INSTITUTE *for* ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

2005–2006

PRINCETON • NEW JERSEY

INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

2005 – 2006

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

Newark, New Jersey.

> *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.*

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INSTITUTE FOR ADVANCED STUDY
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 principle for more than seventy-five years and its record of definitive scholarship and scientific achievement is unsurpassed.

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

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. One of the Institute's unique strengths is its permanent Faculty of twenty-six eminent scholars whose broad interests and extensive ties to the larger academic world are reflected in their own work and also in the guidance and direction they provide to the Institute's visiting Members. The Faculty defines the major themes and questions which become the focus of each School's seminars and other activities, and the Faculty selects and works closely with visiting Members. Small in number and organized in four Schools (Historical Studies, Mathematics, Natural Sciences, and Social Science), the Faculty and Members can interact with one another without any departmental and disciplinary barriers.

Each year the Institute awards fellowships to some 190 visiting Members from about one hundred universities and research institutions throughout the world. The Institute's more than 5,000 former Members hold positions of intellectual and scientific leadership in the United States and abroad. Some twenty-one Nobel laureates, and thirty-four out of forty-eight Fields Medalists have been Institute Faculty or Members. Many winners of the Wolf or MacArthur prizes have also 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.

DINAH KAZAKOFF

"I have found the environment at the Institute to be unequaled in affording me a semester of sustained, uninterrupted research and writing. The intellectual community, which I have engaged with both formally and informally, has provided me with the unpredictable benefits of new colleagues, fresh perspectives on my work, and unmatched intellectual curiosity and rigor."

— Member, School of Natural Sciences

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(in order of service)

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(current Faculty and Faculty Emeriti are in bold)

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CHRISTINE FERRARA
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PAMELA HUGHES
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MARCIA TUCKER
Librarian, Historical Studies and Social Science
(also Coordinator of Information Access for Computing, Telecommunications, and Networking Administration)

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Administrative Officer, School of Mathematics

DONNE PETITO
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MICHELLE SAGE
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SUZANNE P. CHRISTEN
Executive Director and Administrator, The Simons Center for Systems Biology, School of Natural Sciences

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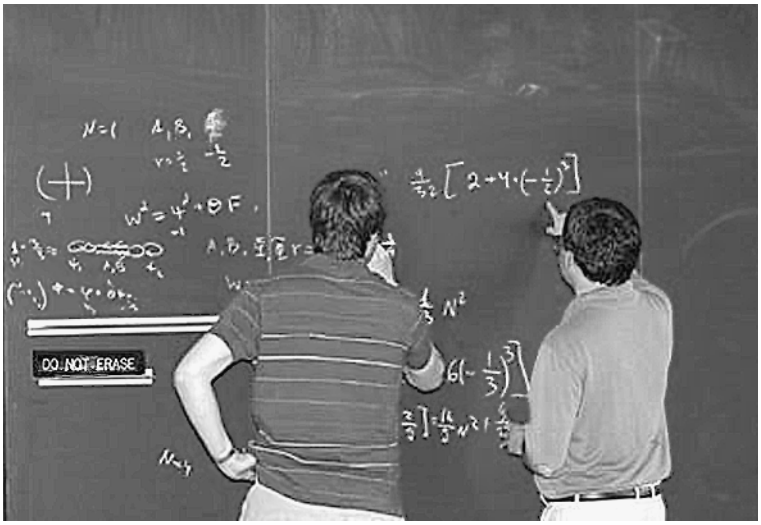

DINAH KAZAKOFF

"Not only have I had a productive period of time here, but equally important I have learned a great deal. Interactions with other members have been stimulating, and have led to many interesting discussions on issues such as ways to detect axions and the development of dark matter caustics."

— Member, School of Natural Sciences

REPORT OF THE CHAIRMAN 2005-06

The 75th Anniversary of the founding of the Institute for Advanced Study, the celebrations for which commenced in early 2005, provided unparalleled opportunities to experience the history and life of the Institute, and the profound affect this institution has had on the careers of many distinguished scholars and scientists who have been here over the years. In the fall term of 2005, the Institute concluded its anniversary celebrations with weekends of lectures by the School of Natural Sciences and the School of Social Science, in September and November, respectively, following similar events for the other two Schools earlier in the year. Both events provided opportunities for past and current Members and others, many of whom traveled to the Institute from around the country, to reconnect and to enjoy talks as diverse as "Surfing the Human Genome for Genetic Predispositions to Cancer," delivered by Arnold J. Levine, Professor in the School of Natural Sciences, and "National Liberation and Religious Revival," by Michael Walzer, UPS Foundation Professor in the School of Social Science. Both weekends illustrated the outstanding range and quality of the research and scholarship present in the sciences and humanities here — the distinguishing feature of the Institute for three-quarters of a century.

The Faculty of the Institute are at the core of its continuing traditions; they uphold its standards through their own research and the selection of its Members. In these ways, they construct the vital communities of scientists and scholars that form each year at the Institute and provide guidance and mentoring. We have, unfortunately, experienced the loss of two Faculty members who contributed greatly to the Institute over many years — astrophysicist John N. Bahcall, Richard Black Professor in the School of Natural Sciences, who passed away in August 2005, and medieval historian Marshall Clagett, Professor Emeritus in the School of Historical Studies, who passed away two months later in October. As one of the world's leading astrophysicists, John Bahcall mentored generations of scientists in his four decades at the Institute, and was a tireless champion for resources for astronomical research, for example, through his work with the Hubble Space Telescope. Marshall Clagett, a Faculty member since 1964, was one of the foremost scholars in the study of medieval science, particularly the work and influence of Archimedes. Both are greatly missed as colleagues and friends.

In July 2005, the Institute had the pleasure of welcoming art historian Yve-Alain Bois to the Faculty of the School of Historical Studies. A specialist in 20th-century European and American art, Yve-Alain Bois is recognized as an expert on a wide range of artists, from Henri Matisse and Pablo Picasso to Piet Mondrian, Barnett Newman, and Ellsworth Kelly. He is a distinguished curator and author, and we look forward to his scholarly contributions in years to come. The appointment of Avishai Margalit as the new George F. Kennan Professor in the School of Historical Studies was announced in February. Avishai Margalit is one of the foremost thinkers and commentators on the contemporary human condition, the moral issues of our time, and current problems facing Western societies, and he will add immeasurably to the life and scholarship at the Institute.

The Institute continues to reach out to the wider community in many ways, particularly in the area of mathematics where its Program for Women and Mathematics and its Park City Mathematics Institute (PCMI) have made major contributions nationally and inter-

nationally, addressing concerns in mathematical education and career development. For the last seven years, PCMI, which brings together students and practitioners of mathematics from many stages, from fifth graders through to world leaders in research, has been under the guidance and leadership of Herb Clemens of The Ohio State University. PCMI has flourished under Herb's inspired leadership and we owe a great debt to him as he steps down as Director of the program.

In order to maintain a secure basis for its academic excellence into the future, the Institute continues to fortify and build its financial resources. The Board of Trustees has taken an active lead in launching a campaign to strengthen the endowment that has generated more than $61 million toward sustaining ongoing and new activities of the Institute. The $25 million gift from the Charles Simonyi Fund for Arts and Sciences and the $10 million challenge grant for the program in systems biology from The Simons Foundation, provided outstanding leadership in this regard. The unrestricted cash gift from the Charles Simonyi Fund for Arts and Sciences is the largest donation since the founding of the Institute, and has provided the means to establish The Karoly Simonyi Memorial Endowment Fund, honoring Charles Simonyi's late father, an esteemed and beloved professor of electrical engineering who taught science to generations of Hungarian scientists and engineers. Since joining the Board in 1997, Charles has been an energetic and generous participant in all aspects of the life of the Institute, and we are extremely grateful for his exceptional commitment and support.

The Simons Foundation challenge grant, too, demonstrates an extraordinary level of dedication to the mission of the Institute. It will help support, along with future funds from additional donors, operational and building costs associated with the program in systems biology, as well as the establishment of an endowment fund. The program, within the School of Natural Sciences, has been formally named The Simons Center for Systems Biology in recognition of this gift. Jim Simons, a Board member since 2002 and former Member in the School of Mathematics, created the Foundation with his wife Marilyn to advance the frontiers of research in the basic sciences and mathematics. We honor their vision and dedication. The Institute also received an extremely generous anonymous pledge of $10 million in Spring 2006, and the income from the funds received thus far are being used to support our work in biology.

Beyond the continuing development of biology at the Institute, further substantial expansion is not anticipated, but our finances need to be strengthened if our current level of activity is to be maintained into the future. Our Board continues to be very generous in their time and efforts towards this end, and we are most grateful for their many contributions.

We had the pleasure at the May 2006 meeting of the Board of electing three new trustees, Dr. Victoria B. Bjorklund, Dr. David Hollinger, and Dr. Florian Langenscheidt. Dr. Bjorklund is a Partner at Simpson Thacher & Bartlett LLP, where she heads the Firm's Exempt Organizations Group. Dr. Hollinger, who will serve as Academic Trustee for the School of Historical Studies, is Preston Hotchkis Professor of History at the University of California, Berkeley. Dr. Langenscheidt is a leading author and publisher and is a partner of Langenscheidt Publishing Group, a company that produces a diverse range of bilingual dictionaries, and map, travel, and language publications used throughout the world. All three bring considerable expertise, energy, and enthusiasm and we look forward to their collaboration and participation in the life of the Institute.

Of further note is the retirement of Immanuel Kohn, who has served on the Board of the Institute since 1997. The Institute has greatly benefited from Ike Kohn's wise counsel and astute guidance, as well as his commitment to scholarship and his deep intellectual interests. He has served on the Academic Affairs and Development & Public Affairs Committees, as well as on the Oversight Committee for Development Review. His role as chair of the Audit Committee has been of great importance in sustaining the Institute's well-being. We are profoundly grateful for his years of dedicated service and for his generous endowment of the Hans Kohn Membership, which will continue to enable future scholars to profit from the life of the Institute.

Fernando Henrique Cardoso, former President of Brazil, and W. Robert Connor, President of the Teagle Foundation, have both resigned as Trustees, effective December 31, 2005, and June 30, 2006, respectively. To each we are deeply grateful for their service.

I also want to acknowledge the retirement in January 2006 of our dear colleagues Allen Rowe and Rachel Gray, whose service to the Institute totals more than forty years between them. I personally enjoyed collaborating with these dedicated individuals, who worked so hard to promote the Institute's mission. They were true colleagues and partners in this significant endeavor. John Masten, the Associate Director for Finance and Administration, and Michael Gehret, the Associate Director for Development and Public Affairs, have been appointed to succeed them, and we look forward to supporting them in their important roles at the Institute.

On behalf of the Trustees, I want to thank the Director and all the staff at the Institute who each day contribute to the quality of work and life at the Institute. Their commitment supports the unique environment of freedom that Faculty and Members have to accomplish their research and to make strides in many areas of the sciences and humanities. We are deeply grateful for the myriad ways in which they sustain this excellence.

James D. Wolfensohn
Chairman, Board of Trustees

REPORT OF THE DIRECTOR 2005-06

At the start of the academic year, the Institute was in the midst of celebrations of the 75th anniversary of its founding by Louis Bamberger and Caroline Bamberger Fuld. Weekends celebrating the work of the Schools of Mathematics and of Historical Studies had been held in March and April 2005, respectively, while its early years, its debt to its founders, and the centenary of the *annus mirabilis* of Albert Einstein were marked on the precise anniversary of the founding, May 20. These events were followed by weekend celebrations for the School of Natural Sciences and for the School of Social Science.

The Natural Sciences weekend on September 23 and 24 began with talks covering some of the main topics studied in the School: String Theory, Genomics, Cosmology, and Planetary Science, together with a talk by former Member Joseph Atick, President and CEO of Identix, on "The Science and Politics of Managing Human Identity." On the Saturday, a panel of former Members chaired by Robert May, then President of The Royal Society, reflected on experiences at the Institute before an audience packed into Wolfensohn Hall to hear Brian Greene speak on "String Theory and Unification."

Our year of celebration was rounded out on November 11 and 12 by the School of Social Science. The present Faculty of the School gave talks on the Friday afternoon illustrating the breadth of research in the School: Michael Walzer talked on "National Liberation and Religious Revival," Eric Maskin on "Auction Theory on Practice," and Joan Scott on "Balancing Equality and Difference." The Saturday morning talks by Daniel Kahneman on "Recent Advances in the Study of Well-Being" and by Roland Benabou on "Belief in a Just World and Redistributive Politics" focused on the School's theme for 2005-06 of Psychology and Economics.

An absence left the Natural Sciences weekend inevitably tinged with sadness. The death of John Bahcall on August 17, 2005, took from the Institute the person who had developed astrophysics at the Institute for more than 35 years. His achievements in science, perhaps most spectacularly his initially controversial identification of a discrepancy between theory and experiment in the study of solar neutrinos, which led eventually to a dramatic revision in the fundamental physics of neutrinos, were matched by his outstanding gifts as a mentor of the young postdoctoral fellows he attracted to the Institute, establishing it as one of the leading centers internationally for astrophysical research. On October 29, colleagues came from around the world to celebrate his life and work and to acknowledge their own personal debts to a great physicist.

On October 21, the Institute lost another major figure, Marshall Clagett, one of the world's leading historians of science, from antiquity through the middle ages to the Renaissance. Professor Clagett first came to the Institute as a Member in 1958, returning in 1963, joining the Faculty the following year and becoming an Emeritus Professor in 1986. A major focus of his research was the work of Archimedes and its influence in the medieval world. His final work was on *Ancient Egyptian Science*, and at the time of his death at age 89 he was working on the fourth and final volume of this major work.

Yve-Alain Bois, whose appointment was reported in last year's *Annual Report*, officially joined the Faculty in the School of Historical Studies at the beginning of July 2005. He maintains the Institute's strong tradition in the History of Art, which dates back to the

appointment of Erwin Panofsky in its earliest days. In February, Avishai Margalit, Schulman Professor of Philosophy at the Hebrew University of Jerusalem, was appointed as the third George F. Kennan Professor. Trained as a philosopher, Dr. Margalit is highly regarded for his profound and cogent observations of the Israeli-Palestinian conflict and the broader conflict between Islam and the West. He takes up his appointment on July 1, 2006.

As the Faculty of the School of Historical Studies gains these two distinguished scholars, Glen Bowersock, Professor in the School since 1980, will become an Emeritus Professor at the beginning of July 2006. His contributions to the study of Greek, Roman and Near Eastern history and culture, recognized by honorary degrees and memberships of academies in many countries, and his involvement in the intellectual life of the Institute will clearly continue unabated.

Two other retirements that marked significant milestones for the Institute occurred at the end of 2005. Allen Rowe, Associate Director for Finance and Administration, and Treasurer, retired after twenty-seven years' service, and Rachel Gray, Associate Director for Development and Public Affairs, and Secretary of the Corporation, retired after almost sixteen years' service. During their tenures, the physical and financial resources of the Institute increased greatly and the range of academic activities widened substantially. They devoted countless hours to advancing the Institute's mission, greatly strengthened its links with the local community and built strong relationships with the Institute's supporters.

The Institute has been fortunate to be able recruit as successors to Allen and Rachel, John Masten, until recently Executive Vice President for Finance at Columbia University, and Michael Gehret, previously Senior Vice President for Resources and Planning for the Chicago Symphony Orchestra, respectively. John brings to the Institute thirty years experience of financial, strategic, and operational planning for academic, not-for-profit, and public institutions, and Michael brings a similar wealth of expertise in raising resources for and managing elite cultural institutions, mainly leading orchestras.

As they join the Institute, we are seeking to consolidate and extend the achievements of recent years. Through its capital campaign, with more than $61 million raised by June 2006, the Institute is seeking to acquire the resources to build further its biology program and to ensure that it has adequate resources to pursue its mission in the coming decades. The celebrations of our foundation continually reminded us not only of the past achievements of the Institute but also of the continuing relevance of its mission. The testimony of the Members who come each year makes very evident the crucial importance of the opportunities the Institute provides for the development of their research careers.

The Faculty and staff of the Institute work hard to maintain and enhance the environment that makes this possible so that the Institute continues to realize the dream of Abraham Flexner and the vision of Louis Bamberger and Caroline Bamberger Fuld beyond perhaps what they dared hope.

Peter Goddard
Director

OFFICE OF THE DIRECTOR
RECORD OF EVENTS

In addition to the calendar of events sponsored by the Office of the Director, listed below, the Institute for Advanced Study also offered a series of events and activities for Members, Visitors, and their families. These included the Institute Film Series, AMIAS Movie Mondays, play readings, ballroom dancing classes, yoga, tennis lessons, trips to places of local interest, and activities for children in the Institute community.

Academic Year 2005-06

September 21
Welcome Reception for Members/Visitors and Spouses/Partners

September 23
75th Anniversary Celebration: School of Natural Sciences
"The Quantum Geometry of String Theory," ROBBERT DIJKGRAAF, *University of Amsterdam;* "The Science and Politics of Managing Human Identity," JOSEPH J. ATICK, *Identix Incorporated;* "Surfing the Human Genome for Genetic Predispositions to Cancer," ARNOLD J. LEVINE, *Professor, The Simons Center for Systems Biology, School of Natural Sciences;* "The New Cosmology," DAVID SPERGEL, *Princeton University*; "Extrasolar Planets," PETER GOLDREICH, *Professor, School of Natural Sciences*

September 24
75th Anniversary Celebration: School of Natural Sciences
"Unification and String Theory"
BRIAN GREENE, *Columbia University*

CLIFF MOORE

Wolfensohn Hall was the setting for the lectures presented as part of the School of Natural Sciences 75th Anniversary Weekend in September 2005.

October 5
Friends Fireside Chat
"AIDS in Africa: Will 100 Million Die? A Report from the Front"
JOHN McGOLDRICK, *Bristol Myers Squibb*

October 7
Music Series "Songs – With and Without Words"
Music of Thelonius Monk, Cole Porter and Fred Hersch
FRED HERSCH, piano

Music Series Post Concert Talk
FRED HERSCH with JON MAGNUSSEN

October 8
Music Series Concert
"Songs – With and Without Words"
Music of Thelonius Monk, Cole Porter and Fred Hersch
FRED HERSCH, piano

Music Series Post Concert Talk
FRED HERSCH with JON MAGNUSSEN

October 23
"Music on Mercer Street: A Celebration of Music in the Life of Albert Einstein"
Performed by the Richardson Chamber Players
Presented by the Historical Society of Princeton, Institute for Advanced Study and Princeton University Concerts

October 29
A Tribute to John N. Bahcall: Scientific Lectures, Personal Tributes and Reception

November 2
Friends Forum
"How to Become a Great Khan: The Path to Power in Pre-Modern Inner Asian Politics"

NICOLA DI COSMO, *Luce Foundation Professor in East Asian Studies, School of Historical Studies*

November 9
Artist-in-Residence Program Panel Discussion
"Great Music Programming (In Theory and Practice)"
MARK LAYCOCK, *Music Director, Princeton Symphony Orchestra and Artistic Director, Lake Placid Sinfonietta*; MICHAEL BORISKIN, *Pianist and Artistic/Executive Director, Copland House, Westchester, NY*; ROBERT BEASER, *Composer and Artistic Director, American Composers Orchestra, New York*; JON MAGNUSSEN

November 11
75th Anniversary Celebration: School of Social Science
"Social Science and the Contemporary World": A series of short lectures by Faculty of the School of Social Science
"National Liberation and Religious Revival," MICHAEL WALZER, *UPS Foundation Professor, School of Social Science;* "Auction Theory in Practice," ERIC S. MASKIN, *Albert O. Hirschman Professor, School of Social Science;* "Balancing Equality and Difference," JOAN WALLACH SCOTT, *Harold F. Linder Professor, School of Social Science*

November 12
75th Anniversary Celebration: School of Social Science
Focus on the School of Social Science's 2005-2006 theme, "Psychology and Economics"
"Recent Advances in the Study of Well-Being," DANIEL KAHNEMAN, *Princeton University;* "Belief in a Just World and Redistributive Politics," ROLAND J. M. BENABOU, *Princeton University*

November 30
Friends Forum
"Climate Change and CO_2: What Can We Do For Our Grandchildren?"
MIKE SHEPPARD, *Director's Visitor, Schlumberger Fellow, Schlumberger, Ltd.*

December 2
Recent Pasts 20/21 Conversation
"Past, Present and Future"
JOHN CORIGLIANO, composer, with MICHAEL BORISKIN and JON MAGNUSSEN

Music Series Concert
"Snapshots and Legacies: The Music of John Corigliano"
Music of John Corigliano, Aaron Copland, and Igor Stravinsky
MUSIC FROM COPLAND HOUSE

December 3
Music Series Concert
"Snapshots and Legacies: The Music of John Corigliano"
Music of John Corigliano, Aaron Copland, and Igor Stravinsky
MUSIC FROM COPLAND HOUSE

December 16
Wet Ink: JON MAGNUSSEN, Artist-in-Residence, Presents:
Recently Recorded Excerpts from *The Folding Cliffs*, an Opera-in-Progress

February 8
Friends Forum
"The Economics of the Gold Rush: Benjamin Davidson and Heinrich Schliemann in California 1851-1852"
GILES CONSTABLE, *Professor Emeritus, School of Historical Studies*

February 22
Faculty Lecture
"Living Blood Poured Out: Piety, Practice, and Theology in Northern Europe in the Fifteenth Century"
CAROLINE BYNUM, *Professor, School of Historical Studies*

March 8
Friends Forum
"Fighting World War IV: Preparing for World War V"
IAN ROXBOROUGH, *Member, School of Social Science*

March 22
Faculty Lecture
"Foundations of Mathematics and Homotopy Theory"
VLADIMIR VOEVODSKY, *Professor, School of Mathematics*

March 29
Leon Levy Lecture
"The Puzzle of the Quasi-Calvinist Motivation in Economics and Everyday Life"
DRAZEN PRELEC, *Leon Levy Member, School of Social Science*

April 21
Friends Culture and Cuisine Talk
"A Revolution in Eating: How the Quest for Food Shaped America"
JAMES E. McWILLIAMS, *Professor of History, Texas State University, San Marcos*

April 28
Public Lecture
"Preventing Asteroid Impacts: A Gravitational Tractor for Towing Asteroids"
EDWARD TSANG LU, *Research Physicist and NASA Astronaut*

May 5
Faculty Lecture
"The Three Romes"
GLEN BOWERSOCK, *Professor, School of Historical Studies*

May 13
Recent Pasts 20/21 Conversation
DAVID LANG, composer, with JON MAGNUSSEN

Music Series Concert
"Giant Pipes and Flowerpots: Music in the Birch Garden"
Music of David Lang and Dan Trueman
SO PERCUSSION and TROLLSTILT

May 24
Friends Annual Meeting and Picnic

June 12
Staff Picnic

DINAH KAZAKOFF

"The residential character of IAS, with its isolated and park-like setting, is an aspect of it that cannot be praised too highly. Academic institutions specializing in hosting visitors for one or several terms seldom, in my experience, manage to avoid setting up tensions between the academic setting and family. My family has found the Institute a welcoming and idyllic place to live for the year, and needless to say, this has been a great help to my scholarly work while here."

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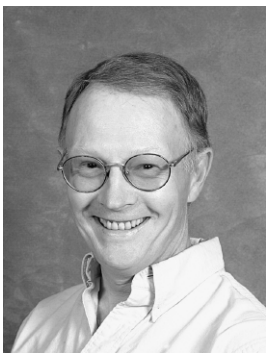

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"I am most grateful for the invitation to IAS and for the blissful year I could spend here. I enjoyed the calm and remoteness of the place in conjunction with the vivid intellectual atmosphere."

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The School of Historical Studies is concerned principally with the history of Western European, Near Eastern, and East Asian civilizations. Both inside and outside these broad areas of study, Faculty and Members have pursued a wide range of topics. The emphasis has traditionally been strong in the fields of 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 foundation, and their work here in these and other areas of research has regularly been enriched by the fruitful interaction of disciplines in a small and collegial community.

The School's broad interpretation of the meaning of "Historical Studies" is clearly reflected in the research projects pursued by the fifty Members and five Visitors who joined the School for the academic year 2005-2006. The focus of their research spanned a diverse range of historical subjects including the History of Art, Philosophy, Music, Religion, Politics, Literature, Law and Economics, as well as Archaeology, Classics, and the History of Science. The periods studied ranged from pre-imperial China (as far back as 1066 BCE) to the 20th Century. Research carried out in the School also extended over a wide geographic range, from Europe, Egypt, and the Byzantine Empire to Latin America, the Middle East, South Asia, Central Asia, and East Asia. The group of scholars who joined the School in 2005-2006 was itself broadly international, including citizens of Austria, Belgium, Brazil, Canada, France, Germany, Greece, Hungary, India, Israel, Italy,

Lebanon, the Netherlands, Pakistan, Russia, Serbia and Montenegro, South Korea, Spain, Switzerland, the United Kingdom, and the United States. Members received support both from the Institute's own funds and from a variety of external sources, including the National Endowment for the Humanities, the Andrew W. Mellon Foundation, the Fritz Thyssen Foundation, the Gerda Henkel Foundation, and the 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.)

ACADEMIC ACTIVITIES

During his first year at the Institute, PROFESSOR YVE-ALAIN BOIS published the lead essay in the catalogue of a Pierre Bonnard retrospective (Musée d'Art Moderne de la Ville de Paris) and that in the catalogue of a touring Fred Sandback retrospective (Vaduz, Graz, Bordeaux); he also published an essay in the catalogue of the Eva Hesse exhibition at the Jewish Museum (New York), another on Matisse's *Le Luxe II* (1907-8) in a collective volume on the artist edited by Statens Museum for Kunst (Copenhagen), as well as testimonies on Jacques Derrida (*Gray Room*) and Hubert Damisch (*Oxford Art Journal*). He also contributed essays to the journal *October*, of which he is an editor, and several reviews to *Artforum*. He worked with two scholars at the Barnes Foundation (Merion, PA) for the preparation of the catalogue raisonné of the Foundation's holdings of Matisse paintings, and began research for a large monograph on the art of Ellsworth Kelly. He continued to direct Harvard University Ph.D. students, both in dissertation work and in oral exam preparation (as well as participating in the doctoral defense of several students at Columbia University).

In September, he gave the keynote address at the "Elective Affinities" conference organized by the International Association of Word and Image at the University of Pennsylvania; in October, he gave a lecture on "pseudomorphism" at the Department of Art and Archeology of Princeton University; in January, he gave a lecture on "non-composition" at the Frei Universität in Berlin; in February, he participated in a discussion of Dada at the National Gallery of Art (Washington, D.C.); in March, he gave again his lecture on "non-composition" at the University of Louisiana (Baton Rouge); in May, he gave a lecture at the symposium of Ellsworth Kelly at the Victoria and Albert Museum (London), and a lecture and a seminar at the Center for Documentation and Advanced Studies in Contemporary Art (Murcia, Spain); in June, he participated in a two-day symposium on the specific problems of doing research on contemporary art at the Sterling and Francine Clark Art Institute (Williamstown, MA). In October, he was elected member of the American Academy of Arts and Sciences.

In October PROFESSOR GLEN BOWERSOCK went to Paris to hold a meeting with the group of scholars he had invited to participate in preparing a detailed inventory of the Fonds Louis Robert. This is the archive of the late French Hellenist and epigraphist, whose widow gave all his excavation and travel notebooks, thousands of squeezes of

inscriptions, and many dossiers of unpublished articles to the Académie des Inscriptions et Belles-Lettres. Under the terms of her gift Professor Bowersock is in charge of the archive. The inventory is now well advanced, thanks to the selfless work of six colleagues from four different countries. The Paris meeting served to lay plans for the distribution and publication of the material.

Over the winter Professor Bowersock delivered several lectures. At a symposium in Princeton on "Antiquity in Antiquity" he offered reflections on the use of the Christian and Jewish pasts by the Ethiopians in the sixth and seventh centuries. In Rome he spoke at a conference at La Sapienza on poverty and disease in Late Antiquity, and he spoke subsequently at Rutgers on terrorism and charity in the same period.

On April 7th Princeton University generously hosted an all-day symposium on the occasion of Professor Bowersock's forthcoming retirement from the School of Historical Studies. Scholars from Italy, France, Germany, the United Kingdom, and the United States spoke on topics in Hellenistic, Roman, Late Antique, and Arabian history. On May 4th Professor Bowersock joined a panel organized at the New York Public Library by the Association of Art Museum Directors to discuss the problems and ethics of collecting antiquities today. On May 5th he delivered a lecture at the Institute for Advanced Study on "The Three Romes" – Rome, Constantinople, and Moscow.

Later in May Professor Bowersock returned to Italy for a meeting of the scientific committee of the Istituto Italiano di Studi Umanistici in Florence. He also delivered a lecture to the Istituto Italiano per la storia antica in Rome. During the past academic year he published nine articles, including a study of the meaning of north and south in the ancient Mediterranean world, a new appraisal of Hellenism in Athens under Augustus, an essay on foreigners in Rome at the time of Josephus, and a review of a new biography of St. Augustine. He completed the manuscript of his book, *Mosaics as History, From Late Antiquity to Islam*, which the Harvard University Press is scheduled to publish in November 2006.

During 2005-2006, PROFESSOR CAROLINE WALKER BYNUM spent most of her time completing her book *Wonderful Blood*, a study of the cult of Christ's blood in fifteenth-century Germany against the background of European piety and theological debate. It is scheduled to appear from the University of Pennsylvania Press in 2007. Her book *Metamorphosis and Identity* (2001) appeared in a paperback edition from Zone Books in the fall of 2005. She published an article on medieval iconography in a volume from Princeton University Press titled *The Mind's Eye*, and three book reviews. She wrote three encyclopedia articles, three reviews, and a review article. She lectured at Arizona State, Southern Connecticut State, Emory, Yale, Rutgers, and Rice, led workshops at Arizona State, Rice, and the Israeli Historical Society in Jerusalem, and attended a conference in Eichstaett. She served on the Selection Committee for the Yad-Hanadiv Foundation in Jerusalem and the Board of Directors for the new Research Center for the Comparative History of Religious Orders at the University of Eichstaett. She continued to direct Columbia University Ph.D. students in dissertation work, and during the spring semester 2006, she taught a Freshman Seminar at Princeton University on "Women and Religion in the Middle Ages." At the Institute she gave the spring Faculty Lecture and sponsored two informal lunchtime colloquia: one for the medievalists in the School of Historical Studies; the other an interdisciplinary group, co-sponsored with Professor Piet Hut of

Interdisciplinary Studies, open to the entire IAS community. In the first of these lunchtime colloquia, which met on Wednesdays, western medievalists, Byzantinists, and Islamicists from both the Institute and neighboring universities discussed such topics as new approaches to the Cairo Geniza, ethnicity in Turkic Eurasia, the history of papal and monastic institutions in western Europe, and medieval understandings of mimesis in poetry, drama and panel painting. The inter-School colloquium met on Fridays and chose the initially mysterious topic "Time and Silence." Among the regular attendees were musicologists, composers, historians, anthropologists, biologists, physicists, literary critics, sociologists, philosophers, and art historians. Topics discussed included whether time is a structure of the human brain, which cultural experiences are facilitated (or repressed) by silence, the nature of post-modern time, and many others.

PROFESSOR PATRICIA CRONE tried the unusual pleasure of being on leave from the Institute in the fall term, which did not feel very different from the normal experience of a fall term until November, when she went to Cambridge, UK, where she spent the next six weeks and delivered the Birkbeck lectures at Trinity College on the subject of materialists, sceptics and rationalizing dualists in the Near East in the first five centuries of Islam. The interest of these thinkers lies in the light they throw on the continuity between the ancient world and that of Islam on the one hand and the strong imprint they left on Islamic theology on the other, as well as in the striking parallel between their thinking and that of early modern European freethinkers. On her return she taught a graduate seminar at Princeton University on the same subject, which is going to preoccupy her for a long time. She also completed an article on a completely different subject (how to make sense of the leather trade that the Arabic sources credit to the pre-Islamic inhabitants of Mecca) and organized a small conference on yet another subject, the reactions of acculturated natives to what one might call their split personalities: in terms of ethnicity they are outsiders to the culture they have adopted, but the adopted culture is the one which shapes their thinking and in which they feel at home. How then can they make the two fit? The conference, which brought together classicists, Syriacists, Judaists, and Islamicists, focused on two reactions, attested in the Near East first in response to Hellenisation and next in response to Islamization, the one apologetic and the other aggressive (called Shu'ubism by the Arabs against whom it was directed).

Three of Professor Crone's articles appeared in print in the course of the year, one an exercise in reading the Qur'an on its own rather than through the eyes of the exegetical tradition (in *BSOAS*), another on a spurious letter illustrating the relationship in the first centuries of Islam between non-Arab converts and Shiism (in a volume on the Patronate edited by John Nawas), and the third a semi-popular piece on the losses that an imperial expansion carries with it to the empire-bearing people themselves (in a periodical called *Common Knowledge*).

PROFESSOR NICOLA DI COSMO completed a text edition consisting of the introduction, notes, translation, and transliteration of a Manchu document; the volume, entitled *The Diary of a Manchu Soldier in Seventeenth-Century China*, was published in July 2006. Other articles published this year include "Mongols and Merchants on the Black Sea Frontier (13th-14th c.): Convergences and Conflicts," in *Turco-Mongol Nomads and Sedentary Societies*, eds. R. Amitai and M. Biran (2005), pp. 391-424; "Venice, Genoa, the Golden Horde, and the Limits of European Expansion in Asia," in *Il Codice Cumanico e il Suo Mondo*, eds. P. Schreiner and F. Schmieder (2005), pp. 279-296;

"A Note on the Authorship of Dzengšeo's *Beye-I cooha bade yabuha babe ejehe bithe*," in *Tumen jalafun jecen akū: Manchu Studies in Honour of Giovanni Stary*, (2006), pp. 73-77. He also completed three forthcoming articles addressed to different audiences: an overview of the Mongol empire with maps for an historical atlas of Central Asia, an essay on the history of the Khitan empire to be published in the catalogue of the upcoming exhibition at the Asia Society *Gilded Splendor: Treasures of China's Liao Empire (907-1125)*; and an article on Venetian-Mongol relations for the volume *Venezia, l'altro e l'altrove*, edited by Susanne Winter.

In October 2005 he gave three lectures at Northwestern University on the theme of dynastic change and modernity in early modern China. In January he presented a paper on empires and globalization in the context of the medieval expansion of Asia at the symposium "Empires: From Ancient to Contemporary Times" held at New York University. On March 1 he lectured at New York University again for the event entitled "Across the Black Sea: Connecting Nicola Di Cosmo and Charles King." In March he also attended the symposium "Representing power in Asia. Legitimizing, consecrating, contesting" at the Institut Européen en Sciences des Religions (Paris), with a paper on the relationship between titles and political authority of the "founding father" of the last Chinese dynasty. In early April he attended the meeting of the Association of Asian Studies as a panel discussant, member of the China and Inner Asia Council (he was elected Chair), and member of the editorial board of the *Journal of Asian Studies*. In April he also lectured at Harvard on recent archaeological discoveries in Mongolia, and on the uses and limits of history for their interpretation.

One of the most exciting activities of the year was his close collaboration with the Luce Foundation and the ACLS to launch a new initiative aimed to support research on East Asian archaeology that involved the evaluation of individual and institutional applications. He also continued to supervise doctoral students at Columbia, the University of Pennsylvania and the Istituto di Studi Umanistici in Italy. Finally, he organized an East Asian seminar series within the School of Historical Studies comprising thirteen talks by speakers from outside and within the Institute.

The first part of this academic year PROFESSOR JONATHAN ISRAEL spent finalizing the text and then the proofs, index, and bibliography of the second part of his survey history of the Enlightenment, entitled *Enlightenment Contested. Philosophy, Modernity and the Emancipation of Man, 1670-1752* (Oxford University Press, 2006, [983 pp]) which is due to be published in Britain in October. This year he also edited, wrote the introduction for, and worked on the translation together with a professional Latinist, in Canada, of the new Cambridge University Press edition of *Spinoza's Tractatus Theologico-Politicus* (1670) due to be published next year. In recent months he began the research for the third volume of his history of the Enlightenment.

In October, he gave a public lectures on "Descartes and the Enlightenment," at King's College, Halifax, in Nova Scotia and on "Spinoza and the Dutch Intellectual Rebels of the late 17th Century" at the University of Michigan, Ann Arbor. In November, he took part in a colloque on "Les Lumières radicales" at the Sorbonne, in Paris, held to mark the appearance of the French translation of the first part of his history of the Enlightenment, by "Éditions Amsterdam," under the title *Les lumières radicales. La philosophie, Spinoza, et la naissance de la modernité (1650-1750)*, and gave a radio interview on the subject. In

December he gave a lecture to the Royal Netherlands Academy of Sciences in Amsterdam on Spinoza and at University College London, on the "Readmission of the Jews to England" (1656) to mark the 350th anniversary of the event. In February, he held a graduate seminar on the Radical Enlightenment in Venice and in March, gave a public lectures on "Voltaire's War on the Radical Enlightenment," at Princeton University, and a paper at a one-day symposium, devoted to the eighteenth-century German scholar, Reimarus, at Rutgers. In May, he gave a lecture at Copenhagen University on censorship during the Enlightenment, and in June a lecture on the Radical Enlightenment's relevance to today to the annual Engelsberg symposium, in Sweden. This year he also participated as an examiner in two Ph.D. examinations, in Paris in November and in Venice in February.

Beside book reviews, his publications include the forthcoming "John Locke and the Intellectual Legacy of the Early Enlightenment," *Eighteenth-Century Thought*, and "Europe and the Radical Enlightenment. A Typology of Modernity's Intellectual and Cultural Roots," an expanded version of the annual C.Th. Dimaras Lecture, given in Athens in 2004, published in 2005, in a bilingual English-Greek edition by the Athens Institute for Neohellenic Research.

In the academic year 2005-2006 PROFESSOR HEINRICH von STADEN's external lectures and seminars included the following. In July 2005, he gave a lecture at the University of Exeter on the nature and purposes of Galen's exegetical activity. In October, he gave a paper at the University of La Coruña (Spain) on Celsus' appropriation of Hellenistic treatises on drugs. At a colloquium in March 2006 at the Université René Descartes (Paris) on 'Femmes en médecine,' in honor of former Institute Member Danielle Gourevitch, Professor von Staden gave an invited lecture on "Femmes et pharmaka." Also in March, he lectured at the Université de Fribourg (Switzerland) on "Pureté, purification et katharsis dans la Collection hippocratique." In early May 2006, he gave a seminar on pre-Aristotelian theories of catharsis at the Istituto di Studi Umanistici in Florence. In late May he contributed a paper on Hellenistic medicine, focusing in particular on Hellenistic inscriptions concerning physicians, to a conference on Hellenistic science at the Radcliffe Institute in Cambridge, Massachusetts. In June, he participated in the annual meeting of the 'Arbeitskreis Alte Medizin' at the Universität Mainz. Also in June, he gave a seminar on catharsis at the Università di Palermo in Sicily.

In 2005-2006 Professor von Staden devoted most of his research to a larger long-term project on the relation between observation and explanation in ancient science, particularly in the life sciences and in medicine. He also published several book reviews and had five articles accepted for publication (on catharsis; on the relation between *ars* and *natura* in the work of Aulus Cornelius Celsus; on Celsus' pharmacology; on interpretations of 'Hippocrates' in the third and second centuries BCE; and on Galen's uses of exegesis to stage himself).

Professor von Staden continued to serve on the editorial boards of several journals and as a consultant to several universities, research institutions, and foundations.

During the academic year 2005-06 PROFESSOR EMERITUS GILES CONSTABLE published (with William Connell) *Sacrilege and Redemption in Renaissance Florence. The Case of Antonio Rinaldeschi* and edited (with Michel Rouche) a Festschrift in honor of

Olivier Guillot, to which he also contributed an article. He published three book reviews and co-authored two memoirs. A translation into Japanese of an article on "Mary and Martha in the Middle Ages" appeared in *Studies in Western Art XII* (2006), pp. 195-212. He gave a plenary address at the meeting of the Medieval Academy (where he also presided at a session) and the concluding address at the inaugural meeting of the Research Center for the Comparative Study of Religious Orders (of which he is a member of the academic board) at the University of Eichstätt. He lectured at the University of Iowa, the Italian Cultural Institute in New York, the Institute for Advanced Study, the College of William and Mary, the Technical University of Dresden, the University of Lublin (where he also spoke at the Institute of East Central Europe), and the Thaddeus Manteuffel Institute of History of the Polish Academy of Sciences in Warsaw. He spoke at seminars at Princeton University and at the Institute for Advanced Study, commented on two papers presented at a meeting in honor of John Fleming, and spoke at the meeting in Paris where the Festschrift for Professor Guillot was presented. As in previous years, he served on the advisory board of the Delmas Foundation and on the editorial boards of several scholarly journals.

PROFESSOR EMERITUS OLEG GRABAR gave a lecture in Vienna at the celebration of the 100th anniversary of the death of the great art historian Alois Riegl, then in Paris at the Louvre at a symposium on Islam and image. He co-chaired and contributed to a colloquium in Jerusalem on the Haram al-Sharif, sponsored by the Hebrew University, al-Quds University, and the French Institute, and introduced as well as commented upon a seminar on The Arts of Asia held at the Asia Society in New York and the Sterling and Francine Clark Art Institute in Williamstown. He gave public lectures on the Dome of the Rock at the University of British Columbia in Vancouver and the University of Delaware. His publications were: *Constructing the Study of Islamic Art I: Early Islamic Art 650-1100* (Ashgate, London, 2005), pp. 326; *Constructing the Study of Islamic Art IV: Jerusalem* (Ashgate, London, 2005), pp. 251; *Constructing the Study of Islamic Art II: Islamic Visual Culture* (Ashgate, London, 2006), pp. 450; *Constructing the Study of Islamic Art III: Islamic Art and Beyond* (Ashgate, London, 2006), pp. 360; "Islam and the West in the Arts," E. Ihsanoglu ed., *Cultural Contacts in Building a Universal Civilisation: Islamic Contributions* (Istanbul, 2005), pp. 227-242; "Le Présent d'un Passé" *Le chant rythmique de l'esprit, arts de l'Islam et abstraction géométrique* (Donation Albers-Honegger, Mouans-Sartoux, 2005), pp. 5-9; "La Mosquée et le sanctuaire, sainteté des lieux en Islam," *Revue de l'histoire des religions*, t. 222 (December 2005), pp. 481-489; and "The experience of Islamic Art," in Irene Bierman ed., *The Experience of Islamic Art on the Margins of Islam* (Los Angeles, 2005), pp. 11-60.

PROFESSOR EMERITUS CHRISTIAN HABICHT worked on the history and epigraphy of the Greek cities of Cyzicus (sea of Marmara) and Messene (Peloponnese). He read proofs for his book *The Hellenistic Monarchies* and contributed additional bibliography and corrections to another edition of his *Athènes hellénistique*.

Two international Symposia were held in his honor to mark his 80th birthday: in Athens April 3-5, 2006, on Athenian Epigraphy (sponsored by the American School of Classical Studies, the Greek Epigraphical Society and the Epigraphical Museum), and in Volos April 7-9 on the Epigraphy of Thessaly (sponsored by the same and the University of Thessaly). The event at Athens was combined with reports from all contributors to the

new edition of Athenian documents on stone. Professor Habicht declined an invitation to deliver a keynote speech at an international conference on Pausanias, sponsored by the National Greek Research Foundation and scheduled for April 2007.

A second, revised and enlarged edition of his *Athènes hellénistique. Histoire de la cité d' Alexandre le Grand à Marc-Antoine* was published in January of 2006 by *Les Belles Lettres,* Paris. In June of 2006 the University of Michigan Press published his *The Hellenistic Monarchies: Selected Papers*. His other publications were: "Ludwig Ross als Epigraphiker," in H.G. Goette, *Ludwig Ross und Griechenland* (Rahde, 2005), 107-112; "Datum und Umstände der rhodischen Schlichtung zwischen Samos und Priene," *Chiron* 35 (2005), 137-146; "Notes on Inscriptions from Cyzicus," *Epigraphica Anatolica* 38 (2005), 93-100; "Iulius Maior aus Nysa, Eponym von Kyzikos," *Hyperboreus II* (2005), 114-120; "Kronprinzen in der Monarchie der Attaliden?," *Gerión Anajeos* 9 (2005), 119-126.

PROFESSOR EMERITUS IRVING LAVIN delivered the following lectures in recent months: "Caravaggio's 'Flight into Egypt'," in Barcelona, Spain, on the occasion of an exhibition entitled, *Caravaggio y la pintura realista europea;* and "The Baldachino in St. Peter's: Did Borromini Forget Himself?" in Bonn, Germany, on the occasion of an exhibition and colloquium, *Sankt Peter in Rom 1506-2006*. The lecture he delivered on the occasion of receiving the Premio Internazionale Galileo Galilei in October 2005, has been published in Spanish. His book on Rembrandt's *Jewish Bride*, written together with his wife, Marilyn Aronberg Lavin, was published in Italian by Franco Cosimo Panini, Modena, June 2006.

During the 2005-2006 academic year, PROFESSOR EMERITUS PETER PARET published his opening talk, "Staatsoberhaupt und Fabeltier," of the conference *Gli Imperi dopo l'impero nell'Europa del XIX secolo* of the Istituto storico italo-germanico, in the *Annali dell'Istituto* (Trento, 2006); "Bemerkungen über den Krieg als Thema der Kunst in der frühen Neuzeit," in *Mars und die Musen*, eds. Jutta Nowosadtko & Matthias Rogg (LIT-Verlag, Hamburg, 2006); and "Comment" in "The Future of War: A Forum," in *Historically Speaking*, VII, No. 3 (January-February 2006). His talk in the Judaic Studies Program of Princeton University, "Max Liebermann: Triumph and Catastrophe of Assimilation," will appear in the *Jewish Studies Quarterly*, and his talk "Internationalism for the Nation" at the conference on Max Liebermann at the German Historical Institute in Washington D.C. in *Max Liebermann: Art and the Nation*, ed. Marion Deshmukh (Berghahn Books). He also published reviews in *The American Historical Review, Central European History, H-Net Reviews*, and *The Journal of Military History*.

Professor Paret is currently preparing a third revised edition of his monograph *Clausewitz and the State*, which Princeton University Press is bringing out in the spring of 2007. The work originally appeared in 1976; it has been translated into German, Spanish, and Japanese. The Japanese translation, first published in 1991 by Chuokoron-sha Inc., has just appeared in a paperback edition. The United Kingdom Everman's Library edition of Carl von Clausewitz, *On War*, which he translated and edited with Michael Howard, has been reprinted; his essay, "The History of Armed Power," originally published in 2002, is included in the paperback edition of *A Companion to Western Historical Thought*, edited by Lloyd Kramer and Sarah Maza (Blackwell, 2006); and Cambridge University Press has published a paperback edition of his monograph *An Artist against the Third Reich: Ernst Barlach, 1933-1938*.

PROFESSOR EMERITUS MORTON WHITE's book, *A Philosophy of Culture*, was translated into French and published by Vrin in Paris. His essay "The Analytic and the Synthetic: An Untenable Dualism" was reprinted in a volume entitled *Pragmatism, Old and New*, edited by Susan Haack and published by Prometheus Books. Professor White continues to work on what has been called a "prequel" to *A Philosophy of Culture*. It is a study of the history of the ideas of necessary truth, indubitable truth, and analytic truth from Descartes to the present in which White tries to show how these technical ideas in epistemology and metaphysics were used to defend views about religion, politics, morality, education, and other cultural institutions. In it he also tries to show why the views of classical rationalists on this subject have been gradually abandoned, and why they should be replaced by the pragmatic views he presents and defends in *A Philosophy of Culture*.

THE SCHOOL OF HISTORICAL STUDIES

MEMBERS, VISITORS, AND RESEARCH STAFF

DAVID ANTHONY
Eurasian Steppe Archaeology
Hartwick College · *s*

CATHERINE ATHERTON
Ancient Philosophy
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JOÃO BIEHL
Anthropology and Latin American Studies
Princeton University

MARGARETHE BILLERBECK
Greek and Latin Language and Literature
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Max-Planck-Institute for the History of Science, Germany

ELI FRIEDLANDER
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Tel Aviv University, Israel

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Japanese History and Comparative Historiography
Columbia University

PETER GOLDEN
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Rutgers, The State University of New Jersey

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a Research Assistant · *b* Both Member and Visitor · *f* First Term · *s* Second Term · *v* Visitor

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DOMENICO MELI
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Indiana University

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University of Cambridge · *s*

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VALERY NIKONOROV
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Russian Academy of Sciences · *f*

UTA NITSCHKE-STUMPF
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University of Notre Dame · *s, v*

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Korean Diaspora and History of Capitalism and Democracy
New York University

YURI PINES
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The Hebrew University of Jerusalem, Israel · *s*

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Yale University · *b*

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Centre National de la Recherche Scientifique, France

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Princeton University · *v*

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Università del Piemonte Orientale "A. Avogadro", Italy · *s*

a Research Assistant · *b* Both Member and Visitor · *f* First Term · *s* Second Term · *v* Visitor

JELENA TRKULJA
Byzantine and Western Medieval Art
Institute for Advanced Study · *a*

STEVEN VANDERPUTTEN
Medieval Monasticism
Ghent University, Belgium · *f*

SOPHIE VOLPP
Chinese Literature
University of California, Berkeley · *s*, *v*

NATHAN WACHTEL
Latin American History, Anthropology
Collège de France · *f*

LAURA WEIGERT
Medieval and Renaissance Art History
Reed College · *s*

MUHAMMAD ZAMAN
Islamic Studies
Brown University

EVGENY ZAYTSEV
History of Science and Semantics
Institute for History of Science, Russia

KATHERINE ZIEMAN
Late Medieval English Literature and Culture
Wesleyan University · *b*

THE SCHOOL OF HISTORICAL STUDIES

RECORD OF EVENTS

The following is a calendar of events sponsored by the School of Historical Studies

Academic Year 2005-06

October 4
East Asian Studies Seminar:
"Chinese Muslims in Manchukuo: Japanese Imperialism and Global Islam"
ZVI BEN-DOR, *New York University*

October 5
Medieval Table Lunchtime Colloquium:
"The Translation of Relics as a Political Tool"
STEVEN VANDERPUTTEN, *University of Ghent; Member, School of Historical Studies*

October 12
Medieval Table Lunchtime Colloquium:
"The Cairo Geniza as a Source for Social and Economic History"
ROXANI MARGARITI, *Emory University; Member, School of Historical Studies*; and MARK COHEN, *Princeton University*

October 18
East Asian Studies Seminar:
"Between Human and Labor Rights: Democracy, History, and Neoliberalism in the Politics of Migrant Workers in South Korea"
HYUN OK PARK, *New York University; Member, School of Historical Studies*

October 19
Afternoon Lecture:
"Some Considerations of Burgundian Court Ceremonial Relating to Late Medieval Painting"
ROBERT SUCKALE, *Technical University of Berlin; Member, School of Historical Studies*

October 26
Medieval Table Lunchtime Colloquium:
"Constructions of Voice in the Ellesmere Manuscript of the Canterbury Tales"
KATHERINE ZIEMAN, *University of Notre Dame; Member, School of Historical Studies*

November 1
East Asian Studies Seminar:
"The Informal Government of Suzhou in the Ming"
JOSEPH McDERMOTT, *Cambridge University; Member, School of Historical Studies*

November 2
Medieval Table Lunchtime Colloquium:
"Originality and Eclecticism, The Search for Origins of the 'Morava School'"
JELENA TRKULJA, *Research Assistant, School of Historical Studies*

November 9
Medieval Table Lunchtime Colloquium:
"Databases for Medieval Manuscripts on the Web"
MARIE-ANNE POLO DE BEAULIEU, *Centre National de la Recherche Scientifique; Member, School of Historical Studies*; STEVEN VANDERPUTTEN, *University of Ghent; Member, School of Historical Studies*; GUDE SUCKALE-REDLEFSEN, *Independent Scholar, Berlin*

November 15
East Asian Studies Seminar:
"Sacral Kingship in Asia: The Khazar Case"
PETER GOLDEN, *Rutgers, The State University of New Jersey; Member, School of Historical Studies*

November 16
Medieval Table Lunchtime Colloquium:
"Blockading the Gulf of Eden: A Bishop's Prescription of the 14th Century"
RANABIR CHAKRAVARTI, *Jawaharlal Nehru University; Member, School of Historical Studies*

November 30
Medieval Table Lunchtime Colloquium:
"The Construction of Ethnicity in Medieval Turkic Eurasia"
PETER GOLDEN, *Rutgers, The State University of New Jersey; Member, School of Historical Studies*

December 7
Medieval Table Lunchtime Colloquium:
"Black Beauty or Black Demon: The Queen of Sheba in Medieval Art"
GUDE SUCKALE-REDLEFSEN, *Independent Scholar, Berlin*

December 9
Classics Seminar:
"Traces of a Multi-ethnic City: Grave Reliefs in the Graeco-Roman Museum of Alexandria"
STEFAN SCHMIDT, *Universität Augsburg; Member, School of Historical Studies*

December 13
East Asian Studies Seminar:
"On the Role of the Stirrup in the Development of Ancient Warfare"
VALERY NIKONOROV, *Russian Academy of Sciences; Member, School of Historical Studies*

December 14
Medieval Table Lunchtime Colloquium:
"Vercelli Bibl. Cap. 165: The Iconography and Ideology of Rulership in Carolingian Italy"
CELIA CHAZELLE, *The College of New Jersey; Visitor, School of Historical Studies*

December 16
Classics Seminar:
"A New Letter of Hadrian (the Naryka bronze)"
CHRISTOPHER JONES, *Harvard University; Visitor, School of Historical Studies*

January 17
East Asian Studies Seminar:
"Why Did the Tang Fall: A Re-assessment of the Ninth Century"
LU YANG, *Princeton University*

January 18
Medieval Table Lunchtime Colloquium:
"The Cult of Christ's Blood in Medieval Bohemia"
CAROLINE WALKER BYNUM, *Professor, School of Historical Studies*

Classics Seminar:
"Modelling Musical Practice: The Argument of Ptolemy's Harmonics"
ALEXANDER JONES, *University of Toronto; Member, School of Historical Studies*

January 25
Islamicist Group:
Quran-reading

January 31
East Asian Studies Seminar:
"Trade Networks on the Black Sea, the Mongol Empire, and World History"
NICOLA DI COSMO, *Luce Foundation Professor in East Asian Studies, School of Historical Studies*

February 1
Medieval Table Lunchtime Colloquium:
"Materiality versus Mimesis? The Medieval Image and Concepts of Authenticity"
NINO ZCHOMELIDSE, *Royal Danish Academy of Fine Arts, Copenhagen*

Islamicist seminar:
"Byzantine Documentary Practice and the Origins of the Basmala"
LENNART SUNDELIN, *Research Assistant, School of Historical Studies*

Islamicist Group:
Quran-reading

February 7
East Asian Studies Seminar:
"Conflict and Competition in the World of the Indian Ocean"
ROXANI MARGARITI, *Emory University; Member, School of Historical Studies*

February 8
Medieval Table Lunchtime Colloquium:
"De Spiritu Guidonis, Problems of Editing and Interpretation"
MARIE-ANNE POLO DE BEAULIEU, *Centre National de la Recherche Scientifique; Member, School of Historical Studies*

Classics Seminar:
"The Burial of Herodes Atticus: Elite Identity and Civic Landscape in Roman Greece"
JOSEPH RIFE, *Macalester College; Member, School of Historical Studies*

Islamicist Group:
Quran-reading

February 9
Islamicist seminar:
"An early Arabic papyrus"
PETRA SIJPESTEIJN, *University of Oxford*

February 14
East Asian Studies Seminar:
"Merchants, Merchandise and Merchantmen: The Western Sea-board of India and the Indian Ocean (800-1500)"
RANABIR CHAKRAVARTI, *Jawaharlal Nehru University; Member, School of Historical Studies*

February 15
Islamicist Group:
Quran-reading

February 22
Medieval Table Lunchtime Colloquium:
"The Challenges of Writing Papal History"
THOMAS NOBLE, *University of Notre Dame; Visitor, School of Historical Studies*

Islamicist Group:
Quran-reading

February 28
East Asian Studies Seminar:
"The Price of Omnipotence: Xunzi and Han Feizi on Dilemmas of Rulership"
YURI PINES, *Hebrew University of Jerusalem; Member, School of Historical Studies*

March 2
Afternoon Seminar:
"The Mucker War: A Cultural History of Germanism in 19th Century Brazil"
JOÃO BIEHL, *Princeton University; Member, School of Historical Studies*

March 7
East Asian Studies Seminar:
"In Search of the Ancient Viet: Yue and Hua-Xia Ethnicity in Early South China"
ERICA BRINDLEY, *Penn State University*

March 8
Medieval Table Lunchtime Colloquium:
"Flos in pictura……."
MICHAEL CURSCHMANN, *Princeton University*

March 14
East Asian Studies Seminar:
"The Opening of the Eurasian Steppe at 2000 BCE: the Beginning of an Eurasian Ecumene"
DAVID ANTHONY, *Hartwick College; Member, School of Historical Studies and* DORCAS BROWN, *Hartwick College*

March 15
Medieval Table Lunchtime Colloquium:
"Pictures and Plays of the 'Vengeance of our Lord'"
LAURA WEIGERT, *Reed College; Member, School of Historical Studies*

Islamicist Group:
Quran-reading

March 22
Medieval Table Lunchtime Colloquium:
"The Hours of Catherine of Cleves: From Illumination to Theology"
MARIE-ANNE POLO DE BEAULIEU, *Centre National de la Recherche Scientifique; Member, School of Historical Studies*

March 24
Classics Seminar:
"Gaza as a Christian City at the Beginning of the 6th century AD – Fact or Fiction?"
CLAUDIA TIERSCH, *Technische Universität Dresden; Member, School of Historical Studies*

March 29
Classics Seminar:
"Lawcourts in Roman Athens"
KAJA HARTER-UIBOPUU, *Austrian Academy of Sciences; Member, School of Historical Studies*

April 5
Medieval Table Lunchtime Colloquium:
"The Cross of the Crusaders"
GILES CONSTABLE, *Professor Emeritus, School of Historical Studies*

Islamicist seminar:
"Atomism and Early Christian Cosmology: a Syriac Perspective"
UTE POSSEKEL, *Princeton Theological Seminary*

Islamicist Group:
Quran-reading

April 12
East Asian Studies Seminar:
"Introduction to the Anthropology and Archaeology of the Ancient Peoples of Mongolia"
TUMEN DASHZEVEG, *National University of Mongolia*

Islamicist Group:
Quran-reading

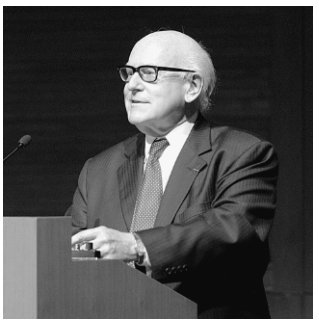
April 19
Islamicist Group:
Quran-reading

May 1
Natives as Members of Imperial and Post-Imperial Elites:
Apologetics and 'Shu'ubiyya' in Hellenism and Islam (Conference):
"Opening Remarks"
PATRICIA CRONE, *Andrew W. Mellon Professor, School of Historical Studies*
"First Encounters"
IAN MOYER, *Pomona College*
"Jews in Greek Culture"
ERICH GRUEN, *University of California, Berkeley*
"Jews outside Greek Culture"
RACHEL NEIS and YARON ELIAV, *University of Michigan*
"Jews and Christians in Islam"
SARAH STROUMSA, *Hebrew University of Jerusalem*

May 2
Natives as Members of Imperial and Post-Imperial Elites:
Apologetics and 'Shu'ubiyya' in Hellenism and Islam (Conference):
"Prejudice"
BENJAMIN ISAAC, *University of Tel Aviv*
"Eusebius and Barbarians Writing Back"
AARON JOHNSON, *University of Texas*
"The Paradigmatic Shu'ubiyya"
SARAH SAVANT, *Harvard University*
"al-Andalus"
MARIBEL FIERRO, *CSIC Madrid*

May 3
Natives as Members of Imperial and Post-Imperial Elites:
Apologetics and 'Shu'ubiyya' in Hellenism and Islam (Conference):
"Syrian and Other Pagans in Greek Culture"
PHILIPPA TOWNSEND, *Princeton University*
"Syrian Christians"
ADAM BECKER, *New York University*
"Chaldaeans in Muslim Iraq"
ISABEL TORAL, *University of Freiburg*
"Christian and Muslim Egypt"
ARIETTA PAPACONSTANTINOU, *University of Paris*, and LENNART SUNDELIN, *Research Assistant, Institute for Advanced Study, School of Historical Studies*
"'Firsts' in Muslim Culture"
WILLIAM McCANTS, *Princeton University*
"Closing Remarks"
MICHAEL COOK, *Princeton University*
Lunchtime Seminar: "The Civil Rights Movement as Re-interpreted in Contemporary Words and Images"
VALERIE SMITH, *Princeton University; Visitor, School of Historical Studies*

May 17
Islamicist Group:
Quran-reading



CLIFF MOORE

Glen W. Bowersock delivering the lecture "The Three Romes" on May 5, 2006.

DINAH KAZAKOFF

"This is my third period at IAS and each time I like it better. I learn more and more to appreciate the unique atmosphere that IAS provides. This semester was especially influential for me because of the presence of so many Members with close research interest. Last but not least, a warm word is due to the devoted staff of IAS, whose commitment makes the life of the Members very much carefree."

— Member, School of Mathematics

THE SCHOOL OF MATHEMATICS

Faculty

ENRICO BOMBIERI, *IBM von Neumann Professor*
JEAN BOURGAIN
PIERRE DELIGNE
PHILLIP A. GRIFFITHS
ROBERT P. LANGLANDS, *Hermann Weyl Professor*
ROBERT MacPHERSON
THOMAS SPENCER
VLADIMIR VOEVODSKY
AVI WIGDERSON, *Herbert H. Maass Professor*

Professor Emeritus

ATLE SELBERG

ACADEMIC ACTIVITIES

During the academic year 2005-2006 the School of Mathematics conducted a special program on "Lie Groups, Representations and Discrete Mathematics." The goal of the program was to explore the connections between representation theory of Lie groups, their arithmetic subgroups, number theory, and geometry of locally symmetric spaces on one hand and discrete mathematics, combinatorics and computer science on the other hand. The program was led by A. Lubotzky with approximately thirty members who spent a term or the entire academic year at the IAS. Senior members participating were P. Sarnak, G. Margulis, N. Katz, N. Alon, A. Eskin, S. Mozes, R. Guralnick, F. Grunewald, and W. Kantor. Many junior members and postdocs participated as well. Because the program was very interdisciplinary, its activities attracted (at various levels of participation) many of the other members of the School of Mathematics as well as colleagues and students of neighboring institutes like Princeton University and Rutgers.

A main goal of the year-long program was to have the members (who came from very different backgrounds) become aware of the topics, results and methods which are studied in the other areas. This was mainly achieved by running a large number of seminars which often targeted non-specialists.

Four regular weekly seminars were organized in connection with the program: Two of them were the traditional discrete mathematics and computer science seminars which are organized every year by faculty member A. Wigderson. This year they have been twisted a bit to make them appeal and be relevant to the group theorists and number theorist members of the program. Another seminar focused on questions and problems which are at the heart of the interaction between all the topics. A fourth seminar, run by P. Sarnak, put more emphasis on number-theoretic and ergodic-theoretic related topics.

There were also two week-long workshops, one in November 2005 and one in February 2006, which were attended by over 80 people each. The first workshop was more educational in

nature. Several lecture series were given by members of the program and by outside visitors. The topics included: expanders in computer science and combinatorics, the combinatorics of finite simple groups, expanders in hyperbolic geometry, Ramanujan graphs and complexes and sum-product results in finite fields with their applications to number theory, combinatorics, and computer science. Some of the speakers were J. Bourgain, A. Wigderson, E. Zelmanov, P. Sarnak, A. Lubotzky, M. Lackenby, Y. Shalom, M. Kassabov, and N. Nikolov.

The second conference was a more traditional one with more than twenty lecturers presenting new results and directions in related areas. Some results achieved at IAS during the course of the program were presented and there were many talks by outside speakers such as L. Babai, F. Chang, W. Li, A. Shálev, I. Pak, and A.Terras.

A main objective of study during the year was "expanders." These are highly connected finite graphs with numerous applications in computer science, communications, error correction, and combinatorics, as well as in more classical mathematics. Their original constructions used results from representation theory of semi-simple Lie groups (such as Kazhdan property (T)) and/or results from number theory and the theory of automorphic forms (such as Ramanujan conjecture). The activity during the year showed that these types of graphs play an important and maybe unexpected role also in several mathematical disciplines, such as hyperbolic geometry, finite simple groups, analytic number theory (e.g. sieving), and more. The program cultivated a group of researchers who came from very different backgrounds but discovered that they were studying related objects.

Some of the exciting developments that matured during the special year are:

- J. Bourgain and A. Gamburd showed (based on sum-product results and the work of Helfgott) that random generators of $SL_2(p)$ give rise to expanders.
- M. Kassabov, A. Lubotzky, and N. Nikolov showed that essentially all finite simple groups can be made into a family of expanders in a uniform way.
- R. Guralnick, B. Kantor, M. Kassabov, and A. Lubotzky showed that the finite simple groups have small and short presentations – by far better than what have been conjectured before.
- B. Barak, A. Rao, R. Shaltiel, and A. Wigderson have improved the best explicit construction of Ramsey graphs as well as extended it to the much harder case of bipartite graphs.

Several new results on property (T) were proved.

- Most notably, Y. Shalom showed that the universal lattice $SL_n(Z[x_1 \ldots\ldots, x_k])$ has property (T) provided $n \geq k+2$.
- M. Ershov showed, using Kac-Moody groups, that there exist Golod-Shafarewich groups with property (T). The latter is of importance in connection to some efforts to solve the virtual Haken conjecture on hyperbolic 3-manifolds via expanders.
- A. Venkatesh and P. Michel used expanders to show strong uniform distributions on the sphere of integral solutions if the equation $x^2+y^2+z^2=n$ as n going to infinity.
- P. Sarnak, J. Bourgain, and A. Gamburd developed a new sieving method which is far reaching "non-commutative" version of the classical sieving. Using results on expanders they show that the orbit of some linear groups acting in Z^n get many vectors with almost prime entries.

As in preceding years, number theory was the subject of a weekly seminar organized in collaboration with the mathematics department of Princeton University. In addition to

lectures by our visiting members, there were lectures by invited speakers on current topics of major interest, among them a lecture by D. Goldston on a breakthrough result on small gaps between consecutive primes and by R. Taylor on the conjecture of Sato and Tate on the distribution of (mod p) points on an elliptic curve as the prime p varies. The topics treated were quite varied, from classical analytic number theory to modular functions to arithmetic geometry.

In connection with the special program, a regular seminar on arithmetic homogeneous spaces was held, including a series of lectures by G. Margulis on the distribution of values of irrational quadratic forms.

On the educational side, in May of 2006 during the Program for Women and Mathematics, Enrico Bombieri gave an overview of the current status of the theory of L-functions.

In the spring term P. Deift, J. Lebowitz and I. Nenciu joined M. Loss, G. Kozma, and J. Schenker to form an interactive group of mathematical physicists. There was a weekly seminar which covered random matrices, integrable systems, nonequilibrium statistical mechanics, loop erased walks, and quantum mechanics. Some of the seminars' highlights included Lebowitz's overview of problems in nonequilibrium states, Deift's review of universality and random matrices, and Loss's talk on ground states of nonrelativistic models of quantum electrodynamics. Y. Sinai gave a fascinating lecture about blow up in complex solutions to the 3D Navier Stokes. Our short-term visitors included E. Carlen, O. Costin, A. Kupiainen, S. Olla, and F. Toninelli. Their talks covered such topics as microscopic models of conductivity, droplet formation and phase transitions for directed polymers.

A four-day conference was held in October to celebrate the 61st birthday of School professor Pierre Deligne. Conference organizers were R. MacPherson, IAS; N. Katz, Princeton University; H. Esnault, University of Duisburg-Essen; and S. Bloch and A. Beilinson of the University of Chicago. Conference speakers were: J. Bernstein, Tel Aviv University; G. Faltings, Max-Planck Institut für Mathematik; O. Gabber, IHES; P. Griffiths, IAS; G. Henniart, University of Paris-SUD; L. Illusie, University of Paris-SUD; M. Kontsevich, IHES; G. Laumon, University of Paris-SUD; G. Lusztig, MIT; Y. Manin, Northwestern University; C. Simpson, University of Nice; T. Terasoma, University of Tokyo; M.-F. Vignéras, Institut de Mathématiques de Jussieu; A. Wiles, Princeton University; and D. Zagier, Max-Planck Institut für Mathematik.

The 29th Marston Morse Memorial Lectures were given by M. Ratner of the University of California at Berkeley. Two lectures were given on "Rigid Actions on Homogeneous Spaces and Applications."

Faculty member Robert Langlands received an honorary degree from the University of Madras in December of 2005 and was awarded the Nemmers Prize in 2006.

THE SCHOOL OF MATHEMATICS

MEMBERS AND VISITORS

NOGA ALON
Combinatorics
Institute for Advanced Study/Tel Aviv University, Israel · *vp, s*

SHIRI ARTSTEIN
Asymptotic Geometric Analysis
Institute for Advanced Study · *vri*

DMITRI BELIAEV
Function Theory
Royal Institute of Technology, Sweden · *vri*

ANDREJ BOGDANOV
Computational Complexity
University of California, Berkeley

EMMANUEL BREUILLARD
Group Theory and Ergodic Theory
IHÉS, France · *s*

KAIHUA CAI
Schrödinger Equations
California Institute of Technology · *s*

FREDERICK COHEN
Algebraic Topology
University of Rochester · *s*

TOMMASO DE FERNEX
Algebraic Geometry
University of Michigan

PERCY DEIFT
Integrable Systems, Random Matrix Theory
New York University · *s*

MIKHAIL ERSHOV
Lie Methods in Group Theory
Yale University

ALEX ESKIN
Lie Groups, Discrete Groups
University of Chicago · *f*

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Ergodic Theory, Combinatorics
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ALEX GAMBURD
Lie Groups and Discrete Mathematics
Stanford University

YAIR GLASNER
Geometric Group Theory
University of Illinois, Chicago

DANIEL GOLDSTEIN
Number Theory and Representation Theory
Center for Communications Research, La Jolla · *v, f*

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Geometry, Automorphic Forms
Institute for Advanced Study

FRITZ GRUNEWALD
Algebra, Number Theory
Heinrich Heine Universität, Germany

VLADIMIR GULETSKII
Algebraic Cycles, Motivic Homotopy
Institute for Advanced Study

ROBERT GURALNICK
Group Theory, Algebraic Curves
University of Southern California · *f, s*

XUHUA HE
Representation Theory
Massachusetts Institute of Technology

NANCY HINGSTON
Hamiltonian Systems
The College of New Jersey

HELMUT HOFER
Differential Equations
New York University · *f*

BRUCE JORDAN
Number Theory
Baruch College (CUNY) · *v*

WILLIAM KANTOR
Finite Groups, Computer Science
University of Oregon

f First term · *j* Joint with School of Natural Sciences · *s* Second Term · *v* Visitor · *vp* Visiting Professor
vri Veblen Research Instructorship

NICHOLAS KATZ
Arithmetic Algebraic Geometry
Princeton University

MAHTA KHOSRAVI
Analysis
McGill University, Canada

BO'AZ KLARTAG
High-Dimensional Geometry
Institute for Advanced Study

SILVIUS KLEIN
Schrödinger Operators
University of California, Los Angeles

GADY KOZMA
Harmonic Analysis
Institute for Advanced Study

STEPHEN KUDLA
Automorphic Forms, Arithmetic Geometry
University of Maryland · *v, s*

MATILDE LALIN
Number Theory
University of Texas, Austin

EREZ LAPID
Automorphic Forms, Trace Formula
The Hebrew University of Jerusalem, Israel · *f*

JOEL LEBOWITZ
Mathematical Physics
Rutgers, The State University of New Jersey · *s*

JAMES LEE
Theoretical Computer Science
University of California, Berkeley

RON LIVNÉ
Modular Forms, Arithmetic Varieties
The Hebrew University of Jerusalem, Israel

MICHAEL LOSS
Quantum Coulomb Systems
Georgia Institute of Technology

ALEXANDER LUBOTZKY
Group Theory, Discrete Mathematics
The Hebrew University of Jerusalem, Israel

GREGORY MARGULIS
Lie Group Theory
Yale University · *s*

ROY MESHULAM
Combinatorics
Technion, Israel

G. ROBERT MEYERHOFF
Hyperbolic 3-Manifolds
Boston College · *v, f/s*

MICHAEL MOVSHEV
Mathematical Physics
IHÉS, France · *j*

SHAHAR MOZES
Discrete Groups, Lie Groups
The Hebrew University of Jerusalem, Israel · *f*

WERNER MÜLLER
Geometric Analysis
Institute for Advanced Study · *v, f*

IRINA NENCIU
Integrable Systems, Random Matrices
California Institute of Technology · *s*

AMOS NEVO
Lie Groups, Ergodic Theory
Technion, Israel

ALEXEI OBLOMKOV
Hecke Algebras
Massachusetts Institute of Technology

HEE OH
Discrete Subgroups of Lie Groups and Representation Theory
California Institute of Technology · *v, s*

GOPAL PRASAD
Arithmetic of Semi-Simple Groups
University of Michigan · *f*

ANDREI RAPINCHUK
Algebraic Groups
University of Virginia · *f*

ALEXANDER RAZBOROV
Combinatorics, Computer Science
Institute for Advanced Study · *vp*

f First term · *j* Joint with School of Natural Sciences · *s* Second Term · *v* Visitor · *vp* Visiting Professor
vri Veblen Research Instructorship

EYAL ROZENMAN
Combinatorics
Weizmann Institute, Israel

YVAN SAINT-AUBIN
Mathematical Physics
University of Montreal, Canada · *f*

MICHAEL SAKS
Computational Complexity, Discrete Mathematics
Rutgers, The State University of New Jersey · *v*

PETER SARNAK
Analytic Number Theory, Automorphic Forms
Princeton University

JEFFREY SCHENKER
Mathematical Physics
Institut Für Theoretische Physik, Switzerland

YEHUDA SHALOM
Discrete Subgroups, Lie Groups
Tel Aviv University, Israel

LIOR SILBERMAN
Analysis on Locally Symmetric Spaces
Princeton University

TIM STEGER
Affine Buildings, Discrete Groups
Universita degli Studi di Sassari, Italy

BENJAMIN SUDAKOV
Combinatorics, Computer Science
Princeton University

BALAZS SZEGEDY
Arithmetic Groups
Microsoft Research

AKSHAY VENKATESH
Automorphic Forms
Clay Mathematics Institute

UZI VISHNE
Spectral Theory, Discrete Groups
Bar Ilan University, Israel

THOMAS VOGEL
Geometry
Mathematical Institute LMU, Germany · *s*

VAN VU
Combinatorics
University of California, San Diego

KATRIN WEHRHEIM
Gauge Theory, Symplectic Geometry
Institute for Advanced Study

ANNA WIENHARD
Discrete Groups, Lie Groups
Universität of Basel, Switzerland

TAMAR ZIEGLER
Ergodic Theory
The Ohio State University

ANDRZEJ ZUK
Analysis and Geometry on Groups
University of Paris VI, France · *f*

f First term · *j* Joint with School of Natural Sciences · *s* Second Term · *v* Visitor · *vp* Visiting Professor
vri Veblen Research Instructorship

THE SCHOOL OF MATHEMATICS

RECORD OF EVENTS

The following is a calendar of events sponsored by the School of Mathematics

Academic Year 2005-06

September 12
Computer Science/Discrete Math, I:
"Locally Decodable Codes With 2 Queries and Polynomial Identity Testing for Depth 3 Circuits"
ZEEV DVIR, *Weizmann Institute of Science, Israel*

September 21
IAS/Princeton Number Theory:
"Modularity and the Breuil-Mezard Conjecture"
MARK KISIN, *University of Chicago*

September 23
Arithmetic Homogeneous Spaces:
"Periods of Automorphic Forms over a Compact Unitary Group"
OMER OFFEN, *Weizmann Institute of Science, Israel*

September 26
Computer Science/Discrete Math, I:
"Expanders, L-Functions, and the Elliptic Curve Discrete Logarithm Problem"
STEPHEN D. MILLER, *The Hebrew University of Jerusalem; Rutgers, The State University of New Jersey*

IAS/Princeton Number Theory:
"Distribution of Rational Points on Equivariant Compactifications of Semi-Simple Groups"
RAMIN TAKLOO-BIGHASH, *Princeton University*

September 27
Computer Science/Discrete Math II:
"Property Tau and the Product Replacement Algorithm"
ALEX LUBOTZKY, *The Hebrew University of Jerusalem; Member, School of Mathematics*

September 28
IAS/Princeton Number Theory:
"Multiple Hurwitz Zeta Functions"
RAM MURTY, *Queen's University*

September 30
Arithmetic Homogeneous Spaces:
"Some Aspects of the Theta Correspondence"
EREZ LAPID, *The Hebrew University of Jerusalem; Member, School of Mathematics*

October 3
Computer Science/Discrete Math, I:
"Szemeredi's Regularity Lemma Revisited"
TERRY TAO, *University of California, Los Angeles*

Short Talks by Postdoctoral Members:
"Furstenberg Averages and Nilpotent Groups"
TAMAR ZIEGLER, *Ohio State University; Member, School of Mathematics*
"On the Relation Between Worst-Case and Average-Case Complexity for NP"
ANDREJ BOGDANOV, *University of California, Berkeley; Member, School of Mathematics*
JAMES LEE, *University of California, Berkeley; Member, School of Mathematics*
"Floer Homology and Adiabatic Limits"
KATRIN WEHRHEIM, *Member, School of Mathematics*
"Chern Classes of Singular Algebraic Varieties"
TOMMASO DE FERNEX, *University of Michigan; Member, School of Mathematics*

October 4
Short Talks by Postdoctoral Members:
"Computing Cohomology of Pro-P Groups Using Lie Algebra Methods"
MIKHAIL ERSHOV, *Yale University; Member, School of Mathematics*
"Ergodic Averages and Combinatorics"
NIKOS FRANTZIKINAKIS, *Pennsylvania State University; Member, School of Mathematics*
"Deformed Harish-Chandra Homorphism for the Cyclic Quiver"
ALEXEI OBLOMKOV, *Massachusetts Institute of Technology; Member, School of Mathematics*
"The G-Stable Pieces of the Group Compactification"

XUHUA HE, *Massachusetts Institute of Technology; Member, School of Mathematics*
"Spectral Asymptotics on Heinsenberg Manifolds"
MAHTA KHOSRAVI, *McGill University, Canada; Member, School of Mathematics*
"Fitting a Smooth Function to Data"
BO'AZ KLARTAG, *Member, School of Mathematics*

October 5
Short Talks by Postdoctoral Members:
"Lyapunov Exponent and Integrated Density of States for Schrödinger Cocycles"
SILVIUS KLEIN, *University of California, Los Angeles; Member, School of Mathematics*
Short Talks by Postdoctoral Members:
"Problem Session (Probability, Analysis, Geometry)"
GADY KOZMA, *Member, School of Mathematics*
"Mahler Measure and Values of Regulators"
MATILDE LALIN, *University of Texas at Austin; Member, School of Mathematics*

October 6
Short Talks by Postdoctoral Members:
"Some Applications of the Pseudo-Randomness of Expander Graphs"
EYAL ROZENMAN, *Weizmann Institute of Science, Israel; Member, School of Mathematics*
"Adding Interactions to a Random Schrödinger Equation"
JEFFREY SCHENKER, *Institut Für Theoretische Physik, Switzerland; Member, School of Mathematics*
"Equidistribution of Automorphic Forms"
LIOR SILBERMAN, *Princeton University; Member, School of Mathematics*
"An Analytic Approach to Combinatorics"
BALASZ SZEGEDY, *Microsoft Research; Member, School of Mathematics*
"Pl and Representable Algebras: Decidable and Undecidable Problems"
UZI VISHNE, *Bar Ilan University, Israel; Member, School of Mathematics*
"Strong Approximation on Random Towers of Graphs"
YAIR GLASNER, *University of Illinois at Chicago; Member, School of Mathematics*

October 7
Special Seminar:
"Indefinite Theta Functions and Mock Theta Functions"
DON ZAGIER, *Max-Planck-Institut für Mathematik*

Short Talks by Postdoctoral Members:
"Solution of Shannon's Problem on the Monotonicity of Entropy"
SHIRI ARTSTEIN, *Member, School of Mathematics*
"Bounds for the Number of Integral or Rational Points on Varieties"
AKSHAY VENKATESH, *Clay Mathematics Institute; Member, School of Mathematics*
"Bounded Cohomology and the Geometry of Representations"
ANNA WIENHARD, *Universität of Basel, Switzerland; Member, School of Mathematics*

October 10
Cluster-Polyfold Setup for Langrangian Floer Homology

Computer Science/Discrete Math, I:
"Randomness Extractors for a Constant Number Independent Sources of Polynomial Min-Entropy"
ANUP RAO, *University of Texas at Austin*

October 11
Cluster-Polyfold Setup for Langrangian Floer Homology

Computer Science/Discrete Math II:
"Why and Which Expanders?"
AVI WIGDERSON, *Herbert H. Maass Professor, School of Mathematics*

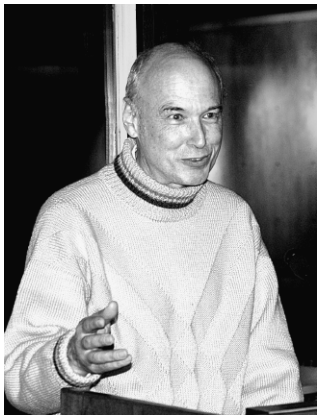
Lie Groups, Representations and Discrete Math:
"From Ramanujan Graphs to Ramanujan Complexes"
ALEX LUBOTZKY, *The Hebrew University of Jerusalem; Member, School of Mathematics*

October 12 - 14
Cluster-Polyfold Setup for Langrangian Floer Homology

Arithmetic Homogeneous Spaces:
"Equidistribution and Arithmetic on Homogeneous Spaces"
AKSHAY VENKATESH, *Clay Mathematics Institute; Member, School of Mathematics*

October 17
Computer Science/Discrete Math I:
"Embeddings of Earthmover Metrics"
ASSAF NAOR, *Microsoft Research*

October 17 - 20
A Conference on the Occasion of the Sixty-First Birthday of Pierre Deligne



CLIFF MOORE

Pierre Deligne, Professor in the School of Mathematics, during A Conference on the Occasion of the Sixty-First Birthday of Pierre Deligne.

October 21
Arithmetic Homogeneous Spaces:
"Asymptotic Geometry of Solvable Groups and Related Graphs"
ALEX ESKIN, *University of Chicago; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Combinatorics of Simplicial Complexes"
GIL KALAI, *The Hebrew University of Jerusalem; Yale University*

Special Seminar:
"Nonuniformly Hyperbolic Attractors; Invertible and Noninvertible"
M. BENEDICKS, *Kungliga Tekniska Högskolan, Stockholm*

October 26
IAS/Princeton Number Theory:
"Distribution of Rational Points on Equivariant Compactifications of Semi-Simple Groups"
RAMIN TAKLOO-BIGHASH, *Princeton University*

October 28
Arithmetic Homogeneous Spaces:
"Ihara's Lemma and the Sato-Tate Conjecture"
RICHARD TAYLOR, *Harvard University*

Computer Science/Discrete Math III:
"Hyperbolic Polynomials and Van Der Waerden/Schrijver-Valiant Like Conjectures"
LEONID GURVITS, *Los Alamos National Laboratory*

October 31
Computer Science/Discrete Math I:
"Quantum Information and the PCP Theorem"
RAN RAZ, *Weizmann Institute of Science, Israel*

Members Seminar:
"Motivic Integration, Constructible Functions, and Stringy Chern Classes"
TOMMASO DE FERNEX, *University of Michigan; Member, School of Mathematics*

November 1
Computer Science/Discrete Math II:
"Expander Graphs on the Symmetric Groups"

EYAL ROZENMAN, *Weizmann Institute of Science, Israel; Member, School of Mathematics*
Lie Groups, Representations and Discrete Math:
"Buildings and the Spectra of Their Laplacians"
TIM STEGER, *Universita degli Studi di Sassari, Italy; Member, School of Mathematics*

November 2
IAS/Princeton Number Theory Seminar:
"Rational Homology Spheres and Automorphic Forms"
FRANK CALEGARI, *Harvard University*

November 4
Arithmetic Homogeneous Spaces:
"Ergodic Theory on Simisimple Groups and Lattice Subgroups"
AMOS NEVO, *Technion, Israel; Member, School of Mathematics*

November 7
Computer Science/Discrete Math I:
"Near-Optimal Algorithms for Unique Games"
YURI MAKARYCHEV, *Princeton University*

Special IAS/Princeton Number Theory:
"Growth of Selmer Groups in Dihedral Extensions"
KARL RUBIN, *University of California, Irvine*

Members Seminar:
"On Some Properties of the Nottingham Group"
MIKHAIL ERSHOV, *Yale University; Member, School of Mathematics*

November 8
Computer Science/Discrete Math II:
"Expander Graphs on the Symmetric Groups, Part II"
EYAL ROZENMAN, *Weizmann Institute of Science, Israel; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Spectra of Laplacians of Buildings"
TIM STEGER, *Universita degli Studi di Sassari, Italy; Member, School of Mathematics*

November 9
IAS/Princeton Number Theory:
"What Are Zeta Functions of Graphs and What Are They Good For?"
AUDREY TERRAS, *University of California, San Diego*

November 11
Arithmetic Homogeneous Spaces:
"Cohomology of Bianchi Groups"
FRITZ GRUNEWALD, *Heinrich Heine Universität, Germany; Member, School of Mathematics*

November 14 -18
Lie Groups, Representations and Discrete Mathematics Workshop

November 22
Computer Science/Discrete Math II:
"Euclidean Embeddings of Finite Metric Spaces: Distortion and Expansion"
JAMES LEE, *University of California, Berkeley; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"The Comparison Between Kac-Moody and Arithmetic Groups"
BERTRAND RÉMY, *Université Claude Bernard, Lyon 1*

November 28
Computer Science/Discrete Math I:
"Almost Orthogonal Linear Codes Are Locally Testable"
TALI KAUFMAN, *Massachusetts Institute of Technology*

IAS/Princeton Number Theory:
"Elliptic Curves, Quadratic Twists and P-(in)divisibility of L-Values"
KARTIK PRASANNA, *University of California, Los Angeles*

Members Seminar:
"Generalized Teichmueller Spaces"
ANNA WIENHARD, *Universität of Basel, Switzerland; Member, School of Mathematics*

November 29
Computer Science/Discrete Math II:
"Szemeredi's Regularity Lemma in Analysis"
BALAZS SZEGEDY, *Microsoft Research; Member, School of Mathematics*

November 30
Lie Groups, Representations and Discrete Math:
"Uniform Kazhdan Groups"
DENIS OSIN, *City College, New York*

December 2
Arithmetic Homogeneous Spaces:
"Distribution of Compact Torus Orbits"
MANFRED EINSIEDLER, *Princeton University*

December 5
Computer Science/Discrete Math I:
"Rational Secure Computation and Ideal Mechanism Design"
SILVIO MICALI, *Massachusetts Institute of Technology*

December 6
Computer Science/Discrete Math II:
"Coding Theory: Survey of Recent Progress and Open Questions"
MADHU SUDAN, *Massachusetts Institute of Technology*

Lie Groups, Representations and Discrete Math:
"Around Property (T)"
ANDRZEJ ZUK, *University of Paris VI, France; Member, School of Mathematics*

December 7
IAS/Princeton Number Theory:
"Universal Kummer Families over Shimura Curves"
RON LIVNÉ, *The Hebrew University of Jerusalem; Member, School of Mathematics*

December 9
Arithmetic Homogeneous Spaces:
"Fake Projective Planes"
GOPAL PRASAD, *University of Michigan; Member, School of Mathematics*

December 9
IAS/Princeton Number Theory:
"Serre's Modularity Conjecture"
CHANDRASHEKHAR KHARE, *University of Utah*

December 12
Computer Science/Discrete Math I:
"From Combinatorial Patterns to Strongly Correlated Networks States in Population Neural Code"
ELAD SCHNEIDMAN, *Princeton University*

December 13
Computer Science/Discrete Math II:
"Dependent Random Choice and Extremal Problems"
BENNY SUDAKOV, *Princeton University; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Hanoi Tower Groups, Their Spectra and Growth of Diameters of Schreier Graphs"
ROSTISLAV GRIGORCHUK, *Texas A & M University*

December 16
Arithmetic Homogeneous Spaces:
"Uniform Bound on the Cheeger Constant for Finitely Generated Linear Groups"
TSACHIK GELANDER, *Yale University*

December 19
Members Seminar:
"Quantitative Symplectic Geometry"
HELMUT HOFER, *New York University; Member, School of Mathematics*

December 20
Computer Science/Discrete Math I:
"Ramanujan Complexes of Any Affine Type"
DONALD CARTWRIGHT, *University of Sydney*

Lie Groups, Representations and Discrete Math:
"Normal Subgroups of the Multiplicative Group of a Finite Dimensional Division Algebra, and Valuations"
ANDREI S. RAPINCHUK, *University of Virginia; Member, School of Mathematics*

January 13
Arithmetic Homogeneous Spaces:
"Entropy and Localization of Eigenfunctions"
NALINI ANANTHARAMAN, *École Normale Supérieure de Lyon*

January 16
Computer Science/Discrete Math I:
"Internal Conflict in a Computational System"
ADI LIVNAT, *Princeton University*

January 17
Computer Science/Discrete Math II:
"Szemeredi's Regularity Lemma and Compactness"
BALAZS SZEGEDY, *Microsoft Research; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Linear Representations and Arithmeticity of Lattices in Products of Trees"
SHAHAR MOZES, *The Hebrew University of Jerusalem; Member, School of Mathematics*

January 23
Computer Science/Discrete Math I:
"Dispersion of Mass and the Complexity of Randomized Algorithms"
SANTOSH VEMPALA, *Massachusetts Institute of Technology*

Mathematical Physics Seminar:
"Loop-Erased Random Walk"
GADY KOZMA, *Member, School of Mathematics*

January 24
Computer Science/Discrete Math II:
"Random Discrete Matrices: a Survey"
VAN VU, *University of California, San Diego; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"The Classification of Finite Simple Groups: Aspects of the Second Generation Proof"
INNA KORCHAGINA, *University of Birmingham, England*

January 27
Arithmetic Homogeneous Spaces: "Counting Representations of Arithmetic Groups"
ALEX LUBOTZKY, *The Hebrew University of Jerusalem; Member, School of Mathematics*

January 30
Computer Science/Discrete Math I:
"From Trees to General Graphs: Counting Independent Sets up to the Tree Threshold"
DROR WEITZ, *Center for Discrete Mathematics & Theoretical Computer Science (DIMACS)*

Mathematical Physics Seminar:
"Matrix Models for Random Circular Ensembles"
IRINA NENCIU, *California Institute of Technology; Member, School of Mathematics*

Members Seminar:
"Universality for Mathematical and Physical Systems"
PERCY DEIFT, *New York University; Member, School of Mathematics*

January 31
Computer Science/Discrete Math II:
"Cryptography and the P Vs NP Question"
ANDREJ BOGDANOV, *University of California, Berkeley; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Paley Graphs and the Combinatorial Topology of the Bruhat Decomposition"
RON LIVNÉ, *The Hebrew University of Jerusalem; Member, School of Mathematics*

February 1
Mathematical Physics Seminar:
"Universality for Orthogonal and Symplectic Ensembles"
PERCY DEIFT, *New York University; Member, School of Mathematics*

February 3
Arithmetic Homogeneous Spaces:
"Irrational Quadratic Forms I"
GREGORY MARGULIS, *Yale University; Member, School of Mathematics*

February 6 - 10
Lie Groups, Representations and Discrete Mathematics Conference

February 13
Computer Science/Discrete Math II:
"Cohomology in Grothendieck Topologies and Lower Bounds in Boolean Complexity"
JOEL FRIEDMAN, *University of British Columbia*

Mathematical Physics Seminar:
"Lowest Energy States in Non-Relativistic QED"
MICHAEL LOSS, *Georgia Institute of Technology*

Members Seminar:
"Random Walks and Equidistribution on Lie Groups"
EMMANUEL BREUILLARD, *Institut des Hautes Études Scientifiques; Member, School of Mathematics*

February 14
Computer Science/Discrete Math II:
"Quantum Computing and Finite Permutation Groups"
ANER SHALEV, *The Hebrew University of Jerusalem*

Lie Groups, Representations and Discrete Math:
"Generalized Harmonic Maps Superridity and Uniformly Convex Metric Spaces"
TSACHIK GELANDER, *Yale University*

February 17
Arithmetic Homogeneous Spaces:
"Primes in Tuples"
D. GOLDSTON, *San Josè State University*

February 20
Computer Science/Discrete Math Seminar I:
"The Grothendieck Inequality Revisited"
RON BLEI, *University of Connecticut*

Mathematical Physics Seminar:
"Edge and Bulk Currents in 2D Disordered Magnetic Systems"
JEFFREY SCHENKER, *Institut Für Theoretische Physik, Switzerland; Member, School of Mathematics*

Members Seminar:
"The Deligne-Simpson Problem and Double Affine Hecke Algebras"
ALEXEI OBLOMKOV, *Massachusetts Institute of Technology; Member, School of Mathematics*

February 21
Joint Arithmetic Homogeneous Spaces and Computer Science/Discrete Math II:
"Irrational Quadratic Forms II"
GREGORY MARGULIS, *Yale University; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Lattices of Minimum Covolume in Classical Chevalley Groups over $\mathbf{F}q((t))$ "
ALIREZA SALEHI-GOLSEFIDY, *Yale University*

Mathematical Physics Seminar:
"Resonances and Formation of the Gaps in the Spectrum of Quasi-Periodic Schrödinger Equation"
MICHAEL GOLDSTEIN, *University of Toronto*

February 22
IAS/Princeton Number Theory:
"Rational Points of Bounded Height and Adelic Mixing"
HEE OH, *California Institute of Technology; Member, School of Mathematics*

February 23
Special Seminar:
"The Jones Polynomial and Quantum Computation"
DORIT AHARONOV, *The Hebrew University of Jerusalem*

February 27
Computer Science/Discrete Math I:
"Hamilton Cycles in Expanding and Highly Connected Graphs"
MICHAEL KRIVELEVICH, *Tel Aviv University, Israel*

Mathematical Physics Seminar:
"Ionization in Time Periodic Fields of Arbitrary Strength: The Hydrogen Atom"
OVIDIU COSTIN, *Ohio State University*

Members Seminar: "Deformation of Yang-Mills Theory via Pure Spinors"
MICHAEL MOVSHEV, *Institut des Hautes Études Scientifiques; Member, School of Mathematics*

February 28
Computer Science/Discrete Math II:
"Independent Transversals in Locally Sparse Graphs"
PO-SHEN LOH, *Princeton University*

Lie Groups, Representations and Discrete Math:
"A Canonical Form for Automorphisms of Totally Disconnected Locally Compact Groups"
GEORGE WILLIS, *University of Newcastle, NSW, Australia*

March 1
IAS/Princeton Number Theory Seminar:
"Finite Orthogonal Groups and Elliptic Curves"
CHRIS HALL, *University of Texas at Austin*

March 3
Arithmetic Homogeneous Spaces:
"Intersection of Dynamically Defined Sets, a Game of Schmidt and a Conjecture of Margulis"
BARAK WEISS, *Ben Gurion University*

March 6
Mathematical Physics Seminar:
"The Thermodynamics Pressure of a Dilute Fermi Gas"
ROBERT SEIRINGER, *Princeton University*

Members Seminar:
"Arithmetic Progressions and Nilmanifolds"
TAMAR ZIEGLER, *The Ohio State University; Member, School of Mathematics*

March 7
Computer Science/Discrete Math II:
"Strong Approximation in Random Towers of Graphs"
YAIR GLASNER, *University of Illinois at Chicago; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Asymptotics and Spectra of Cayley and Schreier Graphs of Branch Groups"
ZORAN SUNIK, *Texas A & M University*

March 8
Special Mathematical Physics Seminar:
"Entanglement in XY Spin Chain and the Asymptotic Analysis of the Block Toeplitz Matrices"
ALEXANDER ITS, *Indiana University-Purdue University Indianapolis (IUPUI)*

March 13
Computer Science/Discrete Math I:
"On the (Im)possibility of Basing One-Way Functions on NP-Hardness"
ADI AKAVIA, *Massachusetts Institute of Technology*

Members Seminar:
"Multivariable Mahler Measure and Regulators"
MATILDE LALIN, *University of Texas at Austin; Member, School of Mathematics*

March 14
Computer Science/Discrete Math II:
"Group Theoretic Algorithms for Fast Matrix Multiplication"
BALAZS SZEDGEDY, *Microsoft Research; Member, School of Mathematics*

March 15
IAS/Princeton Number Theory Seminar:
"Freeman Dyson's "Challenge for the Future": The Mock Theta Functions"
KATHRIN BRINGMANN, *University of Wisconsin at Madison*

March 16
Computer Science/Discrete Math III:
"Time-Space Trade-Offs for Predecessor Search"
MIKKEL THORUP, *AT & T*

Mathematical Physics Seminar:
"Nonequilibrium Stationary States: An Overview"
JOEL LEBOWITZ, *Rutgers, The State University of New Jersey; Member, School of Mathematics*

March 17
Arithmetic Homogeneous Spaces:
"Harmonic Maps and (Cocycles) Super-Rigidity"
DAVID FISHER, *Indiana University*

March 20
Computer Science/Discrete Math I:
"Relaxed Two-Coloring of Cubic Graphs"
TIBOR SZABO, *Eidgenössische Technishcz Hochschule Zürich (ETH)*

March 21
Lie Groups, Representations and Discrete Math:
"Golod-Shafarevich Groups With Property (T) and Kac-Moody Groups"
MIKHAIL ERSHOV, *Yale University; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Kazhdan's Property (T) for Linear Groups over General Rings"
YEHUDA SHALOM, *Tel Aviv University, Israel; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Linear Representations of the Automorphism Group of a Free Group"
FRITZ GRUNEWALD, *Heinrich Heine Universität, Germany; Member, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Cartesian Products as Profinite Completions and Representation Growth of Groups"
MARTIN KASSABOV, *Cornell University*

March 24
Arithmetic Homogeneous Spaces:
"Estimates from Below for the Remainder in Local Weyl's Law"
D. JAKOBSON, *McGill University, Canada*

March 27
Computer Science/Discrete Math I:
"The Cover Time of Random Walks on Random Graphs"
ALAN FRIEZE, *Carnegie Mellon University*

Members Seminar:
"Counting Polynomial Configurations on Dense Subsets of the Integers"
NIKOS FRANTZIKINAKIS, *Pennsylvania State University; Member, School of Mathematics*

March 27 - 28
Marston Morse Lectures:
"Rigid Actions on Homogeneous Spaces and Applications"
MARINA RATNER, *University of California, Berkeley*

March 28
Computer Science/Discrete Math II:
"The Grothendieck Constant of an Expander"
NOGA ALON, *Tel Aviv University, Israel; Member, School of Mathematics*

March 31
Joint Arithmetic Homogeneous Spaces and Number Theory:
"Some Modular Generating Functions for Arithmetic Cycles"
STEPHEN KUDLA, *University of Maryland; Member, School of Mathematics*

April 3
Computer Science/Discrete Math I:
"The Arrangement Method for Linear Programming"
VLADLEN KOLTUN, *Stanford University*

Members Seminar:
"Generation of Finite Simple Groups and Derangements"
ROBERT GURALNICK, *University of Southern California; Member, School of Mathematics*

April 4
Computer Science/Discrete Math II:
"Periodic Orbits and Extractors"
ELON LINDENSTRAUSS, *Princeton University*

Lie Groups, Representations and Discrete Math:
"Isospectrality and Commensurability"
ALAN REID, *University of Texas at Austin*

April 5
IAS/Princeton Number Theory:
"Hecke Correspondences and Semistable Reduction of Shimura Varieties"
TERUYOSHI YOSHIDA, *Harvard University*

April 10
Computer Science/Discrete Math I:
"Computational Hardness from Gaussian Isoperimetry: On Hardness of Graph Coloring, the Shape of Double Bubbles and Related Problems"
ELCHANAN MOSSEL, *University of California, Berkeley*

Mathematical Physics Seminar:
"On the Fourier Law for Coupled Oscillators"
ANTI KUPIAINEN, *University of Helsinki, Finland*

Members Seminar:
"String Topology and Closed Geodesics"
NANCY HINGSTON, *The College of New Jersey; Member, School of Mathematics*

April 11
Computer Science/Discrete Math II:
"New Techniques in Online Game Playing"
ELAD HAZAN, *Princeton University*

April 12
IAS/Princeton Number Theory:
"Singular Moduli"
STEPHEN KUDLA, *University of Maryland; Member, School of Mathematics*

April 14
Mathematical Physics Seminar:
"Blow Ups in Complex Solutions of the 3D-Navier-Stokes System and Renormalization Group Method"
YAKOV SINAI, *Princeton University*

April 17
Computer Science/Discrete Math I:
"Simultaneous Optimization and Fairness"
ASHISH GOEL, *Stanford University*

Members Seminar:
"Fake Projective Spaces"
GOPAL PRASAD, *University of Michigan; Member, School of Mathematics*

April 18
Computer Science/Discrete Math II:
"Black Boxes, Inc."
AVI WIGDERSON, *Herbert H. Maass Professor, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Actions of Product Groups on Manifolds"
ALEX FURMAN, *University of Illinois at Chicago*

April 19
Special Seminar:
"Huygens' Principle and Hyperplane Configurations"
A. P. VESELOV, *Loughborough University, England*

April 21
Arithmetic Homogeneous Spaces:
"Superrigidity, Weyl Group, and Actions on the Circle"
ALEX FURMAN, *University of Illinois at Chicago*

April 24
Mathematical Physics Seminar:
"Droplet Minimizers for Free Energy Functionals With a Liquid-Vapor Transition at the Droplet Formation Threshold"
ERIC CARLEN, *Georgia Institute of Technology*

Members Seminar:
"Some Results on Complete Symmetric Varieties"
XUHUA HE, *Massachusetts Institute of Technology; Member, School of Mathematics*

April 25
Lie Groups, Representations and Discrete Math:
"Relative Property T in Lie Groups and Their Lattices"
YVES DE CORNULIER, *École Normale Supérieure*

April 26
IAS/Princeton Number Theory:
"Identifies in Theta Correspondence"
ZHENGYU MAO, *Rutgers, The State University of New Jersey*

April 28
Arithmetic Homogeneous Spaces:
"Functoriality and Special Values of L-Functions"
FREYDOON SHAHIDI, *Purdue University*

May 1
Computer Science/Discrete Math I:
"Many Hamiltonian Cycles"
JEFF KAHN, *Rutgers, The State University of New Jersey*

Mathematical Physics Seminar:
"Microscopic Models for Thermal Conductivity"
STEFANO OLLA, *Centre De Recherche en Mathématiques de la Décision (Ceremade)*

May 2
Computer Science/Discrete Math II:
"On the Minimal Density of Triangles in Graphs"
ALEXANDER RAZBOROV, *Visiting Professor, School of Mathematics*

Lie Groups, Representations and Discrete Math:
"Almost Normal Subgroups of Lattices"
GEORGE WILLIS, *University of Newcastle*

May 3
Mathematical Physics Seminar:
"Directed Polymers With Quenched Randomness: Delocalization Transition and Critical Properties"
FABIO TONINELLI, *École Normale Supérieure de Lyon*

May 5
Arithmetic Homogeneous Spaces:
"Coverings of Curves"
ROBERT GURALNICK, *University of Southern California; Member, School of Mathematics*

May 8
Computer Science/Discrete Math I:
"Universal Graphs"
MICHAEL CAPALBO, *Center for Discrete Mathematics & Theoretical Computer Science (DIMACS)*

May 9
Computer Science/Discrete Math II:
"On the Minimal Density of Triangles in Graphs (continued)"
ALEXANDER RAZBOROV, *Visiting Professor, School of Mathematics*

May 15
Computer Science/Discrete Math I:
"New Connections Between Derandomization, Worst-Case Complexity and Average-Case Complexity"
DANNY GUTFREUND, *Harvard University*

May 16
Computer Science/Discrete Math II:
"Randomness Reduction in Some Results of Asymptotic Geometric Analysis"
SHIRI ARTSTEIN, *Member, School of Mathematics*

May 23
Lie Groups, Representations and Discrete Math:
"On Margulis' Normal Subgroup Theorem"
TIM STEGER, *Universita degli Studi di Sassari, Italy; Member, School of Mathematics*

May 26
IAS/Princeton Number Theory:
"Modular Units"
AMANDA FOLSON, *University of California, Los Angeles*

DINAH KAZAKOFF

"I think that, because of the close contact between particle theorists and astrophysicists at IAS, it is one of the few places where I could have realized [a] new feature of the dark matter particle....I plan to study this issue in more detail... and I might collaborate on a paper [with a fellow Member] if detailed calculations confirm the naive expectation."

— Member, School of Natural Sciences

THE SCHOOL OF NATURAL SCIENCES

Faculty

STEPHEN L. ADLER, Particle Physics
JOHN N. BAHCALL, Astrophysics *(deceased 8-17-05)*
Richard Black Professor
PETER GOLDREICH, Astrophysics
ARNOLD J. LEVINE, Systems Biology
JUAN MALDACENA, Theoretical Physics
NATHAN SEIBERG, Theoretical Physics
EDWARD WITTEN, Mathematical Physics
Charles Simonyi Professor

Professor Emeritus

FREEMAN J. DYSON

ACADEMIC ACTIVITIES

PROFESSOR STEPHEN ADLER spent part of the last year finishing up work on his book of selected papers, published in January 2006 as Volume 37 in *the World Scientific Series in 20th Century Physics*. The title of the book is *Adventures in Theoretical Physics: Selected Papers with Commentaries*, and the book consists of around 100 pages of commentaries, organized by topic, and 64 reprinted papers. The commentaries put the papers in their historical context, and also follow up on related subsequent literature and developments.

Adler also wrote two papers relating to his interests in foundations of quantum mechanics. The first of these takes a more careful look at the fluctuation terms in the trace dynamics Ward identities, that were used in his 2004 Cambridge monograph *Quantum Theory as an Emergent Phenomenon* to make a connection between an underlying trace dynamics and phenomenological stochastic models for state vector reduction. The current paper clarifies the origin of an apparent inconsistency discussed in Chapter 6 of the Cambridge volume, and considerably streamlines the derivation of the modified Schrödinger equation given there. The second paper written by Adler makes quantitative estimates to set lower and upper bounds on the parameter that governs the magnitude of the stochastic noise term in the modified Schrödinger equation. The lower bound comes from an analysis of latent image formation in photography and etched track detectors, while upper bounds come from a consideration of a variety of processes. The results suggest that to account for latent image formation, the stochastic process must be eight to ten orders of magnitude stronger than conventionally assumed. This should make tests of stochastic localization models feasible in the next decade or two.

During the 2005-06 academic year, PROFESSOR PETER GOLDREICH worked on the following projects. The existence of a molecular oxygen atmosphere around Saturn's

rings was inferred from *in situ* detection of molecular oxygen ions above the rings by the Cassini spacecraft. Farmer and Goldreich placed an upper limit on the column density of neutral oxygen molecules by focusing on bulk atmospheric properties. Heating of the neutrals by viscous stirring, cooling by collisions with the rings, and torquing by collisions with pickup ions are all included in their model. A first upper limit to the neutral column density is derived by reassessing O_2 production and loss rates. Two further limits are obtained using Cassini observations: Corotation of the observed ions with the planet implies that the height-integrated conductivity of the ring atmosphere is less than that of Saturn's ionosphere, and the nondetection of fluorescent atomic oxygen over the rings constrains the molecular column from which it is produced via photodissociation. Different methods yield similar upper limits to the molecular oxygen column density of $2x10^{15}$ molecules per cm^{-2}. Thus the ring's oxygen atmosphere is at most marginally collisional.

Lithwick, Goldreich, and Sridhar developed a model for strong, imbalanced, MHD turbulence in an incompressible magneto fluid. Their model is relevant to turbulence in the solar wind where spacecraft measurements have established that waves travelling away from the sun have higher amplitudes than those travelling towards it. The inertial-range of the strong imbalanced cascade has the following properties: (i) the ratio of the r.m.s. Elsasser amplitudes is independent of scale, and is equal to the ratio of the corresponding energy fluxes; (ii) in common with the balanced strong cascade, the energy spectra of both Elsasser waves are of the anisotropic Kolmogorov form, with their parallel correlation lengths equal to each other on all scales, and proportional to the two-thirds power of the transverse correlation length; (iii) the equality of cascade time and waveperiod (critical balance) that characterizes the strong balanced cascade does not apply to the Elsasser field with the larger amplitude. Instead, the more general criterion that always applies to both Elsasser fields is that the cascade time is equal to the correlation time of the straining imposed by oppositely-directed waves. (iv) in the limit that the energy fluxes are equal, the turbulence corresponds to the balanced strong cascade. Result (i) allows us to infer the turbulent flux ratios from the amplitude, thus providing insight into the origin of the turbulence.

Liu, Goldreich, and Stevenson investigated the depths of the zonal flows in Jupiter and Saturn. Strong (~100 m s^{-1}) and stable (over decadal time scales) zonal winds are observed in these planets' atmospheres. Busse (1976) suggested that they might be the surface expression of deep flows on cylinders. Wind velocities deduced from the motion of the Galileo probe as it descended through Jupiter's atmosphere at 7 degrees latitude offer some support for Busse's suggestion. However, we show that the electrical conductivity of molecular hydrogen severely constrains the depth to which the zonal winds can penetrate. In an electrically conducting fluid, a zonal flow produces a toroidal magnetic field, an associated poloidal electrical current, and Ohmic dissipation. In steady state, the total Ohmic dissipation cannot exceed the planet's net luminosity. This constrains the observed zonal flows to be truncated above 0:95 of Jupiter's radius and 0:86 of Saturn's radius.

But the truncation of a cylindrical flow in a rapidly rotating convective envelope requires an appropriate force to break the Taylor-Proudman constraint. Since we have been unable to identify any plausible candidate, we conclude that the deep-seated flows do not exist. Nevertheless, equatorial jets could maintain constant velocities on cylinders

through the planets provided their half-widths were no greater than ≈21° for Jupiter and ≈ 31° for Saturn. These boundaries are similar to those of the equatorial jets observed in the planets' atmospheres. We speculate that the Reynolds stress associated with turbulent convection promotes differential rotation throughout the interiors of the giant planets. Along cylinders that pass through the maximum penetration depth, the Maxwell stress balances the Reynolds stress resulting in small differential rotation except in the stably stratifed atmosphere. Equatorial jets are unencumbered by the Maxwell stress. They pass through the planets and maintain velocities limited by parasitic instabilities.

During the 2005-2006 academic year, PROFESSOR ARNOLD J. LEVINE worked on the research described below.

A project (with H. Robins and M. Krasnitz) using relative entropy to find hidden sequences in the coding region of bacterial genomes was published in December 2005 in *The Journal of Bacteriology*. Applying this work to HIV revealed sequences that are under-represented in the human genome and over-represented in HIV, which may lead to an understanding of latency in HIV, and is the subject of continuing work.

Another project (with H. Robins and R. Rabadán) began an analysis of the influenza genome. This work involved classifying human and avian strains of influenza based solely on their mononucleotide composition. In particular, the project showed that humans impose a biased mutation on Cytosine residues, causing an increased mutation rate to Uracil. This may be due to an innate immunological defense mechanism in humans that is absent from birds. The work provided evidence for the conjecture that the 1918 Spanish Flu pandemic was a recent reassortment. In a related ongoing project (with J. Vanicek) statistically sensitive algorithms are employed to discover mutations necessary for the avian influenza virus H5N1 to become transmissible from human to human.

Work continued on the relationships between single nucleotide polymorphisms, or SNPs (the genetic differences among people that distinguish individuals from one another) in selected oncogenes and tumor suppressor genes and the elucidation of the signal transduction pathways in which they reside as an approach to understanding the molecular and cellular origins of cancers. In the case of SNPs in the MDM-2 gene (a negative regulator of the tumor suppressor p53), and p53 gene, projects (with G. Bond) demonstrated hormone related and gender specific impact upon or association with the age of onset of cancers, the odds ratio for developing cancers, and survival rates after treatment. Papers from this work, published in *Cancer Research* and in *The Journal of Medical Genetics*, reflect a genetic basis of gender differences in cancer and illustrate that the genotype at a specific locus can affect how hormones, such as estrogen, affect tumorigenesis in humans.

Identifying and understanding the significance of groups of SNPs that travel together as haplotypes is also a focus of interest. Approaches to haplotyping are challenging, especially when working with large populations and genes with multiple SNPs. Evaluation of single associations between each allele and phenotype ignores the influence of important epistatic interactions, and in particular, the possibility of synergistic (or, conversely, antagonistic) interactions arising from functional combinations of alleles.

A project (with G. Atwal) has developed a novel statistical method, grounded in information theory, to quantify genetic variation and associate it with phenotypes such as age

of onset of cancer or level of apoptosis. A multi-information extension of mutual information to more than two random variables indicates how much of phenotype variability is due to a combination of alleles rather than to the sum of each allele. Preliminary calculations, based on samples of lymphoblastoid cell lines, have revealed synergistic interactions between SNPs in the AKT-1, MDM-2, and p53 genes.

Haplotype structure in the human genome not only reflects processes of drift, demography, and recombination, but also natural selection. A project (with G. Atwal) has formulated a method to detect recent selective sweeps in samples of DNA sequences that may provide insight into the trajectory of human evolution. Analysis of the haplotypes of the MDM-2 gene has uncovered a positive selection pressure for a haplotype, abundant in non-African races, that includes an allele associated with age of onset of cancer.

Work (with G. Bhanot and G. Alexe) resulted in the refining of an optimal classifier for robust subtypes of breast cancer disease. The procedure, unsupervised consensus ensemble clustering, uses Principal Component Analysis to find gene sets that represent data variation followed by averaging over many clustering techniques and data perturbations and the use of statistical measure to find an optimum number of stable, perturbation-independent clusters. Preliminary results suggest that it may be possible to determine optimal treatment by the ADH (atypical ductal hyperplasia) pre-invasive cancer stage, by accurate identification of one of eight disease subtypes that have distinctive molecular signatures for prognosis and metastatic risk, making early detection for breast cancer patients even more critical.

During the past year PROFESSOR JUAN MALDECENA has been studying various aspects of the correspondence between gauge theories and gravity or string theory.

With Professor Seiberg, he considered various configurations in two dimensional string theories. This is a continuation of previous work on the subject. They understood how to describe two dimensional configurations with Ramond-Ramond fluxes. String theory configurations with RR fluxes are very important. These two dimensional models provide us with solvable examples where we can compute the effects of the RR flux in an exact manner.

With his student Hai Lin, he studied various aspects of theories that are closely related to $N = 4$ super Yang Mills. Classically, these theories are a truncation of $N = 4$ where we keep only a subset of the fields. These theories typically have many vacua. They gave a gravity description of these vacua. One of the theories is a massive version of the gauge theory living on N D0 branes. Some of the vacua of this theory were conjectured to contain NS-5 branes. They indeed found this explicitly in our classical solutions. The spectrum of strings with large charges was also explored and it was found to have both similarities and differences with the more well studied case in $AdS_5 \times S^5$. In particular the spectrum of near BPS states in this large charge regime was computed and they found that it is characterized by a single function of the 't Hooft coupling. They computed this function at large 't Hooft coupling. In addition they found that the theories realized a curious supersymmetry algebra in 2+1 dimensions.

Together with J. Kinney, S. Raju and S. Minwalla, they considered some aspects of the BPS spectrum of $N = 4$ super Yang Mills. They focused mainly on the spectrum of states

that preserved a minimal amount of supersymmetry. These states are particularly interesting since some BPS black hole solutions in $AdS_5 \times S^5$ exist. They could reproduce the black hole entropy precisely in some special limits and qualitatively in other limits.

With I. Klebanov he studied some aspects of flux tube dynamics in $N = 4$ super Yang Mills. One of their interesting results was that many qualitative aspects of the strong coupling results obtained via AdS/CFT are reproduced at weak coupling by considering planar diagrams. In other words, the restriction to planar diagrams changes the qualitative behavior of the results in an important way. In addition they found a quantitative agreement between the spectrum of excitations of the flux tube and the spectrum of certain string states in *AdS* for $N = 4$ super Yang Mills.

With Dymarsky, Gubser and Guralnik, they studied a class of supersymmetric Wilson loop operators. We found the equations that the *AdS* worldsheets should obey for these correlators. These worldsheets are pseudo-holomorphic surfaces in the $AdS_5 \times S^5$. We found that the Wilson loop expectations values, computed using gravity, are consistent with expectations from the field theory.

With his student D. Hofman, he considered the spectrum of string states in $AdS_5 \times S^5$ in an interesting large J limit. The limit is such that one can continuously vary the 't Hooft coupling so that one could interpolate between weak and strong coupling results after having taken the limit. In this limit, the dispersion relation for excitations was precisely known from the gauge theory side. We managed to reproduce this dispersion relation on the string theory side. They also showed that the symmetries that determine the S-matrix for excitations are the same for the gauge theory and the string theory.

During the past year PROFESSOR NATHAN SEIBERG pursued two research programs: various aspects of noncritical strings, and the dynamics of four dimensional supersymmetric gauge theories.

Seiberg continued the investigation of the noncritical two-dimensional heterotic string. Long fundamental strings play a crucial role in the dynamics. They cancel anomalies and lead to phase transitions when the system is compactified on a Euclidean circle. A careful analysis of the gauge symmetries of the system uncovered new subtleties leading to modifications of the worldsheet results. The compactification on a Euclidean thermal circle is particularly interesting. It leads to an incompatibility between T-duality (and its corresponding gauge symmetry) and locality.

This work in two dimensions was extended to higher dimensions in two papers with N. Itzhaki and D. Kutasov. They studied the dynamics near a 1 + 1 dimensional intersection of two orthogonal stacks of five branes in type IIB string theory, using an open string description valid at weak coupling, and a closed string description valid at strong coupling. The weak coupling description suggests that this system is invariant under eight supercharges with a particular chirality in 1 + 1 dimensions, and its spectrum contains chiral fermions localized at the intersection. The closed string description leads to a rather different picture—a three dimensional Poincare invariant theory with a gap and sixteen supercharges. They showed that this dramatic change in the behavior of the system is partly due to anomaly inflow. Taking it into account leads to a coherent picture, both when the fivebranes in each stack are coincident and when they are separated.

In another work with N. Itzhaki and D. Kutasov, certain supersymmetry breaking deformations of linear dilaton backgrounds in different dimensions were studied. In some cases, the deformed theory has bulk closed strings tachyons. In other cases there are no bulk tachyons, but there are localized tachyons. The real time condensation of these localized tachyons was described by an exactly solvable worldsheet CFT. They also found some stable, non-supersymmetric backgrounds.

The second line of research about four dimensional gauge theory started with joint work with A. Dymarsky and I. R. Klebanov. They carried out a thorough analysis of the moduli space of the cascading gauge theory found on p D3-branes and M wrapped D5-branes at the tip of the conifold. They found various mesonic branches of the moduli space whose string duals involve the warped deformed conifold with different numbers of mobile D3-branes. The branes that are not mobile form a BPS bound state at threshold. In the special case where p is divisible by M there also exists a one-dimensional baryonic branch whose family of supergravity duals is the resolved warped deformed conifolds. The warped deformed conifold is a special case of these backgrounds where the resolution parameter vanishes and a $\mathbf{Z}_2$ symmetry is restored. They studied various brane probes on the resolved warped deformed conifolds, and successfully matched the results with the gauge theory. In particular, they showed that the radial potential for a D3-brane on this space varies slowly, suggesting a new model of D-brane inflation.

It was pointed out with K. Intriligator that some recently proposed string theory realizations of dynamical supersymmetry breaking actually do not break supersymmetry in the usual desired sense. Instead, there is a runaway potential, which slides down to a supersymmetric vacuum at infinite expectation values for some fields. The runaway direction is not on a separated branch; rather, it shows up as a "tadpole" everywhere on the moduli space of field expectation values.

The possibility of dynamical supersymmetry breaking in a long-lived meta-stable vacuum was explored with K. Intriligator and D. Shih. This relatively unexplored avenue has led to many new models of dynamical supersymmetry breaking. A surprisingly simple class of models with meta-stable dynamical supersymmetry breaking is based on $N = 1$ supersymmetric QCD, with massive flavors. Though these theories are strongly coupled, the existence of meta-stable vacua was definitively demonstrated by using the free-magnetic dual description. The simplicity of these models suggests that broken supersymmetry is generic in supersymmetric field theory and in the landscape of string vacua.

With P.C. Argyres and A. Kapustin it was pointed out that for $N = 4$ gauge theories with exceptional gauge groups G_2 and F_4 the S-duality transformation acts on the moduli space by a nontrivial involution. They noted that the duality groups of these theories are the Hecke groups with elliptic elements of order 6 and 4, respectively. These groups extend the $\Gamma_0(3)$ and $\Gamma_0(2)$ subgroups of $SL(2, \mathbf{Z})$ by elements with a non-trivial action on the moduli space. They showed that under a certain embedding of these gauge theories into string theory, the Hecke duality groups are represented by T-duality transformations.

Seiberg also wrote his rapporteur talk in the Solvay conference about the topic of emergent spacetime. He summarized the arguments that space and time are likely to be emergent notions, i.e., they are not present in the fundamental formulation of the theory, but

appear as approximate macroscopic concepts. Along the way he briefly reviewed certain topics. These included ambiguities in the geometry and the topology of space which arise from dualities, questions associated with locality, various known examples of emergent space, and the puzzles and the prospects of emergent time.

PROFESSOR EDWARD WITTEN spent most of the academic year 2005-06 writing (with A. Kapustin) a very detailed paper explaining how the geometric Langlands program can be understood from the viewpoint of four-dimensional quantum gauge theories, similar to theories used in particle physics. The Langlands program is a wide-ranging vision of number theory and representation theory that has had much influence in mathematics. It is far from being fully understood, and as a result its presumably simpler geometric analog has attracted much interest. It is this that Witten and Kapustin have understood via gauge theories.

More recently, with S. Gukov, Witten has extended this understanding to what is called the ramified case of the geometric Langlands program.

During 2005-06, Witten also completed two papers with former students, one (with C. Beasley) involving the effective action of the heterotic string, and one (with P. Svrcek) involving the role of axions in string theory.

PROFESSOR EMERITUS FREEMAN DYSON spent most of the year finishing two books intended for the general public. One with the title *A Many-colored Glass: Reflections on the Place of Life in the Universe*, is an enlarged and revised version of lectures given at the University of Virginia in 2004 and will be published by the University of Virginia Press. The other with the title *The Scientist as Rebel*, is a collection of book reviews and essays, previously published in *The New York Review of Books* and other places, and will be published by *The New York Review of Books*. Both books were sent to the publishers in May 2006 and will be published in Fall 2006 or Spring 2007. Dyson continues to review books regularly for *The New York Review of Books*.

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THE SCHOOL OF NATURAL SCIENCES

RECORD OF EVENTS

The following is a calendar of events sponsored by the School of Natural Sciences

Academic Year 2005-06

Particle Physics Activities

September 19
High Energy Theory Seminar:
"A Guide to Disentangling SUSY at Fermilab and the LHC"
CHRIS KOLDA, *University of Notre Dame*

September 21
Physics Group Meeting:
"Black Hole Singularities in Yang-Mills Theories"
HONG LIU, *Massachusetts Institute of Technology*

September 22
Informal Phenomenology Seminar:
"Top Compositeness and Precision Unification"
KAUSTUBH AGASHE, *Johns Hopkins University; Member, School of Natural Sciences*

September 28
Physics Group Meeting:
"Some Aspects of N-point Functions in the Cigar Geometry"
GASTON GIRIBET, *Buenos Aires University*

September 29
Informal Phenomenology Seminar:
"Resolving Neutrino Mass Hierarchy and CP Degeneracy by Kamioka-Korea Twin Hyper-Kamiokande"
HISAKAZU MINAKATA, *Tokyo Metropolitan University*

October 3
High Energy Theory Seminar:
"Exact Counting of 4D BPS Black Holes"
XI YIN, *Harvard University*

October 5
Physics Group Meeting: No Specific Topic
INFORMAL DISCUSSION

October 6
Informal Phenomenology Seminar:
"Resolution to the B → Pi K Puzzle"
SATOSHI MISHIMA, *Tohoku University; Member, School of Natural Sciences*

October 7
High Energy Theory Seminar:
"Boundary Ground Ring in Minimal String Theory"
ANIRBAN BASU, *Enrico Fermi Institute; Member, School of Natural Sciences*

October 12
High Energy Theory Seminar:
"The Superconformal R-symmetry and AdS/CFT"
KEN INTRILIGATOR, *University of California, San Diego; Member, School of Natural Sciences*

October 13
Informal Phenomenology Seminar:
"Detecting Solar Axions Using the Earth's Magnetic Field"
PATRICK HUBER, *University of Wisconsin at Madison*

October 17
High Energy Theory Seminar:
"Twistors in QCD"
DAVID KOSOWER, *CEA/Saclay*

CLIFF MOORE

The School of Natural Sciences 75th Anniversary Weekend attracted many former Members and Visitors back to the Institute.

October 19
Physics Group Meeting:
"Geometric Transitions, Black Rings, and Black Hole Microstates"
IOSIF BENA, *University of California, Los Angeles; Member, School of Natural Sciences*

October 20
Informal Phenomenology Seminar:
"Decoding MSSM at LHC"
LIANTAO WANG, *Harvard University*

October 26
Physics Group Meeting:
"Violation of the Bekenstein Bound in M(atrix)-theory"
ALEKSEY MINTS, *University of California, Berkeley*

October 27
Informal Phenomenology Seminar:
"Towards a High Energy Theory for the Higgs Phase of Gravity"
MICHAEL GRAESSER, *California Institute of Technology*

October 27
Special High Energy Theory Seminar:
"Black Holes and Quiver Quantum Mechanics"
ANDREW STROMINGER, *Harvard University*

October 28
High Energy Theory Seminar:
"Dark Matter Caustics"
PIERRE SIKIVIE, *University of Florida; Member, School of Natural Sciences*

October 31
High Energy Theory Seminar:
"Black Holes and Topological String"
HIROSI OOGURI, *California Institute of Technology*

November 2
Physics Group Meeting:
"Collider Bounds on Pseudoscalars Coupling to Gauge Bosons"
MATT KLEBAN, *Member, Institute for Advanced Study*

November 3
Informal Phenomenology Seminar:
"Warped Domain Wall Fermions: An Approach to Lattice Chiral Gauge Theories"
MATTHEW MARTIN, *Los Alamos National Laboratory*

November 4
High Energy Theory Seminar:
"The Open Topological String and 2-Dimensional Yang-Mills Theory"
ANDREW NEITZKE, *Harvard University; Member, School of Natural Sciences*

November 9
Physics Group Meeting:
hep-th/0511084, "Asymptotic States of the Bounce Geometry"
INFORMAL DISCUSSION

November 10
Informal Phenomenology Seminar:
"Baryogenesis and Neutralino Dark Matter in the MSSM"
CSABA BALAZS, *Argonne National Laboratory*

November 14
High Energy Theory Seminar:
"The Beginning of the End: Quasilocal Tachyons and Black Holes"
EVA SILVERSTEIN, *Stanford University*

November 15
Special High Energy Theory Seminar:
"Branes, Fluxes and the SM"
LUIS IBANEZ, *Universidad Automa de Madrid*

November 16
Physics Group Meeting:
"Microstates for BPS Black Holes and Black Rings"
TOMMY LEVI, *University of Pennsylvania*

November 17
Informal Phenomenology Seminar:
"A Natural Supersymmetric Standard Model"
RYUICHIRO KITANO, *Stanford Linear Accelerator Center*

November 18
High Energy Theory Seminar:
"Warped Compactifications: Flavor, Unification and Dark Matter"
KAUSTUBH AGASHE, *Johns Hopkins University; Member, School of Natural Sciences*

November 23
Physics Group Meeting:
hep-th/0511040, "Producing a Scale-Invariant Spectrum of Perturbations in a Hagedorn Phase of String Cosmology"
INFORMAL DISCUSSION

November 28
High Energy Theory Seminar:
"Bethe Ansatz for a Quantum Supercoset Model"
NELIA MANN, *University of California, Santa Barbara*

November 30
Physics Group Meeting:
"Geometric Transitions on non-Kaehler Manifolds"
ANKE KNAUF, *DESY*

December 6
Informal Phenomenology Seminar:
"Wormholes, Dark Energy and the Null Energy Condition"
ROMAN BUNIY, *University of Oregon*

December 7
Physics Group Meeting:
hep-th/0510262, "An Ambitwistor Yang-Mills Lagrangian" and hep-th/0511287, "Dimer Models from Mirror Symmetry and Quivering Amoebae"
INFORMAL DISCUSSION

December 8
Informal Phenomenology Seminar:
"Naturalness and Higgs Decays in the MSSM with a Singlet"
SPENCER CHANG, *New York University*

December 9
High Energy Theory Seminar:
"String Theory in Beta Deformed Spacetimes"
MARCUS SPRADLIN, *Kavli Institute for Theoretical Physics; Member, School of Natural Sciences*

December 12
High Energy Theory Seminar:
"Non-Geometric Flux Compactifications of String Theory"
WASHINGTON TAYLOR, *Massachusetts Institute of Technology*

December 14
Physics Group Meeting:
"New String Theories with Sixteen Supercharges"
SIMEON HELLERMAN, *Member, School of Natural Sciences*

January 19
Informal Phenomenology Seminar:
"Closed Cosmic F- and D-strings Dynamically Stabilized"
ALBERTO IGLESIAS, *New York University*

January 26
Informal Phenomenology Seminar:
"Nonrelativistic General Coordinate and Conformal Symmetries"
DAM THANH SON, *University of Washington; Member, School of Natural Sciences*

January 27
High Energy Theory Seminar:
"Black Rings, Geometric Transitions and Black Hole Physics"
IOSIF BENA, *University of California, Los Angeles; Member, School of Natural Sciences*

February 1
Physics Group Meeting: Informal Discussion on hep-th/0601001,
"The String Landscape, Black Holes and Gravity as the Weakest Force" and hep-th/0601111,
"Bounds on Masses of Bulk Fields in String Compactifications"
MARCUS SPRADLIN, *Kavli Institute for Theoretical Physics; Member, School of Natural Sciences*

February 2
Informal Phenomenology Seminar:
"Radiatively Generated Maximal Mixing Scenario for the Higgs Mass and the Least Fine Tuned MSSM"
RADOVAN DERMISEK, *University of California, Davis; Member, School of Natural Sciences*

February 6
High Energy Theory Seminar:
"Pure Spinor Formalism as an N=2 Topological String"
NATHAN BERKOVITS, *Universidade Estadual Paulista*

February 8
Physics Group Meeting: hep-th/0512111,
"Solving Pure QCD in 2+1 Dimensions" and hep-th/0407051, "Towards the QCD String: 2+1 Dimensional QCD in the Planar Limit"
INFORMAL DISCUSSION

February 9
Informal Phenomenology Seminar:
"Beyond the MSSM"
PAUL LANGACKER, *University of Pennsylvania*

February 10
High Energy Theory Seminar:
"Brane-antibrane Pairs and Generalized Complex Geometry"
PASCAL GRANGE, *Ecole Polytechnique; Member, School of Natural Sciences*

February 16
Informal Phenomenology Seminar:
"On Quantum Mechanics as a Constrained Deterministic Dynamics"
PETR JIZBA, *Czech Technical University*

February 22
Physics Group Meeting:
"Dimer Models and Quiver Gauge Theories"
SEBASTIAN FRANCO, *Princeton University*

February 23
Informal Phenomenology Seminar:
"Deep Inelastic Sum Rules at the Boundaries Between Perturbative and Non-perturbative QCD"
ANDREI KATAEV, *Institute for Nuclear Research, Moscow*

February 24
High Energy Theory Seminar:
"Imaginary Liouville Theory"
THOMAS CURTRIGHT, *University of Miami; Member, School of Natural Sciences*

March 1
Physics Group Meeting:
"Computational Complexity of the Landscape"
MICHAEL DOUGLAS, *Rutgers, The State University of New Jersey*

March 3
Joint Astrophysics/Phenomenology Seminar:
"Limits on a Cosmological Vector Background"
ALEJANDRO JENKINS, *Caltech*

March 6
High Energy Theory Seminar:
"Sen's Conjectures in Open String Field Theory"
MARTIN SCHNABL, *CERN*

March 8
Physics Group Meeting:
"String Axion Inflation via Random Matrix Theory"
LIAM McALLISTER, *Princeton University*

March 9
Informal Phenomenology Seminar:
"Recent Progress in Lattice Supersymmetry"
ERICH POPPITZ, *University of Toronto*

March 10
High Energy Theory Seminar:
"Iterative Relations in Multiloop Amplitudes"
ANASTASIA VOLOVICH, *Kavli Institute for Theoretical Physics; Member, School of Natural Sciences*

March 15
Physics Group Meeting:
"Black Things Big and Small"
ATISH DABHOLKAR, *Tata Institute of Fundamental Research*

March 16
Informal Phenomenology Seminar:
"Report on the 2nd LHC Olympics and Discussion of its Future Plans"
HERMAN VERLINDE, *Princeton University*

March 20
High Energy Theory Seminar:
"Possible and Impossible in Effective Field Theory"
NIMA ARKANI-HAMED, *Harvard University*

March 24
High Energy Theory Seminar:
"Natural Electroweak Symmetry Breaking in NMSSM and Higgs at 100 GeV"
RADOVAN DERMISEK, *University of California, Davis; Member, School of Natural Sciences*

March 29
Physics Group Meeting:
"A D-Brane Landscape on Calabi-Yau Manifolds"
DUILIU-EMANUEL DIACONESCU, *Rutgers, The State University of New Jersey*

April 3
High Energy Theory Seminar:
"Some General Properties of Boundary Renormalization Group Flows in Two Dimensions"
ANATOLY KONECHNY, *Rutgers, The State University of New Jersey*

April 5
Physics Group Meeting:
"D-Branes in Nongeometric String Theory Backgrounds"
MICHAEL SCHULZ, *University of Pennsylvania*

April 6
Informal Phenomenology Seminar:
"Emerging Holography"
IAN LOW, *Member, School of Natural Sciences*

April 7
High Energy Theory Seminar:
"Constraint on Squark Flavor Mixings from B Physics"
SATOSHI MISHIMA, *Tohoku University; Member, School of Natural Sciences*

April 12
Physics Group Meeting:
"A Holographic Description of the Multiverse—Maybe"
LEONARD SUSSKIND, *Stanford University*

April 13
Informal Phenomenology Seminar:
"Resonances from Two Universal Extra Dimensions"
EDUARDO PONTON, *Columbia University*

April 17
High Energy Theory Seminar:
"Dark Matter: Possibilities and Prospects for Detection"
SCOTT THOMAS, *Rutgers, The State University of New Jersey*

April 19
Physics Group Meeting:
"Spin Chain Magnons at Large 't Hooft Coupling from String Theory in AdS"
JUAN MALDACENA, *Professor, School of Natural Sciences*

April 20
Informal Phenomenology Seminar:
"Searches for New Physics"
GUSTAAF BROOIJMANS, *Columbia University*

April 21
High Energy Theory Seminar:
"Gauge Theory and the Geometric Langlands Program"
EDWARD WITTEN, *Charles Simonyi Professor, School of Natural Sciences*

April 26
Physics Group Meeting:
"Quantum Gravity and the Standard Model"
LEE SMOLIN, *Perimeter Institute*

May 1
High Energy Theory Seminar:
"NJL and QCD from String Theory"
JEFF HARVEY, *Enrico Fermi Institute; University of Chicago*

May 3
Physics Group Meeting: No Specific Topic
INFORMAL DISCUSSION

May 4
Informal Phenomenology Seminar:
"Probing Supersymmetric Baryogenesis: From Electric Dipole Moments to Neutrino Telescopes"
STEFANO PROFUMO, *California Institute of Technology*

May 5
High Energy Theory Seminar:
"Integrable Twists in AdS/CFT"
IAN SWANSON, *California Institute of Technology; Member, School of Natural Sciences*

May 10
Physics Group Meeting:
"Can We Test the Seesaw Mechanism Experimentally?"
HITOSHI MURAYAMA, *University of California, Berkeley*

May 11
Informal Phenomenology Seminar:
"Model Independent Approach to Electroweak Constraints"
WITOLD SKIBA, *Yale University*

May 17
Physics Group Meeting:
"An Uncertainty Principle for (Torsion) Fluxes"
GREG MOORE, *Rutgers, The State University of New Jersey; Member, School of Natural Sciences*

May 18
Informal Phenomenology Seminar:
"Physics of Top Quark"
C. P. YUAN, *Michigan State University*

May 19
High Energy Theory Seminar:
"String Propagation on Monodrofolds and T-folds"
SIMEON HELLERMAN, *Member, School of Natural Sciences*

May 24
Physics Group Meeting:
"Opening Mirror Symmetry on the Quintic"
JOHANNES WALCHER, *Member, School of Natural Sciences*

May 26
Special Physics Group Meeting:
"Opening Mirror Symmetry on the Quintic – Part II"
JOHANNES WALCHER, *Member, School of Natural Sciences*

May 31
Physics Group Meeting:
"The Worldsheet AdS_5 x S^5 S-matrix and Crossing Symmetry"
ROMUALD JANIK, *Jagiellonian University*

June 7
Physics Group Meeting:
"Exploring the Geometry of N=1 Vacua"
YANG-HUI HE, *Oxford University*

Astrophysics Activities

September 13
Institute for Advanced Study Astrophysics Seminar:
"The Massive Black Hole at the Center of the Milky Way"
REINHARD GENZEL, *Max-Planck-Institute for Extraterrestrial Physics*

September 14
Institute for Advanced Study Informal Seminar:
"Very Deep Photometry with Large Surveys: The Image Stacking Approach"
STEFANO ZIBETTI, *Max Planck-Institut for Astrophysics*

September 20
Institute for Advanced Study Astrophysics Seminar:
"String Theory for Astrophysicists"
JUAN MALDACENA, *Professor, School of Natural Sciences*

September 21
Institute for Advanced Study Informal Seminar:
"The SDSS Survey for High Redshift Neutral Gas"
JASON PROCHASKA, *University of California, Santa Cruz*

September 26
Institute for Advanced Study Informal Seminar:
"Carbon Ignition in Type Ia Supernovae"
MIKE KUHLEN, *University of California, Santa Cruz*

September 27
Institute for Advanced Study Astrophysics Seminar:
"Zen and the Art of Early Structure Formation"
PIERO MADAU, *University of California, Santa Cruz*

October 3
Institute for Advanced Study Informal Seminar:
"The CFHT Legacy Survey"
YANNICK MELLIER, *Institut d'Astrophysique de Paris Observatoire de Paris*

October 4
Institute for Advanced Study Astrophysics Seminar:
"MHD Instabilities and Turbulence in Accretion Flows: Recent Results"
JIM STONE, *Princeton University*

October 5
Institute for Advanced Study Informal Seminar:
"The Youngest Extragalactic Radio Sources"
BRUCE PARTRIDGE, *Haverford College; Visitor, School of Natural Sciences*

October 11
Institute for Advanced Study Astrophysics Seminar:
"A Debris Disk Around a Young Neutron Star"
DEEPTO CHAKRABARTY, *Massachusetts Institute of Technology*

October 12
Institute for Advanced Study Informal Seminar:
"Differential Rotation in Stars"
KRISTEN MENOU, *Columbia University*

October 13
Institute for Advanced Study Informal Seminar:
"The Nature of Magnetic Fields in A-stars, White Dwarfs and Magnetars"
HENK SPRUIT, *Max-Planck-Institut for Astrophysics*

October 18
Institute for Advanced Study Astrophysics Seminar:
"Driving Turbulence in the Diffuse Interstellar Medium"
EVE OSTRIKER, *University of Maryland*

October 19
Institute for Advanced Study Informal Seminar:
"Testing Inflation: Non-Gaussianity and the Epoch of Reionization"
DANIEL BABICH, *Harvard University*

Institute for Advanced Study Journal Club on Dark Matter:
"Neutrinos, Dark Matter and Baryon Asymmetry"
MIKHAIL SHAPOSHNIKOV, *Ecole polytechnique fédérale de Lausanne*

October 25
Institute for Advanced Study Astrophysics Seminar:
"The Global Hot Interstellar Medium: New Perspectives"
DANIEL WANG, *University of Massachusetts; Member, School of Natural Sciences*

October 26
Institute for Advanced Study Informal Seminar:
"How Do Black Hole Accretion Disks Radiate?"
SHANE DAVIS, *University of California, Santa Barbara*

Institute for Advanced Study Journal Club on Dark Matter:
"Picturing Dark Matter from Its Neutrinos"
MARCO CIRELLI, *Yale University*

November 1
Institute for Advanced Study Astrophysics Seminar:
"Dark Energy and Cosmic Sound"
DANIEL EISENSTEIN, *Steward Observatory, University of Arizona*

November 2
Institute for Advanced Study Informal Seminar:
"Streams, Clumps and Smooth Models: The Milky Way Structure with SDSS"
MARIO JURIC, *Princeton University*

November 8
Institute for Advanced Study Astrophysics Seminar:
"Diversity in Young Neutron Stars: The High Magnetic Field Puzzle"
VICKY KASPI, *McGill University*

November 9
Institute for Advanced Study Informal Seminar:
"The Supernova Remnant Sgr A East and its Impact on Sgr A*"
GABRIEL ROCKEFELLER, *University of Arizona*

November 15
Institute for Advanced Study Astrophysics Seminar:
"Sky Surveys in Hard X-Rays and Microwave Band: New Local AGNs Discovered by INTEGRAL and Another Way to Measure the Redshifts of Clusters of Galaxies"
RASHID SUNYAEV, *Max-Planck-Institut for Astrophysics*

November 16
Institute for Advanced Study Journal Club on Dark Matter:
"Discussion of the Recent PVLAS Result"
PIERRE SIKIVIE, *University of Florida*

November 21
Institute for Advanced Study Informal Seminar:
"Multi-Scale Growth of Cosmic Structure"
JUNA KOLLMEIER, *The Ohio State University*

November 29
Institute for Advanced Study Astrophysics Seminar:
"Gamma-ray Bursts in the Swift Era"
PAWAN KUMAR, *University of Texas at Austin*

November 30
Institute for Advanced Study Informal Seminar:
"Shaping the Kuiper Belt Size Spectrum"
MARGARET PAN, *California Institute of Technology*

December 5
Institute for Advanced Study Informal Seminar:
"Modeling Angular Momentum Transport in Turbulent Magnetized Accretion Disks"
MARTIN PESSAH, *University of Arizona*

December 6
Institute for Advanced Study Astrophysics Seminar:
"The Properties of the Highest Energy Particles in Nature"
ALAN WATSON, *University of Leeds*

December 7
Institute for Advanced Study Informal Seminar:
"Heating of Cool Cores in Galaxy Clusters and Groups"
MATEUSZ RUSZKOWSKI, *University of Colorado*

Institute for Advanced Study Journal Club on Dark Matter:
"Dark Matter and the Anthropic Principle"
SIMEON HELLERMAN, *Member, School of Natural Sciences*

January 11
Institute for Advanced Study Informal Seminar:
"Cosmic Magnification"
PENGJIE ZHANG, *Shanghai Observatory*

January 18
Institute for Advanced Study Informal Seminar:
"AGN Unification and the X-ray and Infrared Backgrounds"
EZEQUIEL TREISTER, *Yale University*

January 24
Institute for Advanced Study Astrophysics Seminar:
"Measuring the CMB after WMAP"
LYMAN PAGE, *Princeton University*

January 31
Institute for Advanced Study Astrophysics Seminar:
"Life and Death of the First Stars"
ALEX HEGER, *University of California, Santa Cruz*

February 7
Institute for Advanced Study Astrophysics Seminar:
"Small Bodies in the Outer Solar System: Emerging Views from Cassini and the Spitzer Space Telescope"
DALE CRUIKSHANK, *NASA Ames Research Center*

February 8
Institute for Advanced Study Informal Seminar:
"The Assembly of Baryons and Metallicity in Galaxies: New Clues from SDSS"
RAUL JIMENEZ, *University of Pennsylvania*

February 14
Institute for Advanced Study Astrophysics Seminar:
"Stellar Interferometry at Mid-IR Wavelengths; The Behavior of Old Stars"
CHARLES TOWNES, *University of California, Berkeley*

February 15
Institute for Advanced Study Informal Seminar:
"Turbulence and the Large Scale Circulation of the Atmosphere and Ocean"
GEOFF VALLIS, *Princeton University*

February 21
Institute for Advanced Study Astrophysics Seminar:
"Quasar Accretion"
JEREMY GOODMAN, *Princeton University; Member, School of Natural Sciences*

February 28
Institute for Advanced Study Astrophysics Seminar:
"The Tenth Planet (and Friends)"
MIKE BROWN, *California Institute of Technology*

March 1
Institute for Advanced Study Informal Seminar:
"Weak Gravitational Flexion"
DAVID GOLDBERG, *Drexel University*

March 3
Institute for Advanced Study Joint Astrophysics/Phenomenology Seminar:
"Limits on a Cosmological Vector Background"
ALEJANDRO JENKINS, *California Institute of Technology*

March 7
Institute for Advanced Study Astrophysics Seminar:
"AGN Feedback in Brightest Cluster Galaxies"
ANDY FABIAN, *Institute of Astronomy, University of Cambridge*

March 8
Institute for Advanced Study Informal Seminar:
"The Nature of Short-Hard Gamma-Ray Bursts"
DEREK FOX, *The Pennsylvania State University*

March 14
Institute for Advanced Study Astrophysics Seminar:
"A New Mechanism for Core-Collapse Supernova Explosions"
ADAM BURROWS, *Steward Observatory, University of Arizona*

March 21
Institute for Advanced Study Astrophysics Seminar:
"Nature and Environment of High-redshift Ultra-luminous Galaxies"
ANDREW BLAIN, *California Institute of Technology*

March 22
Institute for Advanced Study Informal Seminar:
"Astrophysical Shocks: From Large-Scale Structure to Supernovae and Gamma-Ray Bursts"
MIKHAIL MEDVEDEV, *University of Kansas*

March 28
Institute for Advanced Study Astrophysics Seminar:
"Gamma Ray Burst Discoveries by the Swift Mission"
NEIL GEHRELS, *NASA/Goddard Space Flight Center*

March 29
Institute for Advanced Study Informal Seminar:
"Interpreting the Clustering of Galaxies in the SDSS"
YIPENG JING, *Shanghai Astronomical Observatory*

April 4
Institute for Advanced Study Astrophysics Seminar:
"The Formation of the First Stars and their Feedback Effects: Latest Results"
MIKE NORMAN, *University of California, San Diego*

April 11
Institute for Advanced Study Astrophysics Seminar:
"Corona of Magnetars"
ANDREI BELOBORODOV, *Columbia University*

April 14
Institute for Advanced Study Informal Seminar:
"From High-Velocity Clouds to the Warm-Hot Inter-Galactic Medium: Equilibrium and Non-Equilibrium Ionization in Metal Ion Absorbers"
ORLY GNAT, *Tel Aviv University; California Institute of Technology*

April 18
Institute for Advanced Study Astrophysics Seminar:
"High Resolution Infrared Imaging of Young Planets"
BEN ZUCKERMAN, *University of California, Los Angeles*

April 19
Institute for Advanced Study Informal Seminar:
"Why SETI Will Fail"
BEN ZUCKERMAN, *University of California, Los Angeles*

April 21
Institute for Advanced Study Informal Seminar:
"Sonoluminescence and the Prospects for Sonofusion"
CARLOS CAMARA, *University of California, Los Angeles*

April 25
Institute for Advanced Study Astrophysics Seminar:
"Cosmological Simulations of Structure Formation: Successes, Challenges, Problems"
ANDREY KRAVTSOV, *University of Chicago*

April 26
Institute for Advanced Study Informal Seminar:
"The Secular Effect of a Magnetic Field on Galactic Evolution: Onset of Turbulence, Large Scale Structure and High Energy Events"
MARCO MARTOS NUÑEZ, *Universidad Nacional Autónoma de México*

April 27
Institute for Advanced Study Informal Seminar:
"Detecting the Progenitors of Core-Collapse Supernovae"
STEPHEN SMARTT, *Queens University, Belfast*

May 2
Institute for Advanced Study Astrophysics Seminar:
"Dark Matter Substructures and Cores of Elliptical Galaxies"
CHUNG-PEI MA, *University of California, Berkeley*

May 3
Institute for Advanced Study Informal Seminar:
"Dark Energy and Dark Gravity"
ERIC LINDER, *University of California, Berkeley*

May 5
Institute for Advanced Study Informal Seminar:
"Galaxy Clustering and Cosmology with the Halo Occupation Distribution"
JEREMY TINKER, *University of Chicago*

May 9
Institute for Advanced Study Astrophysics Seminar:
"The Galaxy in a New Light – High Energy Gamma Ray Astronomy with H.E.S.S."
WERNER HOFMANN, *Max-Planck-Institut for Astrophysics*

May 17
Institute for Advanced Study Informal Seminar:
"Massive Stars and the Progenitors of Long GRBs"
NORBERT LANGER, *Universiteit Utrecht*

June 6
Institute for Advanced Study Informal Seminar:
"Finally, Concordance on All Scales"
HOUJUN MO, *University of Massachusetts*

The Simons Center for Systems Biology Events

July 13 – 14
The Simons Center for Systems Biology-Bristol Myers Squibb Genomics Symposium on Molecular Profiling
"Genes, Genomes and Cancer"
DAVID BOTSTEIN, *Princeton University*

"Dissecting Complex Pathways in Humans: Lessons from Genetic Analysis of Extreme Phenotypes"
RICHARD LIFTON, *Yale School of Medicine*

"The Impact of a MDM2 Single Nucleotide Polymorphism (SNP309) in Human Cancer and Longevity"
GARETH BOND, *Member, The Simons Center for Systems Biology, School of Natural Sciences*

"Human Genetic Variation and Complex Traits"
KELLY A. FRAZER, *Perlegen Sciences*

"Genetics of Gene Expression"
LEONID KRUGLYAK, *Princeton University*

"Genomic Information and Cancer"
TODD GOLUB, *Massachusetts Institute of Technology*

"A Genomics View of the Differential Risk Landscape: An Integrated Diagnostics and Therapeutics Perspective"
JOHN J. SNINSKY, *Celera Diagnostics*

"Analyze This and That: Genomes and Proteomes"
MICHAEL SNYDER, *Yale University*

"The Genographic Project"
AJAY K. ROYYURU, *IBM Research*

"Human Genome Sequence Variation and the Genetic Basis of Common Disease"
DAVID ALTSHULER, *Massachusetts General Hospital*

"Cellular Oncogenomics Using HT RNAi Phenotype Profiling"
SPYRO MOUSSES, *TGen Research Institute*

"Admixture Association, and a Novel Risk Locus for Multiple Sclerosis"
NICK PATTERSON, *Massachusetts Institute of Technology*

"Exploring Systems Biology with Reactome"
LINCOLN STEIN, *Cold Spring Harbor Laboratory*

August 24
The Simons Center for Systems Biology Seminar:
"Switch-like Dynamics in Viral Regulatory Circuits: Stochastic Gene Expression in HIV-1 and Oscillations in Human Cytomegalovirus"
LEOR WEINBERGER, *Princeton University*

October 12
The Simons Center for Systems Biology Group Meeting

October 21
The Simons Center for Systems Biology Seminar:
"A microRNA Polycistron as a Potential Human Oncogene"
LIN HE, *Cold Spring Harbor Laboratory*

October 24
The Simons Center for Systems Biology Group Meeting

November 1
The Simons Center for Systems Biology Seminar:
"Modeling Genetic Regulation at Transcriptional and Post-Transcriptional Levels: Framework, Algorithms, Applications"
ILYA NEMENMAN, *Columbia University*

November 7
The Simons Center for Systems Biology Group Meeting

November 9
The Simons Center for Systems Biology Seminar:
"Retrotransposable Elements in Yeast and the Mouse"
JEF BOEKE, *The Johns Hopkins University School of Medicine*

November 14 – 15
The Simons Center for Systems Biology & Affymetrix, Inc. Conference

"Empirical Mapping of Sites of Transcription Across Human and Fly Genomes: Lessons Forgotten and Relearned"
THOMAS GINGERAS, *Affymetrix, Inc.*

"Hidden Complexities of the Human Transcriptome"
PHILIPP KAPRANOV, *Affymetrix, Inc.*

"Rank Statistics Based Identification of Enriched Sites in Chip on Chip Experiments"
SHRINKA GHOSH, *Affymetrix, Inc.*

"Mapping Transcription Factor Binding Sites Using Tiling Arrays: A Generative Model and its Implications for Statistical Methods"
RICHARD BOURGON, *University of California, Berkeley*

"An HSMM-Based Algorithm for Expression Detection in Tiling DNA Microarray Data"
ANTONIO PICCOLBONI, *Affymetrix, Inc.*

"MicroRNAs"
HARLAN ROBINS, *Member, The Simons Center for Systems Biology, School of Natural Sciences*

"Oligonucleotide Sequence Frequencies in Genomes"
MICHAEL KRASNITZ, *Member, The Simons Center for Systems Biology, School of Natural Sciences*

"SNPs in the p53 Pathway"
GARETH BOND, *Member, The Simons Center for Systems Biology, School of Natural Sciences*

November 18
The Simons Center for Systems Biology Seminar:
"Integrating Models and Experiments to Understand p53's Ups and Downs"
GALIT LAHAV, *Harvard Medical School*

November 23
The Simons Center for Systems Biology Seminar:
"Relating Genotype to Phenotype with Small Molecules"
STUART SCHREIBER, *Harvard University, Howard Hughes Medical Institute and Broad Institute of Harvard and MIT*

November 28
The Simons Center for Systems Biology Seminar:
"High Resolution Models of Genome Function"
DAVID GIFFORD, *Massachusetts Institute of Technology*

December 5
The Simons Center for Systems Biology Group Meeting

December 6
The Simons Center for Systems Biology Seminar:
"The Structure of DNA in Nucleosomes and its Wider Implication"
WILMA OLSON, *Rutgers, The State University of New Jersey*

December 12
The Simons Center for Systems Biology Seminar:
"Introduction to Immunology, Part 1"
ARNOLD J. LEVINE, *Professor, The Simons Center for Systems Biology, School of Natural Sciences*

December 13
The Simons Center for Systems Biology Seminar:
"Estrogen Alters B Cell Selection and Maturation: Implications for Autoimmune Disease"
BETTY DIAMOND, *Columbia University*

December 15
The Simons Center for Systems Biology Seminar:
"Introduction to Immunology, Part 2"
ARNOLD J. LEVINE, *Professor, The Simons Center for Systems Biology, School of Natural Sciences*

December 16
The Simons Center for Systems Biology Seminar:
"Modular Structure and Internal Conflict in a Neural Network Model"
ADI LIVNAT, *Princeton University*

December 19
The Simons Center for Systems Biology Group Meeting

December 21
The Simons Center for Systems Biology Seminar:
"Networks in Protein Folding"
ERZSÉBET RAVASZ, *Los Alamos National Laboratory*

January 11
The Simons Center for Systems Biology Seminar:
"Using Viral Proteins to Discover and Dissect Cellular Regulatory Pathways"
JAMES PIPAS, *University of Pittsburgh*

January 23
The Simons Center for Systems Biology Seminar:
"Comparative Analysis of Molecular Interaction Networks"
MEHMET KOYUTURK, *Purdue University*

January 27
The Simons Center for Systems Biology Seminar:
"Molecular Mechanisms of the Malaria Parasite *Plasmodium falciparum*"
MANUEL LLINÁS, *Princeton University*

January 30
The Simons Center for Systems Biology Group Meeting

February 1
The Simons Center for Systems Biology Seminar:
"Retroviral Recombination and HIV-1 Latency"
JOSEPH DOUGHERTY, *University of Medicine and Dentistry of New Jersey - Robert Wood Johnson Medical School*

February 3
The Simons Center for Systems Biology Seminar:
"Finding Genes that Cause Disease: Molecular Epidemiology in the Post-Genome Era"
TIMOTHY REBBECK, *University of Pennsylvania School of Medicine*

February 9
The Simons Center for Systems Biology Seminar:
"Six Ways to Touch an Elephant—Modeling Different Aspects of the Biomolecular System"
CHEN-HSIANG YEANG, *University of California, Santa Cruz*

February 13
The Simons Center for Systems Biology Group Meeting

February 16
The Simons Center for Systems Biology Seminar:
"A Model of Birdsong Learning and a General Theory of Optimization by Perturbation in Realistic Neural Networks"
ILA FIETE, *Kavli Institute for Theoretical Physics*

February 21
The Simons Center for Systems Biology Seminar:
"A Small Number of Genes are Sufficient to Classify a Large Number of Unique Toxicological and Pharmacological End-points Using Gene Expression"
GEORGES NATSOULIS, *Iconix Pharmaceuticals*

February 27
The Simons Center for Systems Biology Group Meeting

March 3
The Simons Center for Systems Biology Seminar:
"Information Theory for Biologists: Techniques and Applications"
GURINDER SINGH ATWAL, *Member, The Simons Center for Systems Biology, School of Natural Sciences*

March 9
The Simons Center for Systems Biology Seminar:
"Extending Maximum Entropy to Find Functional Motifs in the Genome"
HARLAN ROBINS, *Member, The Simons Center for Systems Biology, School of Natural Sciences*

March 13
The Simons Center for Systems Biology Group Meeting

March 27
The Simons Center for Systems Biology Group Meeting

March 29
The Simons Center for Systems Biology Seminar:
"Do Extragalactic Cosmic Rays Induce Cycles in Fossil Diversity?"
MIKHAIL MEDVEDEV, *University of Kansas*

March 31
The Simons Center for Systems Biology Seminar:
"X Chromosome Abnormalities in Human Basal-like Breast Cancer"
SHRIDAR GANESAN, *The Cancer Institute of New Jersey, University of Medicine and Dentistry of New Jersey - Robert Wood Johnson School of Medicine*

April 10
The Simons Center for Systems Biology Group Meeting

April 12
The Simons Center for Systems Biology Seminar:
"Challenges in Understanding the Genetic Basis of Variation in Human Cardiovascular Disease Risk"
ANDREW CLARK, *Cornell University*

April 13
The Simons Center for Systems Biology Seminar:
"Protein-Protein Interaction Networks"
ALEXEI VAZQUEZ, *Dana Farber Cancer Institute, Harvard Medical School*

April 19
The Simons Center for Systems Biology Group Meeting

April 28
The Simons Center for Systems Biology Seminar:
"The Modern RNA World: Computational Analysis of Noncoding RNAs"
SEAN EDDY, *Washington University School of Medicine*

May 5
The Simons Center for Systems Biology Group Meeting

May 8 – 12
The Simons Center for Systems Biology-Kavli Institute for Theoretical Physics Conference
"Determination of Longevity"
Sponsored by The Ellison Medical Foundation and the Glenn Foundation for Medical Research

"*SIR2* and Aging in Lower Organisms" and "Mammalian *SIR2* Genes and Calorie Restriction"
LEONARD P. GUARENTE, *Massachusetts Institute of Technology*

"RNAi Mediated Epigenetic Control of the Genome"
SHIV GREWAL, *National Cancer Institute*

"Sensing Caloric Restriction in Yeast"
JAMES BROACH, *Princeton University*

"Genomic Analysis of the Insulin/FOXO Longevity Pathway in C. *elegans*"
COLEEN MURPHY, *Princeton University*

"Live and Let Die: Alternate Pathways Regulating Programmed Cell Death in C. *elegans*"
SHAI SHAHAM, *The Rockefeller University*

"Full Genome RNAi Screen for C. *elegans* Longevity Genes"
GARY RUVKUN, *Massachusetts General Hospital*

"Gene Interactions, Gene Networks and the Evolution of Longevity"
DANIEL PROMISLOW, *University of Georgia*

"Neuroendocrine Network Regulation of *Drosophila* Aging"
MARC TATAR, *Brown University*

"Biomarkers of Aging and Molecules That Mediate Calorie Reduction Life Span Extension in Flies"
STEPHEN HELFAND, *Brown University*

"A Modest Proposal for the Identification of Genetic Substrates for Elite Aging in *Homo sapiens*"
GEORGE MARTIN, *University of Washington*

"Mitochondrial Etiology of Degenerative Diseases, Cancer, and Aging"
DOUGLAS WALLACE, *University of California, Irvine*

"p53, Longevity Assurance, Longevity Suppression, and Antagonistic Pleiotropy"
LAWRENCE DONEHOWER, *Baylor College of Medicine*

"p63 Links Cellular Senescence and Organismal Aging"
ALEA MILLS, *Cold Spring Harbor Laboratory*

"Strategies for Survival: Lessons from Bacteria"
STANISLAS LEIBLER, *The Rockefeller University*

"Transient Differentiation at the Single Cell Level"
MICHAEL ELOWITZ, *California Institute of Technology*

"Modeling Signal Transduction Networks: How Quantitative Can One Get?"
BORIS SHRAIMAN, *Kavli Institute for Theoretical Physics*

May 16
The Simons Center for Systems Biology Seminar:
"A Genomic Code for Nucleosome Positioning and Chromosome Function"
JONATHAN WIDOM, *Northwestern University*

May 22
The Simons Center for Systems Biology Group Meeting

June 5
The Simons Center for Systems Biology Group Meeting

June 21 – 22
The Simons Center for Systems Biology-Rita Allen Foundation Symposium
"Thirty Years of the Rita Allen Foundation's Support for Medical Research"

"Mechanisms of Formation of Human Malignant Cells"
ROBERT A. WEINBERG, *Massachusetts Institute of Technology*

"Quiet Time: Genomic Approaches to Understanding Cellular Quiescence"
HILARY A. COLLER, *Princeton University*

"How Telomeres Tame the DNA Damage Response"
TITIA de LANGE, *The Rockefeller University*

"Evading p53 Action During Tumorigenesis and Therapy"
SCOTT W. LOWE, *Cold Spring Harbor Laboratory*

"Mechanism of RNAi"
GREGORY J. HANNON, *Cold Spring Harbor Laboratory*

"Driving the Cell Cycle"
DAVID O. MORGAN, *University of California, San Francisco*

"Mechanisms of Programmed Cell Death by Structural Biology"
YIGONG SHI, *Princeton University*

"Studies on the Mechanism of Cell Competition"
LAURA A. JOHNSTON, *Columbia University*

"Host-Pathogen Interactions as Competitive Genomics: Immunologic Challenges of Mycobacterium Tuberculosis"
CARL F. NATHAN, *Weill Medical College of Cornell University*

"Synaptic Learning Rules in the Cerebellum and Hippocampus"
SAMUEL WANG, *Princeton University*

"'Master Regulators' and their Networks: MyoD, NRSF and Mbp1"
BARBARA J. WOLD, *California Institute of Technology*

"Advancing Cancer Pain Management: the Science, Politics and Ethics"
KATHLEEN M. FOLEY, *Memorial Sloan-Kettering Cancer Center*

"Essential Roles for Glia in *C. elegans* Nervous System Development and Function"
SHAI SHAHAM, *The Rockefeller University*

CLIFF MOORE

"The intellectual lifestyle at the Institute was integral to my efforts to educate myself in economics and psychology, and I found the atmosphere and the collegiality that it induced to be central in this regard."

— Member, School of Social Science

THE SCHOOL OF SOCIAL SCIENCE

Faculty

ERIC S. MASKIN, *Albert O. Hirschman Professor*
JOAN WALLACH SCOTT, *Harold F. Linder Professor*
MICHAEL WALZER, *UPS Foundation Professor*

Professors Emeriti

CLIFFORD GEERTZ
ALBERT O. HIRSCHMAN

Visiting Associate Professor

ADAM ASHFORTH

ACADEMIC ACTIVITIES

The School of Social Science invited nineteen scholars from a pool of 114 applicants from the United States and abroad to be part of the School's scholarly community as Members for the 2005-2006 academic year. Six visitors and two research assistants also participated in the year's activities. The National Endowment for the Humanities partially or fully funded three Members. Economists were supported by grants from the Leon Levy Foundation and The Spencer Foundation, as well as the Richard B. Fisher and the Deutsche Bank Memberships. In addition, the School hosted a Burkhardt Fellowship scholar, funded by the American Council of Learned Societies (ACLS), as a Member. Fields of inquiry of the group included psychology (seven), economics (six), history (four), anthropology (three), political science (two), sociology (two), as well as one scholar each from the fields of literature, rhetoric, and law.

The thematic focus for 2005-2006 was *Psychology and Economics*, exploring an active and exciting area of current social science research at the intersection of these two disciplines. Psychological work on the biases and errors to which human decision makers are prone (often called "bounded rationality") is inducing economists to modify their theories of how people behave individually, socially, and in markets. Problems from economics and game theory are inspiring psychologists to undertake new experiments and to revise their views on the nature of intuition and reasoning. Both disciplines are expanding the concept of *Homo Economicus* to accommodate such phenomena as altruism, fairness, identity, and time-varying discounting. The thematic year was organized by Eric S. Maskin, in consultation with Daniel Kahneman and Roland Benabou from Princeton University.

The School conducted three seminar series – the Social Science Thursday Luncheon Seminar, the Psychology and Economics Thematic Seminar, and the IAS/Princeton University Economics Workshop. The School continued publication of its series of Occasional Papers and Economics Working Papers, which can be accessed online from the Institute's website.

In July 2005, PROFESSOR ERIC MASKIN gave plenary addresses at the Conference in Tribute to Jean-Jacques Laffont in Toulouse and at the International Game Theory Conference at the State University of New York, Stony Brook, on the subject of majority rule and strategic voting. Majority rule was also the subject of a talk he gave to the Jefferson Society at the University of Virginia in November. In July, he gave a series of lectures on cooperative game theory at the University of Bolzano, Italy, for advanced European graduate students and young faculty. He gave a similar lecture series at the Studiezentrum in Gerzensee, Switzerland, in September, and spoke on the same subject at University College, London, in November. In September, he spoke on the subject of time discounting at a joint meeting in Princeton of the evolutionary biology departments of Oxford University and Princeton University. He spoke on the same subject at the University of Paris in January. In November, he spoke on the British Greenhouse Gas Auction, which he helped design, at the School of Social Science weekend, part of the seventy-fifth anniversary celebration of the Institute for Advanced Study. In January, Professor Maskin spoke on the drawbacks of patent protection in high-technology industries in the Roy Seminar in Paris. He spoke on the same subject at Duke University/University of North Carolina, Chapel Hill in February and at the University of California, Los Angeles and Oxford University in May. This was also the subject of his keynote address at the CSEF-IGIER Symposium on Economics and Institutions in Capri in June. In January, he spoke on evolution and repeated games at a conference on the Evolution of Norms at the University of California, Irvine. He spoke on that same subject at the Symposium in Honor of Robert Aumann in April at the State University of New York, Stony Brook. In April, he gave a paper on default rules in contracts at a conference on the Law and Economics of Contracts at Columbia Law School. In spring 2006, he gave a graduate course on Recent Developments in Mechanism Design and Implementation Theory at Princeton University.

PROFESSOR JOAN W. SCOTT's book *Parité! Sexual Equality and the Crisis of French Universalism* was published by the University of Chicago Press in the fall. The French translation was published at the same time as *Parité! L'Universel et la difference des sexes* by Albin Michel. Professor Scott received an honorary doctor of letters degree from the John Jay College of Criminal Justice of the City University of New York. She gave the Carl Becker lecture at the University of North Iowa. She also lectured at the Graduate Center of the City University of New York, the University of Athens, Greece, and Brown University. She gave the keynote address at the annual conference of the European Social Science History Association in Amsterdam; and a paper at a conference on Secularism at Harvard University. She taught a graduate seminar in the history department at Rutgers, The State University of New Jersey. She continues to serve on the AAUP's Committee on Academic Freedom and Tenure, now as a consultant to the committee. She is currently finishing a book, *The Politics of the Veil,* for Princeton University Press.

During the academic year 2005-2006, PROFESSOR MICHAEL WALZER gave the Annual Isaiah Berlin Lecture at Oxford; the 2nd Annual Elga K. Stulman Lecture at Brown University; the Dankwart A. Rustow Memorial Lecture at the Graduate Center, City University of New York; the Kripke Lecture at the University of Nebraska-Lincoln; and the Fleishhacker Lecture at the University of San Francisco. He delivered the keynote speeches for an International Conference on "The Nation-State and Other Political Traditions of the Jewish People," held in Tel Aviv, Israel, and for the Italian Society of Political Philosophy's annual conference held in Fano, Italy. Professor Walzer

also spent a month as a Miegunyah Distinguished Fellow at the University of Melbourne, Australia, and was awarded an honorary doctorate from the University of Athens, Greece. In addition, he participated in a joint conference presented by *Reset*, *Dissent*, and Centro Studi Americani in Rome and a workshop at the Einstein Forum in Potsdam, Germany. His books *Arguing About War* and *Politics and Passion: Toward a More Egalitarian Liberalism* were released in paperback editions. *Arguing About War* came out in Polish and in a second Italian edition; *What it Means to Be an American* appeared in Japanese; a reprint (with a new Preface) of the German translation of *Spheres of Justice* and a reprint (with a new Afterword) of the French translation of *Just and Unjust Wars* were also published.

VISITING ASSOCIATE PROFESSOR ADAM ASHFORTH continued developing his work on the cultural dynamics of the HIV/AIDS epidemic in Africa. He also began a project studying the realities of grand poverty alleviation schemes in contemporary Africa, focusing on efforts to provide safe drinking water in South Sudan. He presented lectures in Africa, Australia, Europe, and the United States. His book *Witchcraft, Violence and Democracy in South Africa* was awarded the Melville J. Herskovits award for the best scholarly book on Africa, the premier prize for African Studies in the United States.

THE SCHOOL OF SOCIAL SCIENCE

MEMBERS, VISITORS, AND RESEARCH STAFF

WARWICK ANDERSON
History
University of Wisconsin · *b*

DAN ARIELY
Psychology
Massachusetts Institute of Technology · *sp*

SUMEDHA GUPTA ARIELY
Psychology
Massachusetts Institute of Technology · *v*

REBECCA BRYANT
Anthropology
George Mason University

BRIAN CONNOLLY
History
Rutgers, The State University of New Jersey · *a*

MARIANNE CONSTABLE
Law and History
University of California, Berkeley · *n*

CLARISSA HAYWARD
Political Science
Ohio State University · *n*

PETER H. HUANG
Law
Temple University

SHEENA S. IYENGAR
Psychology
Columbia University

SHACHAR KARIV
Economics
University of California, Berkeley

JENNET KIRKPATRICK
Political Science
University of Michigan · *v*

ALAN KIRMAN
Economics
GREQAM, EHESS and Université D' Aix-Marseille 3, France · *sp*

DANICA MIJOVIC-PRELEC
Psychology
Massachusetts Institute of Technology, Media Lab · *v*

P. READ MONTAGUE
Psychology
Baylor College of Medicine · *sp*

LAURE MURAT
Sociology
University of California, Los Angeles

MURIEL NIEDERLE
Economics
Stanford University

MICHAEL G. PELETZ
Anthropology
Emory University · *n*

ADRIANA PETRYNA
Anthropology
New School University · *vs*

DRAZEN PRELEC
Psychology
Massachusetts Institute of Technology, Sloan School · *sp*

TANYA S. ROSENBLAT
Economics
Wesleyan University

IAN ROXBOROUGH
Sociology
State University of New York, Stony Brook

HAIM SHAPIRA
Political Science
Bar-Ilan University, Israel · *a*

DAN SILVERMAN
Economics
University of Michigan

LISA SON
Psychology
Barnard College · *v*

a Research Assistant · *v* Visitor · *s* Second Term · *sp* Spencer Foundation Supported
n NEH Supported · *b* ACLS Supported (Burkhardt Fellow)

ZRINKA STAHULJAK
Literature
University of California, Los Angeles

THOMAS J. SUGRUE
History
University of Pennsylvania

SYLVIE THORON
Economics
University of Toulon, GREQAM, France · *v*

a Research Assistant · *v* Visitor · *s* Second Term · *sp* Spencer Foundation Supported
n NEH Supported · *b* ACLS Supported (Burkhardt Fellow)

THE SCHOOL OF SOCIAL SCIENCE

RECORD OF EVENTS

The following is a calendar of events sponsored by the School of Social Science

Academic Year 2005-06

September 20
IAS/Princeton University Behavioral Economics Seminar:
"Evolutionary Efficiency and Happiness"
LUIS RAYO, *University of Chicago* (with Gary Becker)

September 27
Psychology and Economics Thematic Seminar:
"(Dis)Honesty"
DAN ARIELY, *Massachusetts Institute of Technology; Member, School of Social Science*

September 29
Social Science Thursday Luncheon Seminar:
"Taking a Gamble: The Search for Metacognition in Monkeys"
LISA SON, *Barnard College; Visitor, School of Social Science*

October 4
IAS/Princeton University Behavioral Economics Seminar:
"Neural Substrates of Valuation in Social Exchange and Investment Games"
P. READ MONTAGUE, *Baylor College of Medicine; Member, School of Social Science*

October 6
Social Science Thursday Luncheon Seminar:
"Individual Preferences for Giving"
SHACHAR KARIV, *University of California, Berkeley; Member, School of Social Science*

October 11
IAS/Princeton University Behavioral Economics Seminar:
"Large Stakes and Big Mistakes"
DAN ARIELY, *Massachusetts Institute of Technology; Member, School of Social Science* (with Uri Gneezy, George Loewenstein and Nina Mazar)

October 18
Psychology and Economics Thematic Seminar:
"Willpower and Optimal Consumption"
DAN SILVERMAN, *University of Michigan; Member, School of Social Science*

October 20
Social Science Thursday Luncheon Seminar:
"Counterinsurgency as Military Doctrine and as Social Science"
IAN ROXBOROUGH, *State University of New York, Stony Brook; Member, School of Social Science*

October 25
IAS/Princeton University Behavioral Economics Seminar:
"Competition Over Agents with Bounded Rational Expectations"
RANI SPIEGLER, *Tel Aviv University*

October 27
Social Science Thursday Luncheon Seminar:
"The Economy as a Complex System: Individual and Collective Rationality"
ALAN KIRMAN, *EHESS and Université D'Aix-Marseille 3; Member, School of Social Science*

November 1
Psychology and Economics Thematic Seminar:
"Neuroeconomics"
COLIN F. CAMERER, *California Institute of Technology*

November 3
Social Science Thursday Luncheon Seminar:
"Choice and Its Discontents"
SHEENA S. IYENGAR, *Columbia University; Member, School of Social Science*

November 8
IAS/Princeton University Behavioral Economics Seminar:
"Do Women Shy Away from Competition? Do Men Compete Too Much?"

MURIEL NIEDERLE, *Stanford University; Member, School of Social Science* (with Lise Vesterlund)

November 10
Social Science Thursday Luncheon Seminar:
"Regime Change and Just War"
MICHAEL WALZER, *UPS Foundation Professor, School of Social Science*

November 15
Psychology and Economics Thematic Seminar:
"Happiness and Benefit-Cost Analysis in Financial Regulation: Evaluating Policy Affect"
PETER HUANG, *Temple University; Member, School of Social Science*

November 17
Social Science Thursday Luncheon Seminar:
"Suffering into Science: The Multiple Meanings of Kuru"
WARWICK ANDERSON, *University of Wisconsin; Member, School of Social Science*

November 22
IAS/Princeton University Behavioral Economics Seminar:
"Reputation, Social Identity and Social Conflict"
JOHN SMITH, *Princeton University*

November 29
Psychology and Economics Thematic Seminar:
"The Costs of Ever Increasing Choice"
SHEENA S. IYENGAR, *Columbia University; Member, School of Social Science*

December 1
Social Science Thursday Luncheon Seminar:
"Is Multilateral International Treaty Negotiation a Cooperative or Non-cooperative Process?: The Kyoto Example"
SYLVIE THORON, *University of Toulon, GREQAM; Visitor, School of Social Science*

December 6
IAS/Princeton University Behavioral Economics Seminar:
"Other-Regarding Behavior: Theories and Evidence"
DAN SILVERMAN, *University of Michigan; Member, School of Social Science* (with Nicola Persico)

December 8
Social Science Thursday Luncheon Seminar:
"Uncivil Disobedience"
JENNET KIRKPATRICK, *University of Michigan; Visitor, School of Social Science*

December 13
Psychology and Economics Thematic Seminar:
"Honoring Metacognitive Control: Part I"
LISA SON, *Barnard College; Visitor, School of Social Science*

December 15
Social Science Thursday Luncheon Seminar:
"A Bayesian Truth Criterion for Subjective Judgments"
DRAZAN PRELEC, *Massachusetts Institute of Technology; Member, School of Social Science*

January 26
Social Science Thursday Luncheon Seminar:
"How Do Labor Markets Operate: Gastroenterology as a Case Study for Market Design"
MURIEL NIEDERLE, *Stanford University; Member, School of Social Science*

January 31
Psychology and Economics Thematic Seminar:
"Gender Differences in Incorporating Performance Feedback"
TANYA ROSENBLAT, *Wesleyan University; Member, School of Social Science* (with M. Mobius, M. Niederle and P. Niehaus)

February 2
Social Science Thursday Luncheon Seminar:
"Jim Crow's Last Stand: The Struggle for Civil Rights in the Suburban North"
THOMAS J. SUGRUE, *University of Pennsylvania; Member, School of Social Science*

February 7
IAS/Princeton University Behavioral Economics Seminar:
"Substantive and Procedural Rationality of Decisions Under Uncertainty"
SHACHAR KARIV, *University of California, Berkeley; Member, School of Social Science*

February 9
Social Science Thursday Luncheon Seminar:
"The 'New Unwritten Law': Husband-Killing in Chicago"
MARIANNE CONSTABLE, *University of California, Berkeley; Member, School of Social Science*

February 14
Psychology and Economics Thematic Seminar:
"Changing Identity"
ALAN KIRMAN, *GREQAM, EHESS and Université D'Aix-Marseille 3; Member, School of Social Science* (with U. Horst and M. Teschl)

February 16
Social Science Thursday Luncheon Seminar:
"Measuring Trust in Social Networks"
TANYA ROSENBLAT, *Wesleyan University; Member, School of Social Science*

February 21
Psychology and Economics Thematic Seminar:
Panel Discussion on the "Philosophy" of Behavioral and Neuro-economics
JONATHAN D. COHEN, FARUK R. GUL, WOLFGANG PESENDORFER, *Princeton University* and RICHARD H. THALER, *University of Chicago*

February 23
Social Science Thursday Luncheon Seminar:
"Paths of No Return: Rights and Reparations in Cyprus"
REBECCA BRYANT, *George Mason University; Member, School of Social Science*

February 28
IAS/Princeton University Behavioral Economics Seminar:
"Truthful Answers are Surprisingly Common: Experimental Tests of the Bayesian Truth Serum"
DRAZAN PRELEC, *Massachusetts Institute of Technology; Member, School of Social Science*

March 2
Social Science Thursday Luncheon Seminar:
"Inches and Wages: The Economics and Ethics of Human Growth Hormone Treatment"
DAN SILVERMAN, *University of Michigan; Member, School of Social Science*

March 7
Psychology and Economics Thematic Seminar:
"Mechanisms of Time Discounting in the Brain"
SAMUEL M. McCLURE, *Princeton University*

March 9
Social Science Thursday Luncheon Seminar:
"Unexpected Values of Lawsuits: Real Options Models of Litigation, Settlement, and Risk Multipliers for Attorneys' Fees in Federal Civil Rights Cases"
PETER HUANG, *Temple University; Member, School of Social Science*

March 14
IAS/Princeton University Behavioral Economics Seminar:
"The Neural Basis of Norm Compliance and Norm Enforcement"
ERNST FEHR, *University of Zurich*

March 16
Social Science Thursday Luncheon Seminar:
"Beer, Vinegar, and Pain Killers: Experience and Expectations"
DAN ARIELY, *Massachusetts Institute of Technology; Member, School of Social Science*

March 21
Psychology and Economics Thematic Seminar:
"Endogenous Transfers in the Prisoner's Dilemma Game: An Experimental Test of Cooperation and Coordination"
GARY CHARNESS, *University of California, Santa Barbara*

March 23
Social Science Thursday Luncheon Seminar:
"When the World Turns Upside Down: Inversions, Distortions, Self-Deceptions"
DANICA MIJOVIC-PRELEC, *Massachusetts Institute of Technology; Visitor, School of Social Science*

March 28
IAS/Princeton University Behavioral Economics Seminar:
"Attitude-Dependent Altruism, Turnout, and Voting"
JULIO J. ROTEMBERG, *Harvard University*

March 30
Social Science Thursday Luncheon Seminar:
"Why Computers Don't Care: The Origins of Meaning in Efficient Computation"
P. READ MONTAGUE, *Baylor College of Medicine; Member, School of Social Science*

April 4
Psychology and Economics Thematic Seminar:
"Signaling in Matching Markets"
MURIEL NIEDERLE, *Stanford University; Member, School of Social Science* (with Peter Coles)

April 6
Social Science Thursday Luncheon Seminar:
"Democracy's Identity Problem: Is 'Constitutional Patriotism' the Answer?"
CLARISSA HAYWARD, *Ohio State University; Member, School of Social Science*

April 11
IAS/Princeton University Behavioral Economics Seminar:
"Social Learning and Consumer Demand"
TANYA ROSENBLAT, *Wesleyan University; Member, School of Social Science*

April 18
IAS Economics Seminar:
"Correlation and Cooperation"
MENAHEM YAARI, *Hebrew University*

April 18
Psychology and Economics Thematic Seminar:
"Intergroup Competition and Social Preferences: An Experimental Study"
JENS W. GROSSER, *Princeton University* (with Rupert Sausgruger)

April 20
Social Science Thursday Luncheon Seminar:
"'Pornographic Archeology': Medieval Sexuality in Nineteenth-Century France"
ZRINKA STAHULJAK, *University of California, Los Angeles; Member, School of Social Science*

April 25
IAS/Princeton University Behavioral Economics Seminar:
"An Economic Model of the Planning Fallacy"
MARKUS BRUNNERMEIER and JONATHAN PARKER, *Princeton University*

April 27
Social Science Thursday Luncheon Seminar:
"Transgenderism and Gender Pluralism in Southeast Asia Since Early Modern Times"
MICHAEL G. PELETZ, *Emory University; Member, School of Social Science*

May 2
IAS/Princeton University Behavioral Economics Seminar:
"Strategic Surveys and the Bequest Motive"
ANDREW CAPLIN, *New York University* (with John Ameriks, Steven Laufer and Stijn Van Nieuwerburgh)

May 4
Social Science Thursday Luncheon Seminar:
"The Cop, the Fairy, and the Novelist: Police Records of a Character in Balzac"
LAURE MURAT, *University of California, Los Angeles; Member, School of Social Science*

May 9
Psychology and Economics Thematic Seminar:
"Dating Markets: Theory and Experimental Evidence"
EMIR KAMENICA, *Harvard University* (with Sheena S. Iyengar)

May 11
Social Science Thursday Luncheon Seminar:
"Universalism, Relativism and Applied Ethics: The Case of Female Circumcision"
ELISABETTA GALEOTTI, *University of Piemonte Orientale*

May 16
Psychology and Economics Thematic Seminar:
"Self-Control Through Second-Order Preferences"
KLAUS NEHRING, *University of California, Davis*

May 23
Psychology and Economics Thematic Seminar:
"A Cognitive Theory of Identity"
ROLAND BENABOU, *Princeton University* (with Jean Tirole)

May 30
Psychology and Economics Thematic Seminar:
"Cultivating Conscience: How Law Promotes Moral Behavior"
LYNNE STOUT, *University of California, Los Angeles*

June 6
Psychology and Economics Thematic Seminar:
"Leadership Commitment and Bargaining Power"
SYLVIE THORON, *University of Toulon, GREQAM; Visitor, School of Social Science*

June 13
Psychology and Economics Thematic Seminar:
"Honoring Metacognitive Control: Part 2"
LISA SON, *Barnard College; Visitor, School of Social Science*

June 20
Psychology and Economics Thematic Seminar:
"Matchimizing: A Model of Bounded Rationality"
SEBASTIAN SEUNG, *Howard Hughes Medical Center* and *Massachusetts Institute of Technology*

CLIFF MOORE

"The Institute has been, beyond all expectations, an ideal environment for my work this year. The most valuable elements have been the convenient and pleasant work space, peace and relative isolation from importunate interruptions and distractions, collegiality among the Members and Faculty, and the splendid library resources."

— Member, School of Historical Studies

SPECIAL PROGRAMS

PROGRAM IN INTERDISCIPLINARY STUDIES

Faculty

PIET HUT

PIET HUT continued to lead the interdisciplinary program. His visitors came from a variety of fields, including physics, astrophysics and astrobiology, mathematics, various areas in computational science as well as computer science and artificial intelligence, cognitive science, medicine, psychology, political science, history of science, and philosophy.

Professor Hut's main project in astrophysics is the Art of Computational Science, an initiative that he started a few years ago with Jun Makino, from Tokyo University. It is centered around a combination of research and education aimed at encouraging collaborations of computational scientists in the development of virtual laboratories. This project extends the notion of 'open source' to that of 'open knowledge,' in which not only the software is freely shared, but also the background knowledge, represented in the form of dialogues between the researchers developing the software. Hut and Makino have published several volumes of the ACS series on their web site http://www.artcompsci.org.

Together with Professor Caroline Bynum from the School of Historical Studies, Professor Hut organized a weekly luncheon with the title "Time and Silence," spanning two semesters. As a continuation of the Interdisciplinary Conversations from the previous year, the same format was used: at the start of each luncheon, someone introduced a topic in five minutes, and the remaining time was spent in a freely flowing discussion. Many participants commented on the unusually large breadth of the conversations, with input from typically a score or more researchers from areas spanning many fields in science and the humanities.

As another widely interdisciplinary activity, Professor Hut started a new web site, Ways of Knowing, or WoK for short, at http://www.waysofknowing.net, in collaboration with Steven Tainer, a logician, philosopher, and teacher of Eastern contemplative traditions at the Institute for World Religions in Berkeley, California.

Professor Hut organized a workshop, MODEST-6d, at the Institute for Advanced Study, entitled "Black Magic & White Elephants: Performance and Transparency in Computational Stellar Dynamics." The two main topics of this workshop were the ways to implement performance enhancement of existing and future codes, and ways to increase understandability and hence extendibility of these codes. Participants ranged from astrophysicists and computational scientists in other areas to computer scientists.

In the summer of 2005, Professor Hut also co-organized a summer school in Amsterdam, Holland, on gravitational dynamics, with an emphasis on stellar dynamics, stellar evolution, and hydrodynamics. With seven teachers and fifty students, it was possible to let all students work in pairs on realistic computational research projects, through intensive consultation with the teachers.

ARTIST-IN-RESIDENCE PROGRAM

Jon Magnussen, Composer

The 2005-06 academic year marked the third year of *Recent Pasts 20/21*, the Artist-in-Residence Program's four-year exploration into music of the past century. The goal of this undertaking is to contribute to a better understanding of the wide variety of aesthetic perspectives in western art music of the 20th and 21st centuries through chamber music concerts and talks.

The 2005-06 music series explored recent currents in contemporary music in the following concerts: SONGS – WITH AND WITHOUT WORDS, featuring pianist Fred Hersch, offered a program of works by Thelonius Monk and Cole Porter, and included Hersch's own compositions. SNAPSHOTS AND LEGACIES: THE MUSIC OF JOHN CORIGLIANO, performed by Music From Copland House, showcased the music of Academy Award® - and Pulitzer Prize-winner John Corigliano, and music of composers who influenced him, Igor Stravinsky and Aaron Copland. Works on the program included: Corigliano's *Mr. Tambourine Man: Poems of Bob Dylan* for soprano and piano; *Soliloquy* for clarinet and string quartet; *Snapshot: Circa 1909* for string quartet (with video); *Chiaroscuro* for two pianos tuned 1/2 tone apart; Copland's *Sextet* for clarinet, piano and string quartet; and Stravinsky's *Concertino* for string quartet. GIANT PIPES AND FLOWERPOTS: MUSIC IN THE BIRCH GARDEN featured So Percussion performing David Lang's *the so-called laws of nature* and, together with Trollstilt, Dan Trueman's *Five-and-a-half Gardens*.

Speakers in the series included composer/pianist Fred Hersch, whose post-concert discussion illuminated aspects of the improvisatory art and explored the connections between the jazz and classical music traditions; composer John Corigliano, who spoke about challenges today's composers of concert music face and the opportunities new technologies are presenting; the musicians of So Percussion and Trollstilt, who discussed and demonstrated the technology they employ in performance and their unusual instruments, many of which they make themselves; and composer David Lang, who spoke about risk and decision-making in the compositional process.

In addition to directing *Recent Pasts 20/21*, during the 2005-06 year Magnussen composed and produced a recording of five new scenes from his opera-in-progress, *The Folding Cliffs*, with singers Christopher Burchett (baritone), Leslie Goldman (soprano), Amy Van Roekel (soprano), Sumner Thompson (baritone), and Michael Zegarski (baritone). He presented the recordings in a talk about the opera to the Institute community. Magnussen also composed *Christmas Bells*, for 3-part treble chorus and treble soloist, based on Henry Wadsworth Longfellow's Civil War-era poem, which was premiered by the Westminster Conservatory Children's Chorus, directed by Patricia Thel. He edited contributions to the Artist-in-Residence "Words Series" website (www.ias.edu/air/words), and continued work on *The Folding Cliffs*.

DIRECTOR'S VISITORS

Scholars from a variety of fields, including areas not represented in the Schools, Director's Visitors contribute much to the vitality of the Institute. They are invited to the Institute for varying periods of time, depending upon the nature of their work.

LOUISE DOLAN

Director's Visitor Louise Dolan is a mathematical physicist and Professor of Physics at the University of North Carolina at Chapel Hill. She does research in theoretical physics and superstring theory, and is head of the task force on a Department of Energy grant that funds the string theory program at Chapel Hill. During several brief stays in the spring and summer of 2006 at the Institute for Advanced Study, she collaborated on research in superstrings and twistor theory.

GRAHAM FARMELO

Director's Visitor Graham Farmelo is Senior Research Fellow at the Science Museum, London, and Associate Professor of Physics at Northeastern University. He is currently completing a biography of the theoretical physicist Paul Dirac, who spent many sabbaticals at the Institute for Advanced Study between 1930 and 1967, and preparing an edition of Dirac's correspondence with leading Russian physicists, including Kapitza, Tamm, Fock and Gamow. In the summer of 2006 at the Institute, Farmelo completed the drafting of the biography, which will be published in 2007 by Faber.

TOM PHILLIPS

Director's Visitor Tom Phillips is a Royal Academician and a Trustee of the British Museum. He was the Slade Professor of Fine Art at the University of Oxford in 2005. As an artist Phillips is known for his pioneering work with word and image and for his portraits of notable figures in science and the arts. He has works in the collections of the Tate, the National Portrait Gallery and the Museum of Modern Art (MoMA). Phillips also is an accomplished poet, translator, musician and composer. During his stay at the Institute, Phillips' focus was on the visual arts.

MIKE SHEPPARD

Director's Visitor Mike Sheppard is a physicist who has worked for 20 years in the oil industry. He directed Schlumberger's research in the United Kingdom for many years and is now a Schlumberger Fellow. During Fall 2005 at the Institute for Advanced Study, Sheppard investigated approaches to mitigating climate change. His research was multidisciplinary, encompassing the study of both technical and social matters.

INSTITUTE FOR ADVANCED STUDY/ PARK CITY MATHEMATICS INSTITUTE

The IAS/Park City Mathematics Institute (PCMI) is an outreach program of the Institute for Advanced Study, affiliated with the Institute's School of Mathematics. The program, which came under the umbrella of the Institute in 1994, is a professional development institute for research mathematicians, graduate students, undergraduate students, mathematics education researchers, undergraduate faculty, and secondary school teachers.

The annual three-week residential Summer Session is the flagship activity of PCMI. At the Summer Session, all of the various groups of PCMI meet for their own professional programs as well as engage in a significant amount of all-institute interaction. The annual Summer Session strives to create a strong sense of community for all participants, and the interaction among these diverse populations serves to increase awareness of the roles of professionals in all mathematics-based occupations.
In addition to the annual Summer Session, there are academic-year activities and programs around the United States for secondary school mathematics teachers through PCMI's Math Science Partnership Project (known as "PD3") and through PCMI's many Professional Development and Outreach Groups. As well, the graduate-level lecture series from the annual Summer Session are published and distributed by the American Mathematical Society.

In 2003 PCMI received a three-year Math Science Partnership (MSP) grant from the National Science Foundation, which was the prototype "Institutes award" for the overall MSP project. With that award, PCMI established professional development partnerships in three diverse school districts: Cincinnati (Ohio), McAllen (Texas), and Seattle (Washington). In the summer of 2006, PCMI received a two-year continuation of that funding from the National Science Foundation, ensuring that the PD3 project will continue through the summer of 2008.

CHANGE OF PROGRAM DIRECTOR:
At the end of 2006, Herb Clemens will step down as Director of the IAS/Park City Mathematics Institute after a distinguished term of seven years. The incoming Director is Robert Bryant of Duke University, who organized PCMI's Undergraduate Program from 1994 until 1999. A tribute to Herb Clemens was held on July 14, 2006, in Park City, Utah, at the end of the annual Summer Session.

THE ANNUAL SUMMER SESSION

The 16th annual Summer Session of the IAS/Park City Mathematics Institute (PCMI) was held June 25-July 15, 2006, in Park City, Utah. This year's PCMI Summer Session, with a total of 388 participants, included the following programs:

Research Program in Mathematics
Graduate Summer School
Undergraduate Summer School
Secondary School Teacher Program
Designing and Implementing Professional Development seminar
Undergraduate Faculty Program
Mathematics Education Research Program (comprising two separate programs)

The mathematical topic, which changes each year, was *Low Dimensional Topology;* this topic informed the work of the Graduate Summer School, the Research Program and the Undergraduate Summer School. The topic *Mathematical Knowledge for Teaching* provided the focus for the education programs, including the Mathematics Education Research Program, the Designing and Implementing Professional Development seminar, the International Seminar on Mathematics Education, and the Secondary School Teachers Program.

Each of the programs met daily for a series of courses and seminars. The groups also met together for Cross Program Activities three or four days each week. A complete listing of courses, seminars and activities of the Summer Session follows.

GRADUATE SUMMER SCHOOL AND RESEARCH PROGRAM
The Graduate Summer School and the Research Program were organized by Professor Tomasz Mrowka, Massachusetts Institute of Technology, and Professor Peter Ozsváth, Columbia University. The timeliness and centrality of the mathematical topic and the quality of the lecturers combined to make this the largest and one of the most successful summer programs in the history of PCMI.

Also owing to its broad scope, the 2006 program attracted a very wide audience of students and researchers. The Graduate Summer School had 178 applications and the research program over 90. With help from a focused research grant (which included many of the lecturers and scholars present), the program was able to accommodate 102 graduate student participants and 80 researchers, an increase of about thirty percent in each program. The stimulating environment of PCMI will leave a lasting mark on the field, through the many students who were able to benefit from the courses and from the collaborations forged between the research participants.

The Graduate Summer School
There were seven graduate courses, aimed at bringing the current developments *in Low Dimensional Topology* to the participants. Each course consisted of five or six lectures with additional problem sessions. The courses, which met three times each day, were:

Ricci Flow and the Geometrization of three-manifolds; John Morgan, Columbia University
Introduction to Link Homology; Mikhail Khovanov, Columbia University
Contact geometry in low-dimensions; John Etnyre, University of Pennsylvania
Six Lectures for Four 4-Manifolds; Ron Fintushel, Michigan State University, and Ron Stern, University of California at Irvine
Lectures on Heegaard Floer Homology; Zoltan Szabóó, Princeton University
Hyperbolic geometry and 3-manifold topology; David Gabai, Princeton University
Dehn Surgery and 3-Manifolds; Cameron Gordon, University of Texas at Austin.

The material in the various courses was complementary; for example, Gabai's course further developed the hyperbolic geometry introduced in Gordon's, which also served as a useful background for Morgan's course. Also the knot invariants discussed by Khovanov and Szabó, although different in character, were closely connected. Moreover, Etnyre's discussion of contact methods further interwove with Szabó's course and also the symplectic constructions developed by Fintushel and Stern.

The Research Program
The Research Program began with two seminars per day, quickly progressing to three or four seminars per day by the second week. There was ample opportunity for less formal interaction in the Research Program as well; blackboards in the hallway of the conference center facilitated many impromptu conversations, and various seminar rooms with tables and blackboards were available during parts of the day and evenings. The program comprised a series of seminar talks which were loosely divided into the following various specializations represented in the program:

(1) Combinatorial Invariants, organized by Mikhail Khovanov
(2) Floer homology, organized by Jacob Rasmussen
(3) Four-manifolds, organized by Tom Mark
(4) Hyperbolic Geometry, organized by David Futer
(5) Symplectic Geometry, organized by Yakov Eliashberg
The wide range of interests of the participants helped foster a dialogue among the various areas.

Clay Mathematics Institute Senior Scholar-in-Residence. Through the generous support of the Clay Mathematics Institute, Cambridge, Massachusetts, PCMI welcomed three Senior Scholars-in-Residence to the 2006 Summer Session: Yakov Eliashberg, Stanford University, Robion Kirby, University of California at Berkeley, and John W. Milnor, State University of New York (SUNY) at Stony Brook. All three played pivotal roles in the research program. Eliashberg inspired large numbers of young contact and symplectic geometers who attended the program, and Kirby generated enthusiasm among the four-dimensional topologists. Both gave general-audience lectures aimed at the general PCMI audience. John Milnor also gave a public lecture, describing the history of higher-dimensional differential topology, placing low-dimensional topology into its wider context in topology. This is the third such year for the Clay Senior Scholars program at PCMI.

Research Program Seminars:
Reeb vector fields and open book decompositions, Ko Honda
Hyperbolic rational homology 3-spheres with large injective radius, Nathan Dunfield
Knot Floer homology and various satellite constructions, Michael Heddon
Rohlin's invariant and gauge theory, Nikolai Saveliev
Knot Floer homology detects genus one fibred knots, Paolo Ghiggini
Legendrian knots and the spanning tree model of the Khovanov homology, Hao Wu
From the SO(3) monopole cobordism formula to Witten's conjecture, Thomas Leness
On embedded contact homology, Michael Hutchings
Disoriented and confused: fixing the functoriality of Khovanov homology, Scott Morrison
Commensurability classes of 2-bridge knot,, Genevieve Walsh
Convexity of Morse stratifications and spines of 3-manifolds, Gabriel Katz
Differentials on Khovanov-Rozansky homology, Jacob Rasmussen
Gromov-Witten "equals" Reshetikhin-Turaev, David Auckly
4-manifolds, links and Alexander duality, Slava Krushkal
Symplectic mapping classes and fillings, Emmanuel Giroux
High distance knots, Saul Schleimer
Knot surgeries and negative definite four-manifolds, Brendan Owens
Poisson Structures on Moduli of SL(3)-Bundles over a Punctured Surface, Sean Lawton
Engel Structures, Thomas Vogel
Groping around link concordance, Tim Cochran
Open books and hyperbolic Dehn Survery, David Futer
A rational blowdown surgery revisited, Jongil Park
Non-compact Heegaard splittings anda theorem of Casson and Gordon, Scott Taylor
Extending knot Floer homology to higher genus boundary, Robert Lipschitz
Hyperbolic arborescent links, Francois Gueritaud
An exact triangle for knot Floer homology, Ciprian Manolescu
A local cobordism formula for SL(3) link homology, Ari Nieh

Form Seiberg-Witten to Gromov: Floer theory versions, Yi-Jen Lee
Knot Contact homology, Lenny Ng
Symplectic S^1 x N^3 and subgroup separability, Stefan Friedl and Stefano Vidussi
Topological 4-manifolds - a survey for grad students, Peter Teichner
On knot Floer homology, Peter Ozsváth
Singular archiral Lefschetz fibrations, Robion Kirby
Quantum hyperbolic geometry, Francis Bonahon
Tigh contact structures and contact Ozsváth-Szabó invariants, Andras Stipsicz

UNDERGRADUATE SUMMER SCHOOL

With 36 students participating, the Undergraduate Summer School at PCMI was organized around two courses, one aimed at introductory level students (e.g., students whose backgrounds included calculus and possibly linear algebra) and the other intended for students at a more advanced undergraduate level. This year's introductory course was "Topology of 2-dimensional and 3-dimensional spaces," taught by Erica Flapan of Pomona College. The advanced course was "Hyperbolic Geometry," taught by Francis Bonahon of the University of Southern California. Both courses were well-presented and well-received by the students. In particular, both courses were appropriate for their intended student audiences in that each course matched the advertised levels of "introductory" and "advanced."

Flapan's course was narrowly focused on the introductory students and restricted only to undergraduate students (rather than following the general PCMI philosophy of courses being open to all at the Summer Session). As a result of this unusual decision, the introductory students were able to speak up and participate fully in the class sessions. Flapan also had all the students collaboratively work in groups on presentations given at the end of the Summer Session.

Although aimed at the advanced undergraduate participants, Bonahon's advanced course was not restricted to the undergraduate students, and he consequently had a large daily attendance (between 30 and 40).

Both of the Undergraduate Summer School lecture series were well organized and well delivered, and the topics chosen by both instructors complemented the rest of the PCMI program.

Another noteworthy aspect of the Undergraduate Summer School this year was the sizable contingent of minority students attending the program. Brian Hopkins of St. Peter's College in Jersey City, New Jersey, brought five undergraduate students to PCMI; along with several minority students from other colleges this produced one of the highest minority student contingents in PCMI history.

UNDERGRADUATE FACULTY PROGRAM

The Undergraduate Faculty Program (UFP) was organized and coordinated by Colin Adams of Williams College. The objectives of the program were that the 13 participants would learn how to teach an undergraduate course in knot theory, how to do research in knot theory and how to direct student research in knot theory. In addition, knot theory was presented in the broader context of *Low Dimensional Topology*, allowing for interaction with the other PCMI participants.

Adams' course in knot theory was heavily attended not only by the 13 UFP participants but also by participants in most of the other PCMI programs, particularly the Undergraduate Summer School and the Secondary School Teachers Program. He stressed topics that could lead to student (or faculty) research projects and had many of the UFP participants deliver lectures during the three weeks. This high level of participation was continued in the later afternoon seminar that was devoted more specifically to UFP participants and the issues concerning the teaching of undergraduate knot theory and related topics.

Adams also contributed a great deal to the PCMI program at-large with several general lectures and presentations. His unique blend of comedy and mathematical exposition added a great deal to this year's Summer Session.

THE SECONDARY SCHOOL TEACHER PROGRAM

Forty-nine middle school and high school teachers spent a rewarding and challenging three weeks learning mathematics, reflecting on what it means to teach mathematics and working together to produce a product to share with their colleagues both at PCMI and more broadly through the PCMI website. The Secondary School Teachers Program (SSTP) also included a video interface component with six additional teachers from Cincinnati and six teachers from McAllen (Texas) as part of the Math Science Partnership project known as PD3 (PCMI and Districts Partner to Develop Professional Development).

Funding for the SSTP assumed a slightly different aspect this year with the primary source of funding being split between two National Science Foundation grants. The first grant is the continuation of the Math Science Partnership grant (PD3), which was extended for two more years through the summer of 2008; the second grant is from NSF's Teacher Professional Continuum Program and will fund the development of the SSTP's mathematics course materials into commercial products with facilitators' guides. The new grant provides funding for non-PD3 teachers to attend the summer SSTP.

Seventeen of the teachers returned for a second year in the SSTP; 18 of the participants were PD3 teachers. The other participants came from a variety of geographic locations including Illinois, Washington, Maine, New Mexico, Minnesota, North Dakota, New Jersey, and California and ranged from teachers with one year of teaching experience to seasoned veterans. The teachers represented Professional Development and Outreach groups from Los Angeles, Seattle, San Jose, New Jersey, New Mexico, and Minnesota, as well as those who came as individuals.

The mathematics session, *Developing Mathematics: Some Applications of Geometric Thinking,* used materials created by Al Cuoco, Educational Development Center, and alumni of the PROMYS for Teachers program from Boston University. Under the leadership of two PROMYS alumni teachers, participants explored basic geometric habits of mind such as studying continuous change and looking for things that don't change, applying them to topics like geometric optimization, geometric invariants and the fundamental theorem of algebra. Dynamic geometry software was integrated into the course on a daily basis as a way to make some of the ideas meaningful and concrete.

Akihiko Takahashi from DePaul University designed and presented the *Reflecting on Practice* sessions, which were focused on the Japanese concept of open-ended problems and what they bring to teaching and learning mathematics. Participants examined tasks, created and evaluated their own open-ended problems, and explored how these would fit into the mathematics curriculum and their own classrooms.

For two hours each afternoon, participants took part in one of eight working groups related to data analysis, functions, geometry, advanced geometry, lesson study, discrete mathematics, observation of teaching, and teacher professional continuum. *The Observation of Teaching* working group is designed to take advantage of the PCMI teaching laboratory for fifth grade students taught by Deborah Ball. *The Advanced Geometry* group led by Jim King was organized around an undergraduate-faculty course on *knot theory*. The interaction with the undergraduate program and faculty led to productive conversations about how this mathematics might appear in high school classes. The Teacher Professional Continuum working group, part of the new NSF grant, was responsible for creating support materials for facilitators who would be using the PCMI mathematics course in their own professional development work. The working groups explored technology, developed lessons, 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.

DESIGNING AND IMPLEMENTING PROFESSIONAL DEVELOPMENT

During the first week of the session 22 mathematics supervisors/educators held special sessions as part of the Designing and Implementing Professional Development program. This program included faculty leaders from the PCMI Professional Development and Outreach (PDO) Groups in Los Angeles, San Jose, New Mexico, New Jersey, Washington, and Minnesota; and team leaders from the three PD3 sites. These participants attended the SSTP sessions and spent the late afternoon as a separate working group, considering ways to keep mathematics central in professional development programs. These sessions were led by Al Cuoco and Wayne Harvey from the Educational Development Center and Charles Patton from SRI International.

Overall the summer was very successful, with high ratings from the participants on nearly every element of the program. The participation of the PD3 teachers was in keeping with that project's goals, interaction with the other PCMI programs was increased, and several new universities have expressed interest in establishing PDO groups. Challenges remain in finding ways to maximize the opportunities offered by the supervisor/PDO leader sessions and in getting the working group products reviewed, revised, and made public in a timely manner.

MATHEMATICS EDUCATION RESEARCH PROGRAM

International Seminar: Begun in 2001, the annual PCMI International Seminar *on Mathematics Education: Bridging Policy and Practice* brings diverse perspectives and practices to the U.S. national dialogue on mathematics education. The 2006 International Seminar focused on problem solving and proof, and on the mathematical knowledge needed by teachers for working with these concepts. This Seminar brought teams from Cameroon, Germany, Mexico, Pakistan, Poland, Singapore and Uganda to work with a team from the United States. Each team was designed to include two participants, one a currently practicing teacher and one an educational policy person. One participant from each of

Cameroon and Pakistan was not able to obtain a visa to attend the seminar, reinforcing the continuing problem of bringing educators from some countries to the United States. PCMI continues the endeavor to create a schedule that will consider the customs and regulations of diverse countries so as to allow the visa process to progress in a timely way.

Prior to the 2006 Seminar, each team was asked to send background material on their country and on their assigned topic and related questions. During the Seminar, each country presented a report, which was discussed and responded to by each of the other countries. Policy briefs from the 2006 group deal with The Nature and Scope of Problem Solving in School Mathematics; Preparation of Teachers for Teaching Problem Solving and Reasoning and Proof, and Conditions for Teachers to Engage in Problem Solving and Reasoning. Once edited, these will appear with the 2005 policy briefs and the proceedings of the 2002 and 2003 seminars on PCMI's web site at the Math Forum at Drexel University. A volume from 2004 is still being prepared for publication.

During 2004-6, PCMI worked with The World Bank to establish a PCMI-like institute in Uganda and the sub-Sahara Africa region. Funding has not yet been realized, but planning for the institute is in place should funding become available.

Elementary Mathematics Laboratory: The Elementary Mathematics Laboratory (EML) was developed to provide a data-rich environment in which the perspectives and expertise of mathematicians, mathematics educators, and K-12 teachers can be brought to bear on problems of teaching and learning elementary mathematics. At the core of the lab is a summer school course for fifth grade students from Park City Schools: participants engage in the design and analysis of the lessons, and observe an experienced classroom teacher teaching the lesson. The goal of the Elementary Mathematics Laboratory is to investigate how essential ideas and ways of working that characterize mathematics at advanced levels might be made accessible to young students, and how students might learn practices essential to mathematical work. A corollary problem focuses on the mathematical knowledge needed for teaching - What do teachers have to do and "be" mathematically in order to engage students in such mathematical work?

This year, the summer school course met for six days and enrolled nineteen students in the class. Classes were held from 10:00a.m. - 12:15p.m., with an additional 30 minutes of homework each day. Elementary Mathematics Laboratory participants attended the class sessions and were involved in the planning and analysis of the class both before and after the lessons. Participants discussed the mathematical ideas and skills in which the students were engaged, and the sorts of mathematical moves and habits that they were developing. Parallel to this was an analysis of the mathematical problems faced by the teacher, and the mathematical moves needed to teach the class. Observations and artifacts gathered from the lab class each day provided resources for this investigation and analysis.

CROSS PROGRAM ACTIVITIES

A defining feature of PCMI is its focus on building understanding, professional respect and a sense of shared purpose among all the various constituents of the mathematical enterprise. To that end, formal and informal Cross Program Activities were held in the afternoons and evenings. In addition, the participants organized and carried out many trips and activities throughout the three weeks of the Summer Session.

For the third year, two evenings of "Pizza and Problem Solving," were organized and presented by two faculty members from Harvey Mudd College: Andrew Bernoff and Francis Su. On each of these two evenings, between 200 and 250 participants attended, representing all the programs at PCMI. The participants appreciated the opportunity to tackle brain-teasers together, which seemed to "level the playing field" among the participants in a healthy way. And participants from all the programs were represented among those who presented solutions at the end of the evening.
Other evening activities included the opening and closing barbecue dinners for participants and their families. The full listing of activities is as follows:

Pizza and Problem Solving (2 sessions); Andrew Bernoff, Harvey Mudd College; Francis Su, Harvey Mudd College
"Schola Functorum" (choir organized by participants)
Jazz/Pop band (organized by participants)
4th of July parade (PCMI won the prize for Most Original Entry)
Clips and Activities from Numb3rs (the TV show); Johnny Lott
Blown Away: What Knot to do When Sailing; Sir Randolph Bacon III (also known as Colin Adams)
The Great Pi/E Debate (video presentation)
The PD3 project (participants in PCMI's Math Science Partnership project)
Real estate in hyperbolic space: investment opportunities for the new millennium; Mel Slugbate (also known as Colin Adams)
Solving the quartic with a pencil; David Auckly
Ice Cream Social sponsored by the Secondary School Teachers Program
The Proof is in the Pudding Parts I&II (Colin Adams and company)
A Conversation with Bob Moses
Tumble and Roll: The Idea of Holonomy; Robert Bryant.
The Elementary Mathematics Teaching Lab; Deborah Ball
A Tribute to Herb Clemens; presenters included Peter Goddard, Institute for Advanced Study; Phillip Griffiths, Institute for Advanced Study; Robert Bryant, Duke University; Gail Burrill, Michigan State University; James Carlson, Clay Mathematics Institute; James King, University of Washingon; John Morgan, Columbia University; Karl Rubin, Stanford University; Elaine Wolfensohn, Wolfensohn Family Foundation.

Clay Senior Scholar-in-Residence Lectures:
Flexible and Rigid Mathematics; Yakov Eliashberg, Stanford University
Boys' surface and eversions of the 2-dimensional sphere; Robion Kirby, University of California at Berkeley
Fifty Years Ago; John W. Milnor, SUNY Stony Brook

PD^3: PCMI AND DISTRICTS PARTNER TO DESIGN PROFESSIONAL DEVELOPMENT

A major development for PCMI in 2003-04 was the receipt of a Math Science Partnership Initiative grant from the National Science Foundation. The original three-year award of some $5.5 million has been extended a further two years with an additional $1 million in funding. This award funded a significant expansion in the Secondary School Teacher Program (SSTP) each summer, both in the number of participants attending

PCMI and by furnishing the equipment and personnel necessary to videoconference the morning SSTP sessions to remote sites in Cincinnati and McAllen. The funding also supports the design and implementation of a comprehensive in-year program of teacher professional development in three school districts in the United States: Cincinnati (Ohio), McAllen (Texas), and Seattle (Washington).

In each district, the goal is for the PCMI three-fold model of 1) continuing to do mathematics, 2) analyzing practice, and 3) becoming a resource to one's peers, to be tailored and implemented as the official professional development program for math teachers in selected middle and high schools in each district. At the end of three years, good progress has been made in both the McAllen and Seattle school districts, with the progress at Garfield High School in Seattle deemed to be exemplary. The progress in the Cincinnati Public Schools, however, was irretrievably hampered by the loss of support for the project when a new administration was installed at the district level. The PD3 project will therefore shift from Cincinnati to Las Cruces, New Mexico, for the remaining two years of funding. The already-established Professional Development and Outreach Group at New Mexico State University will begin partnering with the Las Cruces and Gadsden school districts in the fall of 2006 as a part of the PD3 project.

The project supports the participation of teachers and district administrators working in concert with university mathematicians and mathematics educators to design professional development offerings that, based on PCMI's three-fold model, are unique to the needs of each schools' teachers and curriculum. The anticipated unit of change is the individual school, with change then expected to spread to the entire district.

PUBLICATION SERIES

PCMI is very pleased to make the proceedings of its Summer Session available to the public. The full series, which comprises nearly all of the lectures ever given in PCMI's Graduate Summer School, includes the following titles:

Volume 1: *Geometry and Quantum Field Theory*
Volume 2: *Nonlinear Partial Differential Equations in Differential Geometry*
Volume 3: *Complex Algebraic Geometry*
Volume 4: *Gauge Theory and Four Manifolds*
Volume 5: *Hyperbolic Equations and Frequency Interactions*
Volume 6: *Probability Theory and Applications*
Volume 7: *Symplectic Geometry and Topology*
Volume 8: *Representation Theory of Lie Groups*
Volume 9: *Arithmetic Algebraic Geometry*
Volume 10: *Computational Complexity Theory*

The publication of Volume 11 is expected by the end of 2006, with Volumes 12 and 13 slated for publication in early 2007.

All published volumes are available either from the American Mathematical Society or through popular national bookstores.

Also published are three volumes in the *Park City Mathematics Institute Subseries*, which is a subsection of the AMS *Student Mathematics Series*. These volumes are aimed at under-

graduate students and are published independently of the Park City Mathematics Series mentioned above. Published thus far are:

Lectures on Contemporary Probability by Gregory F. Lawler and Lester N. Coyle
An Introduction to the Mathematical Theory of Waves by Roger Knobel
Codes and Curves by Judy L. Walker.
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.

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The Clay Mathematics Institute
Mathematical Sciences Research Institute
Chautauqua Workshop Programs
Texas Instruments

Appreciation is also extended to the Department of Mathematics at the University of Utah.

OVERSIGHT BOARD

The IAS/Park City Mathematics Institute is governed by an Oversight Board:

STEERING COMMITTEE

Members of the Steering Committee plan and manage the activities of the PCMI as follows:

Chair:
C. Herbert Clemens, The Ohio State University

Incoming Chair:
Robert Bryant, Duke University

2006 Graduate Summer School/Research Program Organizers:
Tomasz Mrowka, Massachusetts Institute of Technology
Peter Ozsváth, Columbia University

Graduate Summer School:
John Morgan, Columbia University

Lecture Series:
John Polking, Rice University

Mathematics Education Research Program:
Gail Burrill, Michigan State University
Roger Howe, Yale University

Recruitment:
Nathaniel Whitaker, University of Massachusetts at Amherst

Research Program:
Karl Rubin, Stanford University

Secondary School Teachers Program:
Gail Burrill, Michigan State University
James R. King, University of Washington
Carol Hattan, Skyview High School
Undergraduate Faculty Program:
William Barker, Bowdoin College
Daniel Goroff, Harvey Mudd College

Undergraduate Program:
William Barker, Bowdoin College
Aaron Bertram, University of Utah

The topic for the 2007 Summer Session will be *Statistical Mechanics*, organized by Scott Sheffield, Courant Institute, and Thomas Spencer, the Institute for Advanced Study. The Clay Senior Scholars-in-Residence will be Andrei Okounkov of Princeton University and Srinivasa Varadhan of the Courant Institute.

PROGRAM FOR WOMEN AND MATHEMATICS

The thirteenth annual Program for Women and Mathematics was held at the Institute for Advanced Study from May 15 to 26, 2006, and the research topic was "Zeta Functions all the Way." The program was sponsored by the Institute for Advanced Study and Princeton University and generously supported by the National Science Foundation and The Starr Foundation.

The goal of the program is to encourage undergraduate and graduate student participants to continue their mathematics education. Research mathematicians offer lectures and seminars on a focused topic, as well as mentoring, discussions on peer relations and an introduction to career opportunities. Earlier in the year the name of the program was modified to Program for Women and Mathematics in order to more accurately reflect the goals of the program.

This year's 53 participants included teacher assistants and lecturers, with 12 postdoctoral mathematicians, 16 graduate students and 18 undergraduate students. Mentors and students were accommodated in the Institute's housing complex, providing an opportunity to meet Institute Members and mathematicians from neighboring institutions. Participants had their breakfasts and lunches in the Institute's dining room and dinners were ordered from local restaurants and brought to the dining room. The organization of the dinners was a combined effort of the staff of the School of Mathematics and volunteers from among the participants.

Audrey Terras of the University of California, San Diego, served as the overall organizer for the program this year. She gave the upper level graduate course, "Zeta and L-Functions of Graphs" during the second week. Kate Okikiolu from the same university gave the upper level graduate course titled "Spectral Zeta Functions in Geometry" during the first week. Ruth Gornet served as assistant for the course the first week, and Amanda Beeson and Brooke Feigon assisted Professor Terras.

The lower level course, a survey of zeta functions, was directed at undergraduates and beginning graduate students and was given by Margaret Robinson and Giuliana Davidoff, both at Mt. Holyoke College. The assistants were Amanda Folsom and Cornelia Yuen.

There was an active research seminar on most afternoons organized by Matilde Lalin of the Institute and the Mathematical Sciences Research Institute. Seminars were as follows: Ruth Gornet, University of Texas at Arlington, "Gazillions of Isospectral Riemann Surfaces"; Brittany Fasy of Saint Joseph University, "Realizing Groups as Semi-direct Products"; Karen Acquista of Boston University, "Feynman Diagrams and Special Values of Zeta-Functions"; Ivana Alexandrova of the University of Toronto, "The Scattering Amplitude at a Maximum of the Potential"; Nicole Raulf of Princeton University, "Asymptotics of Class Numbers"; Yaim Cooper of MIT, "Properties Determined by the Ihara Zeta Function of a Graph"; Cristina Ballantine of the College of the Holy Cross, "Zeta Functions of Graphs, Buildings and Ramanujan Graphs"; Habiba Kadiri of the University of Montreal, "Zeros of L-Functions and Applications"; and Pirita Paajanen of The Hebrew University of Jerusalem, "Zeta Functions of Finitely Generated Infinite Groups."

Another afternoon activity consisted of two colloquia. Institute professor Enrico Bombieri discussed "The Rosetta Stone of L-Functions," and Harold Stark of the University of California, San Diego, lectured on "Zeta Functions and Class Numbers."

The Women-in-Science seminar was organized again by Cynthia Rudin of New York University and Katy Bold of Princeton University. It was held each day at 5 p.m. with a variety of discussion sessions, panels, and speakers. Two special programs were given by Angela Creager of Princeton University and Shelley Costa of Swarthmore College.
Friday, May 19, was Princeton Day, and the entire group spent the day at Princeton University listening to lectures, touring the campus, and having their lunch and dinner meals there. The highlight of the day was a talk by Andrew Wiles. Most of the organization of this event was done by Sun-Yung Alice Chang, who had assistance from the students at Princeton.

Karen Uhlenbeck of the University of Texas at Austin and Chuu-Lian Terng of the University of California at Irvine were in residence for the entire program. Sun-Yung Alice Chang of Princeton University, Nancy Hingston of The College of New Jersey and Lisa Traynor of Bryn Mawr College were in attendance for a number of activities.

The Institute for Advanced Study and the School of Mathematics appreciate the dedication of the senior women who have graciously given of their time and talents since the inception of the program in 1994. Organizers, program committee members, and lecturers have all contributed without compensation to the growth and success of the women's program. In the past twelve years many young women in the field of mathematics, or contemplating entering the field, were encouraged and supported by Karen Uhlenbeck, the program founder, and her collaborator and co-organizer Chuu-Lian Terng. Their commitment to the goals of the program has been unparalleled.

On the last day of the program, questionnaires were passed out to the participants in order to gain feedback about the structure and quality of the program. Both undergraduates and graduate students expressed their appreciation at being able to participate in the program, and many of the participants commented that they felt more motivated and focused at the conclusion of the event. The questionnaire confirmed the success of this year's program, and we look forward to hosting the 2007 program.

PROSPECTS IN THEORETICAL PHYSICS

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

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

The 2006 Prospects in Theoretical Physics program was held from July 17 to July 28 on the campus of the Institute for Advanced Study. The theme of the 2006 program was "Applications of String Theory." String theory remains the leading candidate for the unification of all elementary particles and forces. In recent years, techniques from string theory have also proved very useful in addressing the physics of strong interactions, as well as many questions in cosmology. The 2006 program focused on these applications.

More than 100 individuals were officially enrolled in the program, with a majority of the visiting students living in the Institute's housing complex during the two-week program. Moreover, the program lectures attracted many students, post-docs and professors from nearby institutions.

The Prospects in Theoretical Physics program is under the direction of Professor Chiara R. Nappi, a Princeton University Physics Professor, who is assisted by a local organizing committee of area physicists. This year's organizer and Program Director was Juan Maldacena of the Institute for Advanced Study. An alphabetical listing of the program's lecturers and their topics follows:

Niklas Beisert, Princeton University
"Integrability in AdS/CFT"

Mirjam Cvetic, University of Pennsylvania
"Construction of Semi-Realistic String Vacua"

Steven Gubser, Princeton University
"AdS/CFT and Relativistic Heavy Ion Collisions"

Ken Intriligator, University of California, San Diego
"Dynamical Supersymmetry Breaking"

Nissan Itzhaki, Princeton University
"The Evolving Cosmological Constant (Problem)"

Shamit Kachru, Stanford University
"Cosmology and Particle Physics from Flux Vacua"

Igor Klebanov, Princeton University
"D-branes on Cones and Gauge/String Dualities"

Juan Maldacena, Institute for Advanced Study
"Giant Magnons"

Joseph Polchinski, University of California, Santa Barbara
"Cosmic Strings and Superstrings"

Herman Verlinde, Princeton University
"D-branes at CY Singularities"

Edward Witten, Institute for Advanced Study
"Gauge Theory and the Geometric Langlands Program"

Prospects in Theoretical Physics 2006 was supported by The Concordia Foundation.

CLIFF MOORE

"About the material resources and organization of IAS, I can only speak in superlatives. I have particularly valued the efficient and at the same time friendly approach of the staff Members. Everybody managed to be very courteous and very helpful. I really felt welcome. In particular, I have appreciated the HS-SS library."

— Member, School of Historical Studies

THE LIBRARIES

The Historical Studies-Social Science Library (Marcia Tucker, Librarian) contains some 100,000 volumes and has subscriptions to over 1,000 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 library has occupied its present building since 1964.

The Institute's rare book collection, the gift of Lessing J. Rosenwald, consists of about 2,000 volumes on the history of science and was compiled by Herbert M. Evans in the 1930s. The collection, which is housed in a special room, includes numerous first editions of important scientific works in mathematics, astronomy, physics, and the life sciences. Additional volumes have been added through various gifts, most notably through the Leon Levy Fund, expanding the subject scope of the collection.

The library has an extensive collection of offprints including those received by Professors Andrew E.Z. Alföldi, Kurt Gödel, Ernst H. Kantorowicz, Elias Avery Lowe, Millard Meiss, Erwin Panofsky, and former Members Robert Huygens and Walther Kirchner.

The microfilm collections of the library include a large selection from Manuscripta, a collection of several thousand fifteenth- to nineteenth-century printed books from the Vatican Library. The Bavarian Academy has given the Institute a microfilm copy of slips presented for the Thesaurus Linguae Latinae along with additional material on CD. The library has microfilm copies of the papers of Kurt Gödel and Simone Weil.

The Historical Studies-Social Science Library houses the Institute archives. The papers in the collection date from the 1930s and include official correspondence of the Director's Office, minutes of meetings of the Faculty and the Board of Trustees, miscellaneous correspondence concerning past Faculty members, records of the Electronic Computer Project, and other documents. The archives also include the Institute's photograph collection.

The Mathematics-Natural Sciences Library (Momota Ganguli, Librarian) is centered in Fuld Hall with collections in various locations on campus. The library contains about 30,000 volumes of monographs and bound periodicals plus print and electronic subscriptions to about 175 journals. The areas covered by the library collection are pure and applied mathematics, astrophysics, theoretical and mathematical physics, and biology. The library adds approximately 350 new books annually to the collection and has an extensive collection of collected works of mathematicians.

Both of the Institute's libraries participate in the shared cataloging system of the Research Libraries Group, which gives Institute scholars computerized access to a database that contains more than twenty-two million records. Searches of this database retrieve bibliographic information and identify the location of materials in all participating libraries.

The Institute is a member of the Research Libraries Group SHARES partnership, a resource-sharing program. Access to electronically cataloged titles is available via Horizon, the Institute's web-accessible online catalog. The Institute's libraries are participants in the JSTOR project, which makes available archival electronic versions of many core journals in mathematics and the humanities.

The Historical Studies-Social Science Library maintains a computer center with access to a variety of word processing packages for both PCs and Macintoshes, and access to databases in the fields of Classical Studies, the History of Science, Islamic, and French studies. The Mathematics-Natural Sciences Library's electronic resources include access to Math-SciNet, an online catalog, a variety of indexes, and a growing collection of full-text journals.

All scholars affiliated with the Institute enjoy the same privileges as Princeton University faculty in the Princeton University Library system. All scholars also have privileges in the Robert E. Speer Library of the Princeton Theological Seminary.

The librarians and the faculties of all four Schools at the Institute warmly appreciate gifts of books and publications from former and current Members of the Institute.

BRUCE M. WHITE

"It almost goes without saying that the work environment at the Mathematics department at IAS is great. IAS is ideally suited to usefully bringing researchers together. The ancillary staff have been incredibly helpful, both secretarial and at your excellent library."

— Member, School of Mathematics

INDEPENDENT AUDITORS' REPORT

The Board of Trustees,
Institute for Advanced Study - Louis Bamberger and
Mrs. Felix Fuld Foundation

We have audited the accompanying statement of financial position of Institute for Advanced Study – Louis Bamberger and Mrs. Felix Fuld Foundation (the Institute) as of June 30, 2006, and the related statements of activities and cash flows for the year 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 audit. The accompanying financial statements of the Institute as of and for the year ended June 30, 2005, were audited by other auditors whose report thereon dated September 23, 2005, expressed an unqualified opinion on those statements.

We conducted our audit 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 audit provides a reasonable basis for our opinion.

In our opinion, the 2006 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, 2006, and the changes in its net assets and its cash flows for the year then ended in conformity with U.S. generally accepted accounting principles.

As discussed in note 10 to the financial statements, the Institute adopted the provisions of Financial Accounting Standards Board Interpretation No. 47, *Accounting for Conditional Asset Retirement Obligations* in 2006.

Our audit was made for the purpose of forming an opinion on the basic financial statements taken as a whole. The supplementary information included in schedule 1 is presented for purposes of additional analysis and is not a required part of the basic financial statements. Such information has been subjected to the auditing procedures applied in the audit of the 2006 basic financial statements and, in our opinion, is fairly stated in all material respects in relation to the 2006 basic financial statements taken as a whole.

KPMG LLP

January 3, 2007

STATEMENT OF FINANCIAL POSITION
JUNE 30, 2006 (WITH COMPARATIVE FINANCIAL INFORMATION AS OF JUNE 30, 2005)

ASSETS	**2006**	**2005**
Cash	$ 1,124,277	$ 1,670,531
Accounts Receivable	391,051	276,438
Government grants and contracts receivable	3,890,527	2,325,625
Accrued investment income	478,116	364,213
Prepaid and other assets	702,904	557,901
Contributions receivable – net	658,313	415,583
Unamortized debt issuance expense – net	532,804	580,594
Funds held by trustee	2,816,324	2,772,121
Beneficial interest in remainder trust	3,350,451	—
Land, buildings and improvements, equipment and rare book collection – net	49,908,605	49,997,653
Investments	594,156,997	510,729,683
TOTAL ASSETS	$658,010,369	$569,690,342

See accompanying notes to financial statements.

LIABILITIES AND NET ASSETS	2006	2005
LIABILITIES:		
Accounts payable and accrued expenses	$ 7,085,600	$ 6,609,788
Refundable advances	4,621,729	4,850,220
Liabilities under split-interest agreements	2,628,934	2,191,339
Postretirement benefit obligation	13,919,758	15,172,955
Asset retirement obligation	821,460	—
Note payable	745,018	805,005
Long-term debt	43,976,683	45,606,837
Total liabilities	73,799,182	75,236,144
NET ASSETS:		
Unrestricted	385,749,378	322,072,455
Temporarily restricted	141,988,818	124,358,400
Permanently restricted	56,472,991	48,023,343
Total net assets	584,211,187	494,454,198
TOTAL LIABILITIES AND NET ASSETS	$658,010,369	$569,690,342

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2006 (WITH SUMMARIZED FINANCIAL INFORMATION FOR THE YEAR

	UNRESTRICTED	TEMPORARILY RESTRICTED
REVENUES, GAINS AND OTHER SUPPORT:		
Private contributions and grants	$ 33,250,551	$ 4,745,501
Government grants	—	6,057,455
Income on long-term investments	3,461,857	1,831,584
Net appreciation in fair value of investments	47,679,445	24,149,583
Gain (loss) on sale of plant assets	443,949	—
Net assets released from restrictions - satisfaction of program restrictions	19,153,705	(19,153,705)
Total revenues, gains and other support	103,989,507	17,630,418
EXPENSES:		
School of Mathematics	7,944,715	—
School of Natural Sciences	8,640,813	—
School of Historical Studies	5,553,598	—
School of Social Science	3,207,709	—
Libraries and other academic	5,879,660	—
Administration and general	9,039,574	—
Postretirement benefits	(1,253,197)	—
Auxiliary activity - tenants' housing expenses – net of unrestricted revenue $4,616,490 in 2006	532,689	—
Total expenses	39,545,561	—
Change in net assets before cumulative effect of change in accounting principle	64,443,946	17,630,418
Cumulative effect of change in accounting principle	(767,023)	—
Change in net assets	63,676,923	17,630,418
NET ASSETS, BEGINNING OF YEAR	322,072,455	124,358,400
NET ASSETS, END OF YEAR	$385,749,378	$141,988,818

See accompanying notes to financial statements.

ENDED JUNE 30, 2005)

2006		
PERMANENTLY RESTRICTED	TOTAL 2006	TOTAL 2005
$ 8,449,648	$ 46,445,700	$ 7,254,246
—	6,057,455	6,253,542
—	5,293,441	66,453
—	71,829,028	61,247,582
—	443,949	(3,603)
—	—	—
8,449,648	130,069,573	74,818,220
—	7,944,715	7,925,171
—	8,640,813	6,881,927
—	5,553,598	4,953,741
—	3,207,709	3,131,366
—	5,879,660	7,079,691
—	9,039,574	8,739,394
—	(1,253,197)	5,453,287
—	532,689	467,760
—	39,545,561	44,632,337
8,449,648	90,524,012	30,185,883
—	(767,023)	—
8,449,648	89,756,989	30,185,883
48,023,343	494,454,198	464,268,315
$56,472,991	$ 584,211,187	$494,454,198

STATEMENT OF CASH FLOWS
YEAR ENDED JUNE 30, 2006 (WITH COMPARATIVE FINANCIAL INFORMATION FOR THE YEAR ENDED JUNE 30, 2005)

	2006	2005
CASH FLOWS FROM OPERATING ACTIVITIES:		
Change in net assets	$ 89,756,989	$ 30,185,883
Adjustments to reconcile change in net assets to net cash provided by (used in) operating activities:		
Depreciation and accretion	3,843,198	3,706,923
(Gain) loss on sale of capital assets	(443,949)	3,603
Contributions restricted for endowment and plant	(5,003,697)	(2,845,316)
Net appreciation in fair value of investments	(71,829,028)	(61,247,582)
Amortization of debt issuance expense	47,790	49,645
Amortization of bond discount	34,846	35,786
Cumulative effect of change in accounting principle	767,023	—
Changes in assets/liabilities:		
Accounts receivable and government grants and contracts receivable	(1,679,515)	166,245
Accrued investment income	(113,903)	(5,376)
Prepaid and other assets	(145,003)	2,783
Contributions receivable	(242,730)	431,316
Beneficial interest in remainder trust	(3,350,451)	—
Accounts payable and accrued expenses	475,812	1,106,313
Refundable advances	(228,491)	(15,425)
Postretirement benefit obligation	(1,253,197)	5,453,287
Net cash provided by (used in) operating activities	10,635,694	(22,971,915)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of plant assets	787,126	30,364
Purchase of plant assets	(4,042,890)	(3,987,474)
Proceeds from sale of investments	1,089,539,794	571,594,396
Purchase of investments	(1,101,138,080)	(545,316,536)
Net cash (used in) provided by investing activities	(14,854,050)	22,320,750
CASH FLOWS FROM FINANCING ACTIVITIES:		
Contributions restricted for endowment and plant	5,003,697	2,845,316
Increase (decrease) in liabilities under split-interest agreements	437,595	(95,436)
Repayment of long-term debt	(1,665,000)	(1,584,640)
Repayments of note payable	(59,987)	(58,806)
Increase in funds held by trustee	(44,203)	(25,853)
Net cash provided by financing activities	3,672,102	1,080,581
Net (decrease) increase in cash	(546,254)	429,416
CASH, BEGINNING OF YEAR	1,670,531	1,241,115
CASH, END OF YEAR	$ 1,124,277	$ 1,670,531
SUPPLEMENTAL DATA:		
Interest paid	$ 2,476,634	$ 2,729,373

See accompanying notes to financial statements.

NOTES TO FINANCIAL STATEMENTS
JUNE 30, 2006
(with comparative financial information for June 30, 2005)

(1) Organization and Summary of Significant Accounting Policies

Organization

The Institute for Advanced Study – Louis Bamberger and Mrs. Felix Fuld Foundation (the Institute), an independent, private institution devoted to the encouragement, support and patronage of learning, was founded in 1930 as a community of scholars where intellectual inquiry could be carried out in the most favorable circumstances.

Focused on mathematics and classical studies at the outset, the Institute today consists of the School of Historical Studies, the School of Mathematics, the School of Natural Sciences and the School of Social Science. Each school has a small permanent faculty, and some 190 fellowships are awarded annually to visiting members from other research institutions and universities throughout the world.

The objectives of the Institute were described as follows in the Founders' original letter to the first Trustees: "The primary purpose is the pursuit of advanced learning and exploration in fields of pure science and high scholarship to the utmost degree that the facilities of the institution and the ability of the faculty and students will permit."

Summary of Significant Accounting Policies

Basis of Presentation

The accompanying financial statements, which are presented on the accrual basis of accounting, have been prepared to focus on the Institute as a whole and to present net assets and revenues, expenses, gains, and losses based on the existence or absence of donor-imposed restrictions. Accordingly, net assets and changes therein are classified as follows:

- Permanently restricted net assets – net assets subject to donor-imposed stipulations that they be maintained permanently by the Institute. Generally, the donors of these assets permit the Institute to use all or part of the income earned on related investments for general or specific purposes.

- Temporarily restricted net assets – net assets subject to donor-imposed stipulations that will be met by actions of the Institute and/or by the passage of time.

- Unrestricted net assets – net assets not subject to donor-imposed stipulations. Unrestricted net assets may be designated for specific purposes by action of the board of trustees.

Revenues are reported as increases in unrestricted net assets unless use of the related asset is limited by donor-imposed restrictions. Expenses are reported as decreases in unrestricted net assets. Expiration of donor-imposed stipulations that simultaneously increase unrestricted net assets and decrease temporarily restricted net assets are reported as net assets released from restrictions. Temporarily restricted revenues received and expended during the same fiscal year are recorded as unrestricted revenues and expenses in the statement of activities.

Contributions and investment return with donor-imposed restrictions are reported as temporarily restricted revenues and are reclassified to unrestricted net assets when an expense is incurred that satisfies the donor-imposed restriction.

Contributions of long-lived assets are reported as unrestricted revenue. Contributions restricted for the acquisition of grounds, buildings, and equipment are reported as temporarily restricted revenues. These contributions are reclassified to unrestricted net assets upon acquisition of the assets.

The change in fair value of investments is recognized as increases or decreases in unrestricted net assets unless their use is temporarily or permanently restricted by explicit donor stipulations.

(a) Contributions

Contributions, including unconditional promises to give, are recognized as revenues in the period received. Conditional promises to give are not recognized until they become unconditional, that is when the conditions on which they depend are substantially met. Contributions of assets other than cash are recorded at their estimated fair value. Pledges of contributions to be received after one year are discounted at a risk-free rate. The discount rates range from 1.09% to 5.65%. Amortization of discount is recorded as additional contribution revenue in accordance with donor-imposed restrictions, if any, on the contributions.

One donor contributed $25,021,658 during the year ended June 30, 2006.

(b) Investments

All investments, including short-term investments, investments in marketable securities, limited partnerships and hedge and offshore funds, are reported in the financial statements at fair value, based upon values provided by external investment managers, general partners or quoted market value. The Institute reviews and evaluates the values provided by external investment managers and general partners and agrees with the valuation methods and assumptions used in determining the fair value of funds. These estimated fair values may differ significantly from the values that would have been used had a ready market for these securities existed.

The statement of activities recognizes unrealized gains and losses on investments as increases and decreases, respectively, in unrestricted net assets unless their use is temporarily or permanently restricted by explicit donor stipulation. Purchase and sale transactions are recorded on a settlement-date basis. Gains and losses on the sale of investment securities are calculated using the specific identification method.

The Institute regularly offers first mortgages on primary residences to full-time faculty and senior administrative employees who have met certain requirements stipulated by the board of trustees.

(c) Plant Assets and Depreciation

Proceeds from the sale of plant assets, if unrestricted, are transferred to operating funds, or, if restricted, to amounts temporarily restricted for plant acquisitions. Depreciation is provided over the estimated useful lives of the respective assets on a straight-line basis (buildings and capital improvements 20-40 years, equipment 3-6 years).

(d) Refundable Advances

Conditional amounts are recorded initially as deferred restricted revenue, and are reported as revenues when expended in accordance with the terms of the condition.

(e) Split Interest Agreements

The Institute is the beneficiary of various unitrusts and pooled income funds. The Institute's interest in these split interest agreements is reported as a contribution in the year received and is calculated as the difference between the fair value of the assets contributed to the Institute, and the estimated liability to the beneficiary. This liability is computed using actuarially determined rates and is adjusted annually. The assets held by the Institute under these arrangements are recorded at fair value as determined by quoted market price and are included as a component of investments.

(f) Unamortized Debt Issuance Costs

Debt issuance costs represent costs incurred in connection with debt financing. Amortization of these costs is provided on the effective interest method extending over the remaining term of the applicable indebtedness. Deferred financing costs at June 30, 2006 and 2005, were net of accumulated amortization of $433,985 and $386,195, respectively.

(g) Asset Retirements

The Institute recognizes the fair value of a liability for legal obligations associated with asset retirements in the period in which the obligation is incurred, in accordance with Financial Accounting Standards Board (FASB) No. 143, *Asset Retirement Obligations* and FASB Interpretation (FIN) 47 *Accounting for Conditional Asset Retirement Obligations*, if a reasonable estimate of the fair value of the obligation can be made. When the liability is initially recorded, the Institute capitalizes the cost of the asset retirement obligation by increasing the carrying amount of the related long-lived asset. The liability is accreted to its present value each period, and the capitalized cost associated with the retirement obligation is depreciated over the useful life of the related asset. Upon settlement of the obligation, any difference between the cost to settle the asset retirement obligation and the liability recorded is recognized as a gain or loss in the statement of activities.

(h) Fund Raising Expenses

Fund raising expenses incurred by the Institute amounted to $1,118,484 for the year ended June 30, 2006. This amount is included in administration and general expenses in the accompanying statement of activities.

(i) 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 statement of activities. Accordingly, certain operating costs have been allocated among the functional categories.

(j) Prior Year Summarized Financial Information

The financial statements include certain prior year summarized comparative information in total but not by net asset class. Such information does not include sufficient detail to constitute a presentation in conformity with U.S. generally accepted accounting principles. Accordingly, such information should be read in conjunction with the Institute's financial statements for the year ended June 30, 2005, from which the summarized information was derived.

(k) Tax Status

The Institute is exempt from federal income taxes pursuant to Section 501(c)(3) of the Internal Revenue Code and is listed in the Internal Revenue Service Publication 78.

At June 30, 2006 and 2005, the Institute has prior year and current year carryforward losses resulting in a deferred tax asset of approximately $275,000 and $225,000, respectively. The carryforward losses are generated by investments in partnership interests held by the Institute.

The Institute, however, believes that it is more likely than not that its deferred tax asset will not be realized; accordingly a full valuation allowance was provided at June 30, 2006 and 2005 against the deferred tax asset associated with the loss carry forward.

(l) Use of Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements. Estimates also affect the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

(2) Contributions Receivable

Unconditional promises to give at June 30, 2006 and 2005 were as follows:

	2006	2005
Unconditional promises to give:		
Less than one year	$ 220,342	$ 342,000
One to five years	503,658	82,000
	724,000	424,000
Discount on promises to give	(65,687)	(8,417)
Total	$ 658,313	$ 415,583

(3) Investments and Funds Held by Trustee

Investments

Endowment and similar funds investments at June 30, 2006 and 2005 are comprised of the following:

	2006	2005
Limited partnerships	$ 74,075,116	$ 92,689,761
Hedge and offshore funds	441,041,075	347,487,378
Debt securities	68,365,353	62,591,567
Mortgages from faculty and staff	6,263,278	4,310,750
	589,744,822	507,079,456
Funds invested separately:		
Charitable remainder and pooled income funds:		
Cash and cash equivalents	220,062	121,136
Fixed income securities	4,029,950	1,251,338
Stocks	125,975	2,277,753
Real estate	36,188	–
	4,412,175	3,650,227
Total	$ 594,156,997	$ 510,729,683

The Institute's interests in limited partnerships and offshore funds represent 12% and 74%, respectively, 86% collectively of total investments held by the Institute at June 30, 2006 and 18% and 68%, respectively, 86% collectively of total investments held by the Institute at June 30, 2005. These instruments may contain elements of both credit and market risk. Such risks include, but are not limited to, limited liquidity, absence of regulatory oversight, dependence upon key individuals, emphasis on speculative investments (both derivatives and nonmarketable investments) and nondisclosure of portfolio composition.

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.

The following tables summarize the investment return and its classification in the statement of activities for the years ended June 30, 2006 and 2005:

	2006		
	UNRESTRICTED	TEMPORARILY RESTRICTED	TOTAL
Dividends and interest	$ 3,461,857	$ 1,831,584	$ 5,293,441
Realized gain	$ 18,528,752	$ 9,567,193	$ 28,095,945
Unrealized gain	29,150,693	14,582,390	43,733,083
Net appreciation in fair value of investments	$ 47,679,445	$ 24,149,583	$ 71,829,028

	2005		
	UNRESTRICTED	TEMPORARILY RESTRICTED	TOTAL
Dividends and interest	$ 91,151	$ (24,698)	$ 66,453
Realized gain	$ 12,325,803	$ 6,664,543	$ 18,990,346
Unrealized gain	27,784,177	14,473,059	42,257,236
Net appreciation in fair value of investments	$ 40,109,980	$ 21,137,602	$ 61,247,582

Funds Held by Trustee

Funds held by trustee represent the balance of the proceeds from the 1997 and 2001 NJEFA bonds that have not yet been expended for construction purposes. These funds are being held in trust by The Bank of New York. Such funds are invested in U.S. Government obligations with maturities of less than one year. At June 30, 2006 and 2005, the market value of such securities approximates their carrying value.

(4) Physical Plant

Physical plant and equipment are stated at cost at date of acquisition, less accumulated depreciation. Library books, other than rare books, are not capitalized.

A summary of plant assets at June 30, 2006 and 2005 follows:

	2006	2005
Land	$ 377,470	$ 377,470
Land improvements	1,036,505	975,274
Buildings and improvements	74,559,121	72,605,423
Equipment	21,382,200	20,608,920
Rare book collection	203,508	203,508
Joint ownership property	2,375,832	1,857,530
	99,934,636	96,250,655
Less accumulated depreciation	(50,026,031)	(46,630,472)
Net book value	$ 49,908,605	$ 49,620,183

(5) Long-Term Debt

A summary of long-term debt at June 30, 2006 and 2005 follows:

	2006	2005
1997 Series F & G - NJEFA	$ 34,205,000	$ 35,650,000
2001 Series A - NJEFA	10,170,000	10,390,000
Less unamortized bond discount	(398,317)	(433,163)
Total long-term debt	$ 43,976,683	$ 45,606,837

Interest expense on long-term debt for the years ended June 30, 2006 and 2005 was $2,353,298 and $2,437,725, respectively.

In November 1997, the Institute received proceeds of the New Jersey Educational Facilities Authority (the Authority) offering of $16,310,000 Revenue Bonds, 1997 Series F and $26,565,000 Revenue Bonds, 1997 Series G of the Institute for Advanced Study Issue. A portion of the proceeds ($16,969,355) was used to retire the existing Revenue Bonds, 1991 Series. The remainder of the proceeds was used for renovations of members housing. In May 2001, the Institute received proceeds of the New Jersey Educational Facilities 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.

The bonds bear interest at rates ranging from 4% to 5%, payable semi-annually, are subject to redemption at various prices and require principal payments and sinking fund installments through July 1, 2031. 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 bonds are repayable as follows at June 30, 2006:

	Amount
Year ending June 30:	
2007	$ 1,765,000
2008	1,825,000
2009	1,915,000
2010	2,005,000
2011	2,110,000
2012 through 2032	34,775,000
Total	$ 44,375,000

(6) 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, 2006 and 2005 totaled approximately $1,639,000 and $1,613,000, 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 sets forth the funded status at June 30, 2006 and 2005:

	2006	2005
Accumulated postretirement benefit obligation:		
Retirees	$ 6,717,564	$ 6,786,758
Fully eligible active plan participants	2,833,863	3,274,954
Other active plan participants	4,368,331	5,111,243
Accumulated postretirement benefit obligation	$ 13,919,758	$ 15,172,955
Change in accumulated benefit obligation:		
Benefit obligation at beginning of year	$ 15,172,955	$ 9,719,668
Service cost	509,395	384,866
Interest cost	782,084	595,004
Actuarial (gain) loss	(2,544,676)	4,473,417
Benefit obligation at end of year	$ 13,919,758	$ 15,172,955
Components of net periodic benefit cost:		
Service cost	$ 509,395	$ 384,866
Interest cost	782,084	595,004
Amortization of transition obligation	(2,544,676)	4,473,417
Net periodic postretirement benefit cost	$ (1,253,197)	$ 5,453,287

	2006	2005
Benefit obligation weighted average assumptions at June 30, 2006 and 2005:		
Discount rate	6.25%	5.25%
Periodic benefit cost weighted average assumptions for the years ended June 30, 2006 and 2005:		
Discount rate	5.25	6.25

At June 30, 2006 and 2005, a 10% trend rate was used for health care costs, with the rate decreasing ratably until the year 2013, and then remaining constant at 5.0% thereafter.

The effects of a 1% increase or decrease in trend rates on total service and interest cost and the postretirement benefit obligation are as follows:

	2006		2005	
	Increase	Decrease	Increase	Decrease
Effect on total service and interest cost	$ 234,394	$ (185,806)	$ 281,222	$ (216,878)
Effect on the postretirement benefit obligation	1,949,242	(1,602,058)	2,390,246	(1,925,854)

Projected payments for each of the next five fiscal years and thereafter are as follows:

	Amount
Year ending June 30:	
2007	$ 608,700
2008	649,400
2009	717,700
2010	767,600
2011	818,900
2012 through 2016	4,615,100

(7) Temporarily and Permanently Restricted Assets

Restricted net assets are available for the following purposes at June 30, 2006 and 2005:

	2006	2005
Temporarily restricted net assets are restricted to:		
School of Mathematics	$ 34,916,191	$ 30,293,543
School of Natural Sciences	10,299,733	8,962,241
School of Historical Studies	30,882,507	26,535,037
School of Social Science	56,922,851	50,863,627
Libraries and other academic	3,308,439	2,680,198
Administration and general	5,659,097	5,023,754
	$ 141,988,818	$ 124,358,400
Permanently restricted net assets are restricted to:		
Investments to be held in perpetuity, the income from which is expendable to support academic services	$ 56,472,991	$ 48,023,343

(8) Disclosures About Fair Value of Financial Instruments

The Institute is required by SFAS No. 107, *Disclosure About Fair Value of Financial Instruments*, to disclose the estimated fair value of financial instruments, both assets and liabilities recognized and not recognized in the statement of financial position, for which it is practicable to estimate fair value.

The estimated fair value amounts in the following disclosure have been determined by the Institute using available market information and appropriate valuation methodologies. The estimates are not necessarily indicative of the amounts the Institute could realize in a current market exchange, and the use of different market assumptions or methodologies could have a material effect on the estimated fair value amounts at June 30, 2006 and 2005.

	2006 Estimated fair value	2005 Estimated fair value
Assets:		
Cash	$ 1,124,277	$ 1,670,531
Government grants and contracts receivable	3,890,527	2,325,625
Funds held by trustee	2,816,324	2,772,121
Beneficial interest in remainder trust	3,350,451	–
Investments	594,156,997	510,729,683
Liabilities:		
Note payable	745,018	805,005
Long-term debt	46,798,669	45,606,837

The fair value estimates presented are based on information available to the Institute as of June 30, 2006 and 2005, and have not been revalued since that date. While the Institute is not aware of any significant factors that would affect the estimates since that date, current estimates of fair value could differ significantly from the amounts disclosed.

(9) Allocation of Postretirement Benefits Expense

Postretirement benefits expense is allocated for the following purposes for the years ended June 30, 2006 and 2005:

	2006	2005
Postretirement benefits expense:		
School of Mathematics	$ (249,379)	$ 1,100,083
School of Natural Sciences	(231,910)	1,055,103
School of Historical Studies	(198,164)	791,972
School of Social Science	(106,663)	462,374
Libraries and other academic	(97,570)	439,508
Administration and general	(356,375)	1,440,470
Auxiliary activity - tenants' housing expenses - net of unrestricted revenue	(13,136)	163,777
	$ (1,253,197)	$ 5,453,287

(10) Cumulative Effect of Change in Accounting Principle

In March 2005, the FASB issued FIN 47. This interpretation clarifies that an entity is required to recognize a liability for the fair value of a conditional asset retirement obligation if the fair value of the liability can be reasonably estimated. Uncertainty about the timing and (or) method of settlement of a conditional asset retirement obligation should be factored into the measurement of the liability when sufficient information exists. The types of asset retirement obligations that are covered by FIN 47 are those for which an entity has a legal obligation to perform an asset retirement activity, however, the timing and (or) method of settling the obligation are conditional on a future event that may or may not be within the control of the Institute. SFAS 143 requires the fair value of a liability for a legal obligation associated with an asset retirement be recorded in the period in which the obligation is incurred. When the liability is initially recorded, the cost of the asset retirement obligation is capitalized.

The Institute adopted FIN 47 effective July 1, 2005 and recorded a liability of $789,073, of which $767,023 was recorded as a cumulative effect of a change in accounting principle. Substantially all of the impact of adopting FIN 47, as described above, relates to estimated costs to remove asbestos that is estimated to be contained within the Institute's facilities.

(11) Subsequent Event

On July 13, 2006, the New Jersey Educational Facilities Authority issued Revenue Refunding Bonds, 2006 Series B, on behalf of the Institute in the aggregate amount of $29,600,000. The 2006 Series B Bonds were issued to finance the advance refunding of the outstanding 1997 Series G Bonds maturing on July 1 in each of the years 2007, 2008 and 2012 through 2028 inclusive, to finance the advance refunding of the outstanding 2001 Series A Bonds maturing on July 1 in each of the years 2007, 2008 and 2019 through 2031 inclusive, and to pay a portion of certain costs incidental to the sale and issuance of the 2006 Series B Bonds.

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SCHEDULE 1
SCHEDULE OF OPERATING REVENUES, EXPENSES AND OTHER REVENUES
YEAR ENDED JUNE 30, 2006

	Unrestricted	Temporarily restricted	Permanently restricted	Total
Operating revenues, gains and other support:				
Private contributions and grants	$ —	$ 4,413,300	—	$ 4,413,300
Government grants	—	6,057,455	—	6,057,455
Endowment spending policy	19,853,950	8,682,950	—	28,536,900
Net assets released from restrictions – satisfaction of program restrictions	19,153,705	(19,153,705)	—	—
Total operating revenues, gains and other support	39,007,655	—	—	39,007,655
Expenses:				
School of Mathematics	7,944,715	—	—	7,944,715
School of Natural Sciences	8,640,813	—	—	8,640,813
School of Historical Studies	5,553,598	—	—	5,553,598
School of Social Science	3,207,709	—	—	3,207,709
Libraries and other academic	5,879,660	—	—	5,879,660
Administration and general	9,039,574	—	—	9,039,574
Postretirement benefits	(1,253,197)	—	—	(1,253,197)
Auxiliary activity – tenants' housing expenses, net of unrestricted revenue	532,689	—	—	532,689
Total expenses	39,545,561	—	—	39,545,561
Change in net assets from operations, including depreciation	(537,906)	—	—	(537,906)
Other revenues, gains and other support:				
Private contributions and grants to endowment	33,250,551	332,201	$ 8,449,648	42,032,400
Net endowment surplus	31,287,352	17,298,217	—	48,585,569
Gain on sale of plant assets	443,949	—	—	443,949
Changes in net assets before cumulative effect of change in accounting principle	64,443,946	17,630,418	8,449,648	90,524,012
Cumulative effect of change in accounting principle	(767,023)	—	—	(767,023)
Change in net assets	63,676,923	17,630,418	8,449,648	89,756,989
Net assets – beginning of year	322,072,455	124,358,400	48,023,343	494,454,198
Net assets – end of year	$ 385,749,378	$ 141,988,818	$ 56,472,991	$584,211,187

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