesson study working group. They also managed to complete two weeks of the mathematics course during their morning sessions and were able to join the SSTP participants in the mathematics course on their last day at PCMI.

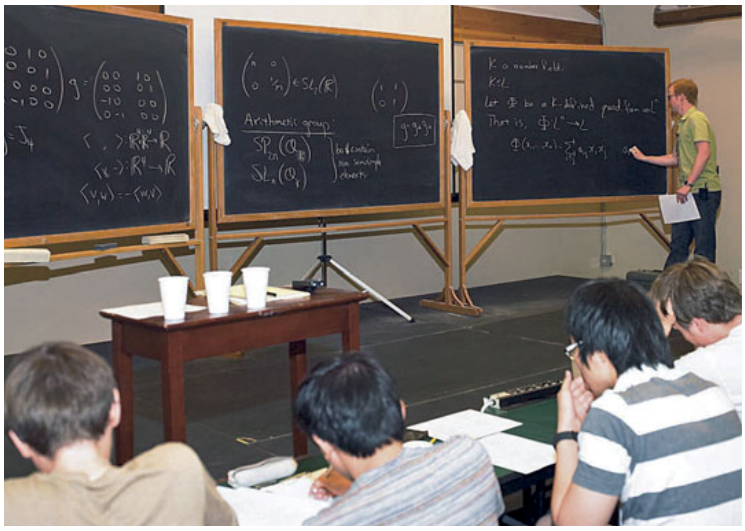
Distance learning

In addition to the SSTP in Park City, eleven teachers from Las Cruces, New Mexico, funded through a National Science Foundation grant, participated in the program through electronic "e-tables," which enabled distance learning via real-time screen images and interaction between the two sites. The New Mexico e-tables were organized by Susana Salamanca, a mathematician at New Mexico State University, and facilitated by Rina Martinez, a past SSTP participant, with Soledad Gonzales and Robyn Perkins, all three middle school teachers.

Undergraduate Faculty Program

For faculty members whose main focus is teaching undergraduate students, the Undergraduate Faculty Program (UFP) at PCMI offers the opportunity to renew excitement about mathematics, talk with peers about new teaching approaches, address some challenging research questions, and interact with the broader mathematical community. The UFP is unique in that it bridges the educational and research objectives of PCMI.

This year's UFP instructor/coordinator was Moon Duchin of Tufts University. Duchin approached the UFP program in a new, experimental way, with an emphasis on fostering research ties between the participants and on developing an excellent source of potential research problems in geometric group theory for undergraduate students.



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Some forty undergraduate students took part in PCMI's 2012 Undergraduate Summer School. PCMI offers two distinct courses for undergraduates, one introductory and one advanced, with students self-selecting into either or both.

Unlike previous years, each of the sixteen participants had experience in geometric group theory, or at least in areas close by. In the first week, each UFP participant gave a roughly thirty minute talk on their research. This set up a common language for all the people in the UFP. The second and third weeks had two components. First, the participants came up with a list of topics in geometric group theory that they wanted to know more about, and various people in the Research Program were asked to give introductory talks on these topics, explicitly modeled on the "What is …" articles in the *Notices of the American Mathematical Society*. Second, and more importantly, there were sessions at least twice a day with all the participants brainstorming research problems, both for themselves and for students. The problems they generated have been collected and organized. A number of the participants are planning on having students start on some of these problems this fall.

Duchin is writing a grant for a follow-up conference in a year and a half for the participants and their students, with the hope that the conference proceedings would be published by the AMS. More importantly, the UFP participants want to document how they are creating their own research community.

Undergraduate Summer School

Some forty undergraduate students took part in PCMI's 2012 Undergraduate Summer School. PCMI offers two distinct courses for undergraduates, one introductory and one advanced, with students self-selecting into either or both.

The introductory course by Jennifer Taback of Bowdoin College drew on the text by John Meier on *Groups, Graphs, and Trees: An Introduction to the Geometry of Infinite Groups.* Although the text contains more than one can typically cover in a full semester, Taback managed to motivate, explore, and establish key results in each of the chapters. She developed ideas briskly, at the board, with, as the class progressed, significant collaboration with and among her students. Her course also attracted a few graduate students, a few participants in the Undergraduate Faculty Program, and ten or so thoroughly engaged high school teachers.

Kevin Wortman of the University of Utah offered the advanced course on "Arithmetic Groups." This subject and course draws on a broad array of insights and theories, resulting in an integrated series of mini-courses on matrix groups, Lie groups, hyperbolic geometry, and analysis. His course attracted several graduate students and several participants from the Undergraduate Faculty Program.

Workshop for Mentors of Undergraduate Mathematics Research by Minority Students (WfM)

New to PCMI this year was a workshop funded by the National Science Foundation through a targeted supplement to PCMI's larger grant. The first Workshop for Mentors of Undergraduate Mathematics Research by Minority Students (WfM) was held at PCMI July 9–13, 2012. Organized and conducted by Steven Cox of Rice University and Dennis Davenport of Howard University, the workshop attracted some twenty-two applicants from a variety of institutions, some which specifically serve minorities. Ten participants were selected to

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The Secondary School Teachers Program attracted sixty-four teachers from all levels.

take part in the workshop, whose focus was to enable more mentors to successfully engage minority undergraduate students in mathematical research. The stated goals of the workshop were:

- to construct or select exciting undergraduate-tractable research problems;
- to transform their mentees into confident speakers and writers of mathematics;
- to acquire group-building skills and so create communities of scholars;
- to design and/or augment curricula for academic and/or summer research; and
- to construct competitive proposals to fund and sustain the above activities.

The program met for three to four hours each day, and was joined by the Undergraduate Faculty Program on three occasions for a joint session. The content sessions served to inform the younger participants and to anchor the daily discussion periods. These discussions brought up concrete challenges and approaches to (1) preparing and mentoring underrepresented groups and (2) supporting faculty and fostering research at minority-serving institutions, and they worked to identify suitable funding mechanisms and ways to better integrate and/or grow related PCMI activities. In particular, the ten participants and two instructors constituted four working groups, with some members contributing to more than one group. Each group generated and presented an outline for a program for addressing points 1 and 2 above.

Group one reviewed the BYU/CURM REU model and proposed to establish something of its ilk at Howard University. Group two proposed an Undergraduate Faculty-Student Partnership program that would pair mentors and students at minority-serving institutions and provide (1) faculty incentives to offer a springtime background course in the upcoming PCMI theme and (2) seats in the undergraduate program for some fraction of those students. A third group proposed a variant on the NSF RTG model that would bring multiple mentors and their students to PCMI, with the lead mentor coming from a minority-serving institution. The fourth group proposed a Proposal Writing Workshop with significant stress on hands-on components and expert follow-up, with the intent to not merely prepare the faculty member but to see that each member submits a complete, competitive proposal. Discussion of these four ideas is ongoing, both among the twelve workshop members and the PCMI Steering Committee.

Cross-Program Activities

In order to bring together the entire PCMI community during the three weeks of the annual Summer Session, many cross-program activities were planned by the organizers, including socials and dinners, creative and outdoor activities, and a number of talks.

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 via a special website created by the Math Forum at Drexel University. The proceedings and briefs of the International Seminar on Mathematics Education are also published on the website at the Math Forum, http://mathforum.org/pcmi/.

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IAS/Park City Mathematics Institute Governance and Management

Science Initiative Group (SIG)

The Science Initiative Group (SIG) has been dedicated to fostering science in developing countries since its founding as an IAS outreach program in 1999. For the past five years, its main project has been the Regional Initiative in Science and Education, known as RISE. With funding from Carnegie Corporation of New York, RISE supports five university-based research and training networks in science and engineering in sub-Saharan Africa. The initiative is designed to address Africa's urgent need for qualified research and teaching staff in subjects relevant to the continent's development.

RISE in numbers: The five RISE networks involve fourteen universities and research institutes in nine countries. As of June 2012, 129 students, including forty-one women and eighty-eight men, hailing from fourteen nations in Africa, have benefited directly from participation in RISE. Masters degrees were awarded to eighteen RISE students, and seven earned doctorates. As these RISE graduates began or resumed university careers, their students became the first indirect beneficiaries of the initiative.

Highlights from the RISE Networks: A year of firsts: Tanzanian physiologist Gaymary Bakari and chemist Faith Mabiki were among the first students to earn their doctorates through RISE-AFNNET, the African Natural Products Network. Since they received their degrees in 2011, both scholars have been employed by Sokoine University of Agriculture in Morogoro, Tanzania, where they continue their research and mentor younger students. The two RISE graduates are collaborators in the search for cures for major poultry diseases. Mabiki, based in the Department of Science, is working to isolate and identify the most efficacious chemical compounds of natural products, while Bakari, in the Department of Veterinary Medicine, tests the effectiveness and safety of various dosages. Their research has led to three patents, including one for the use of crude extract from *Synadenium glaucescens* for treatment of viral diseases in poultry.

The September 2011 Pan-African School of Materials, co-organized by AMSEN, the African Materials Science and Engineering Network, and AUST, the African University of Science and Technology in Abuja, Nigeria, was the first event jointly sponsored by RISE and AUST, and it anticipated the formal partnership between the two institutions, described below. Graduate students from AMSEN, as well as AUST and several other African universities, participated in the two-week workshop with instruction led by Lesley Cornish, AMSEN Academic Director and Director of the DST/NRF Centre of Excellence in Strong Materials at University of the Witwatersrand, South Africa, and Wole Soboyejo, Professor of Engineering at Princeton University and, since January 2012, President of AUST. Students were introduced to phase diagrams and advanced concepts in the fatigue and fracture of materials. Course materials were posted on the RISE website (http://sig.ias.edu/rise), where they remain available as a free resource for students of materials science.

The four Western Indian Ocean Regional Initiative (WIO-RISE) students who received M.Sc. degrees from the University of Dar es Salaam in October 2011 were that university's first RISE graduates. Lightness Mrema's research topic was "A Hydrodynamic Model of Mnazi Bay." She is continuing her academic career in her native Tanzania. Avelino Langa, from Mozambique, who researched "Eddies Variability and their Influence on the Primary Productivity in the Mozambique Channel," is Senior Lecturer and Head of Biological Science at Eduardo Mondlane University in Maputo. Pramod Chumun and Ravina Maurice, both from Mauritius, studied different aspects of *Symbiodinium* harbored by reef-building corals common to Tanzania and Mauritius. Chumun





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is undertaking Ph.D. studies in Japan, while his compatriot Maurice is working as a research assistant for the Mauritius Council on Rodrigues Island.

The Southern African Biochemistry and Informatics for Natural Products Network was the first to create a Virtual Research Environment (VRE), which has enabled enhanced interactions among students and faculty. The secure digital workspace is available to natural products researchers in and beyond the network. Thanks to the VRE, Moola Nyambe, a RISE M.Sc. student from the University of Namibia, has been engaged in an active exchange of information with her supervisors in South Africa and Namibia on her research on "Phytochemical and Anti-microbial Analysis of Secondary Metabolites from *Diospyros lycioides* and *Euclea divinorum* (chewing sticks)."

In May 2012, Kelebogile Mpho of the Sub-Saharan Africa Water Resources Network arrived in Princeton for a five-month term as the first student to take advantage of a new partnership between SIG/RISE and Princeton University. Mpho, an M.Phil. candidate from the University of Botswana's Okavango Research Institute, is part of Princeton's Visiting Student Research Collaborators program. She is conducting research under the supervision of Kelly Caylor of Princeton's Department of Civil and Environmental Engineering.

African footprint: RISE was conceived as an African initiative by and for Africans, with SIG assuming an advisory and developmental role and taking on initial administrative responsibility. The intention since the start has been to help develop the managerial capacity and local support that will enable RISE to become a fully Africa-owned initiative, with SIG maintaining an advisory role. In March 2012, SIG entered into an agreement with AUST-Abuja stipulating that the two organizations would share responsibility for RISE, with the proportion of duties shifting gradually toward AUST over a period of years.

Activities: In addition to numerous specialized academic conferences in which RISE students and faculty participated, SIG and/or RISE representatives were involved with the following activities:

- RISE annual meeting, Kampala, Uganda, October 2011
- Association of International Educational Administrators annual conference, Washington DC, February 2012
- SIG board meeting, Paris, France, March 2012
- African Development Bank's forum on Science, Technology, and Innovations for Youth Employment, Human Capital Development, and Inclusive Growth, Nairobi, Kenya, April 2012
- African Development Bank's Human Development Strategy Consultation, Washington DC, May 2012
- International Foundation for Science–African Academy of Sciences workshop on "Getting and Using Equipment for Scientific Research," Nairobi, Kenya, May 2012

Further information about SIG and RISE is available at www.ias.edu/sig and www.twitter.com/SIGatIAS.

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Michel Reymond
Chef/Manager, Dining Services

Michael Gehret
Associate Director for Development and Public Affairs

Susannah Coleman
Senior Development Officer

Christine Ferrara
Senior Public Affairs Officer

Catherine Fleming
Senior Development Officer

Pamela Hughes
Senior Development Officer

Kelly Devine Thomas
Senior Publications Officer

Library Administration

Momota Ganguli
Librarian, Mathematics and Natural Sciences

Marcia Tucker
Librarian, Historical Studies and Social Science (also Coordinator of Information Access for Computing, Telecommunications, and Networking Administration)

Christine Di Bella
Archivist

School Administration

Mary Jane Hayes
Administrative Officer
School of Mathematics

Donne Petito
Administrative Officer
School of Social Science

Michelle Sage
Administrative Officer
School of Natural Sciences

Suzanne P. Christen
Executive Director and Administrator
The Simons Center for Systems Biology
School of Natural Sciences

Marian Gallagher Zelazny
Administrative Officer
School of Historical Studies

Programs

Catherine E. Giesbrecht
Program Officer
IAS/Park City Mathematics Institute

Arlen K. Hastings
Executive Director, Science Initiative Group

Computing, Telecommunications, and Networking Administration

Jeffrey Berliner
Manager of Computing

Brian Epstein
Computer Manager
Network and Security

Jonathan Peele
Computer Manager
Information Technology Group

James Stephens
Computer Manager
School of Natural Sciences

Thomas Howard Uphill
Computer Manager
School of Mathematics

Edna Wigderson
Manager
Databases and Integration

Present and Past Directors

(in order of service as of June 30, 2012)

Abraham Flexner · Frank Aydelotte

J. Robert Oppenheimer · Carl Kaysen · Harry Woolf

Marvin L. Goldberger · Phillip A. Griffiths · Peter Goddard

Present and Past Faculty

(2011–2012 Faculty and Faculty Emeriti are in bold)

Stephen L. Adler · James W. Alexander · Andrew E. Z. Alföldi · **Danielle S. Allen**

Nima Arkani-Hamed · Michael F. Atiyah · John N. Bahcall · Arne K. A. Beurling · **Yve-Alain Bois**

Enrico Bombieri · Armand Borel · **Jean Bourgain** · **Glen W. Bowersock**

Caroline Walker Bynum · Luis A. Caffarelli · **Angelos Chaniotis** · Harold F. Cherniss · Marshall Clagett

Giles Constable · **Patricia Crone** · José Cutileiro · Roger F. Dashen · **Pierre Deligne**

Nicola Di Cosmo · **Freeman J. Dyson** · Edward M. Earle · Albert Einstein · John H. Elliott

Didier Fassin · **Patrick J. Geary** · Clifford Geertz · Felix Gilbert · James F. Gilliam · Kurt Gödel

Hetty Goldman · **Peter Goldreich** · Oleg Grabar · **Phillip A. Griffiths** · **Christian Habicht**

Harish-Chandra · Ernst Herzfeld · **Albert O. Hirschman** · **Helmut Hofer** · Lars V. Hörmander · **Piet Hut**

Jonathan Israel · Ernst H. Kantorowicz · George F. Kennan · **Robert P. Langlands** · **Irving Lavin**

Tsung-Dao Lee · **Stanislas Leibler** · **Arnold J. Levine** · Elias A. Lowe · **Robert MacPherson**

Juan Maldacena · Avishai Margalit · **Eric S. Maskin** · Jack F. Matlock, Jr. · Millard Meiss

Benjamin D. Meritt · John W. Milnor · David Mitrany · Deane Montgomery · Marston Morse

J. Robert Oppenheimer · Abraham Pais · Erwin Panofsky · **Peter Paret** · Tullio E. Regge

Winfield W. Riefler · Marshall N. Rosenbluth · **Peter Sarnak** · **Joan Wallach Scott** · **Nathan Seiberg**

Atle Selberg · Kenneth M. Setton · Carl L. Siegel · **Thomas Spencer** · Walter W. Stewart

Bengt G. D. Strömgren · **Richard Taylor** · Homer A. Thompson · **Scott Tremaine** · Kirk Varnedoe

Oswald Veblen · **Vladimir Voevodsky** · John von Neumann · **Heinrich von Staden**

Michael Walzer · Robert B. Warren · André Weil · Hermann Weyl · **Morton White** · Hassler Whitney

Avi Wigderson · Frank Wilczek · **Edward Witten** · Ernest Llewellyn Woodward

Chen Ning Yang · Shing-Tung Yau · **Matias Zaldarriaga**

Institute for Advanced Study—
Louis Bamberger and Mrs. Felix Fuld Foundation

Financial Statements
June 30, 2012 and 2011

(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, 2012 and 2011, 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, 2012 and 2011, and the changes in its net assets and its cash flows for the years then ended in conformity with U.S. generally accepted accounting principles.

KPMG LLP

November 14, 2012

STATEMENTS OF FINANCIAL POSITION
JUNE 30, 2012 AND 2011

Assets		2012	2011
Cash and cash equivalents	$	6,201,135	6,612,912
Accounts receivable		835,459	320,377
Grants receivable		4,325,582	4,991,868
Prepaid expenses and other assets		1,036,276	866,085
Contributions receivable—net		50,480,353	1,148,040
Unamortized debt issuance costs—net		467,346	518,933
Funds held by bond trustee		2,407,508	5,141,266
Beneficial interest in remainder trust		2,834,108	3,206,005
Land, buildings and improvements, equipment and rare book collection—net		69,544,447	59,800,972
Investments		607,790,303	607,661,511
Total assets	$	745,922,517	690,267,969
Liabilities and Net Assets			
Liabilities:			
Accounts payable and accrued expenses	$	6,291,175	6,989,724
Deferred revenue		7,355,774	8,561,989
Liabilities under split-interest agreements		2,224,186	2,510,801
Postretirement benefit obligation		15,061,242	14,454,112
Asset retirement obligation		993,443	965,449
Bond swap liability		6,498,621	3,940,182
Note payable		358,908	426,503
Long-term debt, net of discount		52,741,795	54,774,645
Total liabilities		91,525,144	92,623,405
Net assets:			
Unrestricted		346,522,897	358,444,469
Temporarily restricted		134,811,093	141,116,464
Permanently restricted		173,063,383	98,083,631
Total net assets		654,397,373	597,644,564
Total liabilities and net assets	$	745,922,517	690,267,969

See accompanying notes to financial statements.

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2012

	Unrestricted	Temporarily restricted	Permanently restricted	Total
Operating revenues, gains, and other support:				
Private contributions and grants	$ —	18,764,858	—	18,764,858
Government grants	—	8,366,951	—	8,366,951
Endowment spending policy	12,952,782	10,710,118	—	23,662,900
Auxiliary activity	5,059,512	—	—	5,059,512
Net assets released from restrictions—satisfaction of program restrictions	37,841,927	(37,841,927)	—	—
Total operating revenues, gains and other support	55,854,221	—	—	55,854,221
Expenses:				
School of Mathematics	10,576,045	—	—	10,576,045
School of Natural Sciences	11,095,543	—	—	11,095,543
School of Historical Studies	6,790,033	—	—	6,790,033
School of Social Science	4,096,095	—	—	4,096,095
Libraries and other academic	8,528,094	—	—	8,528,094
Administration and general	12,164,093	—	—	12,164,093
Auxiliary activity	5,844,090	—	—	5,844,090
Total expenses	59,093,993	—	—	59,093,993
Change in net assets from operations, including depreciation	(3,239,772)	—	—	(3,239,772)
Other revenues, gains and other support:				
Private contributions and grants	652,182	79,089	74,979,752	75,711,023
Endowment change after applying spending policy	(6,739,386)	(6,384,460)	—	(13,123,846)
Change in fair value of bond swap liability	(2,558,439)	—	—	(2,558,439)
Loss on sale of plant assets	(36,157)	—	—	(36,157)
Change in net assets	(11,921,572)	(6,305,371)	74,979,752	56,752,809
Net assets—beginning of year	358,444,469	141,116,464	98,083,631	597,644,564
Net assets—end of year	$ 346,522,897	134,811,093	173,063,383	654,397,373

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.

STATEMENTS OF CASH FLOWS
YEARS ENDED JUNE 30, 2012 AND 2011

	2012	2011
Cash flows from operating activities:		
Change in net assets	$ 56,752,809	44,471,111
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation	4,198,798	4,128,125
Contributions restricted for endowment and plant	(25,737,701)	(8,022,724)
Net realized and unrealized gains	(11,989,659)	(63,282,128)
Change in fair value of bond swap liability	2,558,439	(689,418)
Loss on sale of plant assets	36,157	43,702
Amortization of debt issuance costs	51,587	54,147
Amortization of bond discount	22,150	23,651
Changes in assets/liabilities:		
Accounts receivable and grants receivable	151,204	(355,075)
Prepaid expenses and other assets	(170,191)	(230,825)
Contributions receivable	(49,332,313)	826,568
Beneficial interest in remainder trust	371,897	(419,722)
Accounts payable and accrued expenses	(698,549)	(465,676)
Deferred revenue	(1,206,215)	(6,913,006)
Postretirement benefit obligation	607,130	(127,888)
Asset retirement obligation	27,994	25,166
Net cash used in operating activities	(24,356,463)	(30,933,992)
Cash flows from investing activities:		
Proceeds from sale of plant assets	3,074,738	704,663
Purchase of plant assets	(17,053,168)	(4,485,852)
Proceeds from sale of investments	208,116,315	373,514,014
Purchase of investments	(196,255,448)	(346,692,454)
Net cash (used in) provided by investing activities	(2,117,563)	23,040,371
Cash flows from financing activities:		
Contributions restricted for endowment and plant	25,737,701	8,022,724
(Decrease) increase in liabilities under split-interest agreements	(286,615)	276,392
Repayment of long-term debt	(2,055,000)	(2,725,000)
Repayment of note payable	(67,595)	(66,264)
Decrease in funds held by bond trustee	2,733,758	2,046,092
Net cash provided by financing activities	26,062,249	7,553,944
Net decrease in cash and cash equivalents	(411,777)	(339,677)
Cash and cash equivalents—beginning of year	6,612,912	6,952,589
Cash and cash equivalents—end of year	$ 6,201,135	6,612,912
Supplemental data:		
Interest paid	$ 1,581,020	1,497,977

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 and Grants

Contributions and grants, 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 0.81%. 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, 2012 and 2011, 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. A financial instrument's level within the fair value hierarchy is based on the lowest level of any input that is significant to the fair value measurement. 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 statement of financial position 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, 2012 and 2011 were net of accumulated amortization of $862,407 and $810,820, 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, change in fair value of bond swap liability, 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 $1,562,269 and $1,349,617 for the years ended June 30, 2012 and 2011, 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, 2012 and 2011 were as follows:

		2012	2011
Unconditional promises to give:			
Less than one year	$	20,426,475	784,833
One to five years		31,034,037	383,334
		51,460,512	1,168,167
Discount on promises to give		(980,159)	(20,127)
Total	$	50,480,353	1,148,040

At June 30, 2012, 99% of gross contributions receivable and 77% of contributions revenue are from four donors.

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 years 2012 and 2011, the Institute recorded revenue of $39 million and $4 million, respectively, 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 at fair value by major category in the fair value hierarchy as of June 30, 2012 and 2011, as well as related strategy, liquidity, and funding commitments:

	June 30, 2012			
	Level 1	Level 2	Level 3	Total
Investments:				
Long-term investment strategies:				
Hedge funds—onshore:				
Emerging markets	$ —	4,213,509	1,541,397	5,754,906
Equities—long bias	—	9,597,508	—	9,597,508
Multiple strategies	—	—	51,440,383	51,440,383
Total	—	13,811,017	52,981,780	66,792,797
Hedge funds—offshore:				
Commercial mortgage backed	—	—	12,622,481	12,622,481
Distressed/high-yield	—	—	18,111,452	18,111,452
Emerging markets	—	—	9,021,029	9,021,029
Equities—long bias	—	12,141,063	—	12,141,063
Equities—long/short	—	36,288,006	27,636,088	63,924,094
Event Driven Strategies	—	9,182,183	—	9,182,183
Fixed income arbitrage	—	—	27,706,190	27,706,190
Global asset allocation	—	24,582,389	—	24,582,389
Multiple strategies	—	59,654,691	149,938,329	209,593,020
Bio tech/health care	—	12,290,624	—	12,290,624
Total	—	154,138,956	245,035,569	399,174,525
Limited partnerships (1)	—	—	106,164,790	106,164,790
Cash and cash equivalents	24,964,487	—	—	24,964,487
Other investments:				
Assets held under split-interest agreements:				
Cash and cash equivalents	138,276	—	—	138,276
Fixed income securities	—	—	3,798,033	3,798,033
Mortgages from faculty and staff	—	—	6,757,395	6,757,395
Total investments	$ 25,102,763	167,949,973	414,737,567	607,790,303
Other assets:				
Beneficial interest in remainder trust	—	—	2,834,108	2,834,108
Funds held by bond trustee:				
U.S. government obligations	2,407,508	—	—	2,407,508
Total other assets	$ 2,407,508	—	2,834,108	5,241,616

(1) The limited partnerships 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, 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 limited partnerships 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, 2012 and 2011 for investments classified in Level 3:

2012

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 June 30, 2011	$ 89,493,643	313,904,120	9,095,117	4,138,260	3,206,005	419,837,145
Acquisitions	22,678,000	42,000,000	1,086,330	36,921	—	65,801,251
Dispositions	(17,826,312)	(25,671,333)	(3,424,052)	(273,614)	—	(47,195,311)
Transfers in/out of Level 3	—	(40,149,527)	—	—	—	(40,149,527)
Net realized and unrealized gains	11,819,459	7,934,089	—	(103,534)	(371,897)	19,278,117
Fair value at June 30, 2012	$ 106,164,790	298,017,349	6,757,395	3,798,033	2,834,108	417,571,675

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

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 between investments classified as either Level 1 or Level 2 for the years ended June 30, 2012 or 2011. During fiscal years 2012 and 2011, approximately $40 million and $53 million, respectively, was transferred from Level 3 to Level 2 due to the expiration of lock-up restrictions.

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, 2012, the Institute is obligated under certain limited partnership agreements to advance additional funding in the amount of $85,373,621, which is anticipated to be called over the next 10 years.

Investment liquidity as of June 30, 2012 is aggregated below based on redemption or sale period:

	Investment fair values
Investment redemption or sale period:	
Daily	$ 28,900,796
Monthly	27,719,314
Quarterly	118,125,452
Semi-annually	22,105,208
Annually	43,013,995
Subject to rolling lock ups or other restrictions	221,181,648
Illiquid	146,743,890
Total as of June 30, 2012	$ 607,790,303

(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, 2012, the Institute had hedge fund investments of approximately $465,967,300, of which approximately $107,770,953 was restricted from redemption for lock-up periods. 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. 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:	
2013	$ 25,082,630
2014	37,362,742
2016 and thereafter	45,325,581
Total	$ 107,770,953

(e) Redemption Restrictions—Limited Partnerships

At June 30, 2012 and 2011, the Institute had limited partnership investments of approximately $106,164,800 and $89,493,600, 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:	
2013	$ 10,836,800
2016 and thereafter	95,328,000
Total	$ 106,164,800

(f) Contingencies

The Institute has an investment in the Ariel Fund Limited (the Fund), which on June 30, 2012 and 2011 had a fair value of approximately $12,630,100 and $15,391,000, 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 years 2012 and 2011, the Institute received distributions of $2,894,863 and $4,677,839, respectively, 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 5.0% and 4.7% for 2012 and 2011, respectively.

The following tables summarize the investment return and its classification in the statements of activities for the years ended June 30, 2012 and 2011:

	2012		
	Unrestricted	Temporarily restricted	Total
Dividends and interest, net of investment expenses	$ (853,407)	(597,198)	(1,450,605)
Net realized and unrealized gains	7,066,803	4,922,856	11,989,659
Total investment return	6,213,396	4,325,658	10,539,054
Endowment spending policy for use in operations	12,952,782	10,710,118	23,662,900
Endowment change after applying spending policy	$ (6,739,386)	(6,384,460)	(13,123,846)

	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

Total investment management and advisory fees were $1,767,082 and $1,582,314 for the years ended June 30, 2012 and 2011, respectively.

(5) Endowment

The Institute's endowment consists of approximately 100 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, 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, totaled approximately $1,639,000 and $1,202,000, at June 30, 2012 and 2011, 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, 2012 and 2011:

	2012			
	Unrestricted	Temporarily restricted	Permanently restricted	Total
Donor restricted	$ (1,638,917)	134,281,483	173,063,383	305,705,949
Board designated	330,569,926	—	—	330,569,926
	$ 328,931,009	134,281,483	173,063,383	636,275,875

	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

Changes in endowment net assets for the fiscal years ended June 30, 2012 and 2011 were as follows:

	Unrestricted	Temporarily restricted	Permanently restricted	Total
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
Dividends and interest income, net	(853,407)	(629,550)	—	(1,482,957)
Realized and unrealized gains	7,066,803	5,434,158	—	12,500,961
Contributions	495,134	79,089	74,979,752	75,553,975
Appropriation for expenditure—operations	(12,952,782)	(10,710,118)	—	(23,662,900)
Appropriation for expenditure—capital and other	(13,211,354)	—	—	(13,211,354)
Net assets, June 30, 2012	$ 328,931,009	134,281,483	173,063,383	636,275,875

Reclassification of unrestricted net assets in 2011 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, 2012 and 2011 follows:

	2012	2011
Land	$ 377,470	377,470
Land improvements	1,979,081	1,681,925
Buildings and improvements	105,052,933	93,828,846
Equipment	28,332,117	26,931,479
Construction in progress	205,928	204,022
Rare book collection	203,508	203,508
Joint ownership property	3,937,361	3,340,441
	140,088,398	126,567,691
Accumulated depreciation	(70,543,951)	(66,766,719)
Net book value	$ 69,544,447	59,800,972

(7) Long-Term Debt

A summary of long-term debt at June 30, 2012 and 2011 follows:

		2012	2011
2001 Series A—NJEFA	$	1,940,000	2,215,000
2006 Series B—NJEFA		27,500,000	28,400,000
2006 Series C—NJEFA		18,000,000	18,400,000
2008 Series C—NJEFA		5,475,000	5,955,000
Less unamortized bond discount		(173,205)	(195,355)
Total long-term debt	$	52,741,795	54,774,645

Interest expense on long-term debt for the years ended June 30, 2012 and 2011 was $1,307,016 and $1,461,015, 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% per annum, 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 December 22, 2008, the Institute entered into a 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, 2012 and 2011, the fair value of the interest rate swap was ($6,498,621) and ($3,940,182), respectively. The unrealized (loss) gain recognized during the year ended June 30, 2012 and 2011 in the amount of ($2,558,439) and $689,418, 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 swap 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, 2012 and 2011, there was no requirement to post collateral imposed by the swap counterparty.

The bonds are repayable as follows at June 30, 2012:

	Amount
Year ending June 30:	
2013	$ 2,290,000
2014	2,320,000
2015	2,360,000
2016	2,505,000
2017	2,550,000
2018 through 2036	40,890,000
Total	$ 52,915,000

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, 2012 and 2011, 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 April 2013. There were no borrowings in fiscal year 2012 or 2011 against the line of credit. Interest payments are due on demand and interest accrues at the LIBOR rate plus 100 basis points, which was 2.07% and 1.73% as of June 30, 2012 and 2011, respectively. No interest expense was incurred for the years ended June 30, 2012 and 2011.

(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, 2012 and 2011 totaled approximately $2,070,700 and $2,085,000, 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, 2012 and 2011. There are no plan assets at June 30, 2012 and 2011.

		2012	2011
Postretirement benefit obligation:			
Retirees	$	6,036,019	6,535,144
Fully eligible active plan participants		1,359,880	1,292,141
Other active plan participants		7,665,343	6,626,827
Postretirement benefit obligation	$	15,061,242	14,454,112
Change in benefit obligation:			
Benefit obligation at beginning of year	$	14,454,112	14,582,000
Service cost		626,003	691,000
Interest cost		795,112	773,000
Benefits paid		(424,617)	(413,758)
Actuarial gain		(389,368)	(1,178,130)
Benefit obligation at end of year	$	15,061,242	14,454,112
Components of net periodic benefit cost:			
Service cost	$	626,003	691,000
Interest cost		795,112	773,000
Amortization of net gain		(389,368)	(1,178,130)
Net periodic postretirement benefit cost	$	1,031,747	285,870

	2012	2011
Benefit obligation weighted average assumptions at June 30, 2012 and 2011:		
Discount rate	4.08%	5.61%
Periodic benefit cost weighted average assumptions for the years ended June 30, 2012 and 2011:		
Discount rate	5.61%	5.40%

The current year trend rate for health care costs was 9.0% and 10.0% at June 30, 2012 and 2011, respectively. It is estimated that it will take 9 years to reach the ultimate trend rate of 5.0% at June 30, 2012 and 2011, 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:

		2012		2011	
		Increase	Decrease	Increase	Decrease
Effect on total service and interest cost	$	318,370	(246,025)	335,000	(258,000)
Effect on the postretirement benefit obligation		3,157,958	(2,218,573)	2,468,152	(1,975,416)

Projected payments for each of the next five fiscal years and thereafter through 2022 are as follows:

	Amount
Year ending June 30:	
2013	$ 479,000
2014	486,000
2015	499,000
2016	519,000
2017	546,000
2018 through 2022	3,153,000

The Institute funds claims as they are incurred. The Institute does not expect to contribute any amounts in fiscal 2013, 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, 2012 and 2011:

	2012	2011
Temporarily restricted net assets are restricted to:		
School of Mathematics	$ 29,549,172	31,199,717
School of Natural Sciences	9,632,215	10,189,133
School of Historical Studies	33,527,995	34,864,151
School of Social Science	52,150,178	54,241,963
Libraries and other academic	4,227,856	4,658,414
Administration and general	5,723,677	5,963,086
	$ 134,811,093	141,116,464
Permanently restricted net assets are restricted to:		
Investments to be held in perpetuity, the income from which is expendable to support academic services	$ 173,063,383	98,083,631

(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 $53,666,000 and $55,642,000 at June 30, 2012 and 2011, respectively.

(11) Subsequent Events

The Institute evaluated events subsequent to June 30, 2012 through November 14, 2012, the date on which the financial statements were issued, and determined there were no subsequent events required to be disclosed.

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