INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

2003 – 2004

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Extract from the letter addressed by the Institute's Founders, Louis Bamberger and Mrs. Felix 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, Mrs. Felix 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 over seventy 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 and distractions of working life at a contemporary 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 small and distinguished permanent Faculty, well-established 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 the departmental and disciplinary barriers found in universities.

Each year the Institute awards fellowships to some 190 visiting Members from about 100 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. More than a dozen Nobel laureates, and many more winners of the Wolf or MacArthur prizes, have been Institute Faculty or Members. Thirty-two out of forty-four Fields Medalists have been Institute Faculty or Members.

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.

DAVID GRAHAM

"It seemed to me that the time was ripe for the creation in America of an institute in the field of general scholarship and science ... not a graduate school, training men in the known and to some extent in methods of research, but an institute where everyone — faculty and members — took for granted what was known and published, and in their individual ways endeavored to advance the frontiers of knowledge."

— Abraham Flexner, Founding Director (1930–39) of the Institute, Memorandum to the Board of Trustees of the Institute for Advanced Study, September 26, 1931

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DAVID GRAHAM

"I regard my career at the Institute as simply the best experience I have had during my professional career ... I have never before been associated with such an impressive group of scholars."

— Member, School of Social Science

Afternoon tea in the Common Room, Fuld Hall

What a pleasure it was to have George F. Kennan make a surprise visit to the Institute for Advanced Study's celebration of his 100th birthday in February of this year. He commented to his gathered family, colleagues, and friends, "The Institute for Advanced Study is unique for the general distinction of its visiting scholars and faculty and for its single-minded devotion to the highest standards of scholarship… I can find no adequate words in which to acknowledge the debt I owe to the Institute."

The celebration of Professor Kennan's legendary diplomatic career as well as his scholarly contributions as a member of the Institute's School of Historical Studies, first as a visiting Member in 1950 and since then as Professor and Professor Emeritus, was organized by José Cutileiro and Jack F. Matlock, Jr., who have each served as George F. Kennan Professors at the Institute for Advanced Study. Distinguished guest speakers with direct experience of the practice and formulation of foreign policy discussed the significance of Professor Kennan's role in United States diplomatic relations, with particular reference to Germany and the Soviet Union. They were Dr. Alexander Bessmertnykh, the last Foreign Minister of the former Soviet Union; The Honorable Lawrence Eagleburger, former Secretary of State; Dr. Karl Kaiser, the Otto Wolff Director Emeritus of the Research Institute of the German Council on Foreign Relations; and The Honorable Strobe Talbott, former Deputy Secretary of State and current President of The Brookings Institution. It was a special privilege to have Annelise Kennan and many Kennan family members with us.

This year was also a time to celebrate the directorship of Phillip A. Griffiths. Phillip was a leader of enormous wisdom, understatement, vision, and humor. His extraordinary instincts, his uncanny ability to see changes on the horizon, and his selection of the important from the trivial defined his directorship. He combined an exemplary respect for the Institute for Advanced Study with a constant pursuit of change when needed. We rejoiced with our ship's captain, Phillip, and his co-captain, Marian, at the fall meeting of our Board of Trustees. Phillip is now engaged in the Institute's activities as a Professor in the School of Mathematics. As Chairman of the Science Initiative Group, Phillip represents the scientific community in the Millennium Science Initiative. The goal of the MSI, a partnership between the World Bank and the world's scientists, is to strengthen the science and technology capacity of developing nations. We shall be forever grateful to Phillip for his leadership.

Eighth Director of the Institute for Advanced Study

On January 1, 2004, the Institute was most fortunate to welcome the eighth Director of the Institute, Peter Goddard, and his wife Helen. A mathematical physicist, Peter had previously been Master of St. John's College at the University of Cambridge, where he also served as a Professor of Theoretical Physics in the Department of Applied Mathematics and Theoretical Physics.

Peter's research in the areas of string theory and conformal field theory was honored in 1997, when he was a winner, with David Olive, of the Dirac Prize and Medal of the International Centre for Theoretical Physics, which cited "their farsighted and highly influential contributions to theoretical physics, over an extended period. Goddard and Olive

have contributed many crucial insights that shaped our emerging understanding of string theory and have also had a far-reaching impact on our understanding of four-dimensional field theory."

During the course of his career, Peter has also developed extensive skills as an administrator. He played a key role in the creation and establishment of the Isaac Newton Institute for Mathematical Sciences, which opened in July 1992 after four years of careful preparation, and he served as its first Deputy Director from 1991-94. The Newton Institute runs research programs on selected themes in mathematics and the mathematical sciences, with applications in a very wide range of science and technology.

Following his role as Deputy Director of the Newton Institute, Peter led the planning and fundraising for the Centre for Mathematical Sciences at Cambridge. This complex of seven new buildings re-housed the departments of mathematics and theoretical physics alongside the Newton Institute on a seven-acre campus. Together they constitute one of the world's largest centers for research and teaching in the mathematical sciences.

Peter was educated at Emanuel School, London, and the University of Cambridge, where he studied mathematics and theoretical physics, and from which he received his B.A. degree, with First Class Honours, in 1966. After graduate work in mathematics and theoretical physics, he began research in theoretical elementary particle physics under the supervision of John Polkinghorne in 1967, and received his M.A. and Ph.D. degrees in 1971. He received a Sc.D. degree from Cambridge in 1996.

From 1969-73, Peter was a Research Fellow at Trinity College, Cambridge, with a leave of absence from 1970-72, when he held a position as a Visiting Scientist at CERN, Geneva, where he began working with others on what became string theory, an attempt to formulate a unified theory of nature. This has been a central theme of Peter's subsequent work.

From 1972-74, he was a Lecturer in Applied Mathematics at the University of Durham. In 1975, Peter became University Assistant Lecturer in the Department of Applied Mathematics and Theoretical Physics at the University of Cambridge, and a Fellow and Lecturer in Mathematics of St. John's College, Cambridge. In 1976, he began work with David Olive and others on magnetic monopoles and extended objects in field theories, and this has been another theme of his research. In 1980, they also began to try to elucidate the roles played by infinite dimensional algebras in theoretical physics, particularly string theory.

Peter served as a Tutor of St. John's College from 1980-87 and as Senior Tutor (responsible for the educational work of the College) from 1983-87. In 1989, his contributions to theoretical physics were recognized by his election as a Fellow of the Royal Society and his appointment as Reader in Mathematical Physics in the University of Cambridge, where a Professorship in Theoretical Physics was established for him in 1992.

In 1994, he became Master of St. John's College. In addition to his research, teaching, and administrative responsibilities, he took a lead in developing projects that encourage the aspirations and accomplishments of school students in educationally deprived areas. He also served as Chairman of the University of Cambridge Local Examination Syndi-

cate, which is responsible for school and other examinations both in the United Kingdom and in many other countries, and as Chairman of the Governing Body of Hills Road Sixth Form College, one of the leading sixth form colleges in the UK.

Twice a Member at the Institute for Advanced Study – in the School of Natural Sciences in 1974 and in the School of Mathematics in 1988 – Peter has also held visiting positions at Lawrence Berkeley Laboratory, Berkeley, California; CERN, Geneva; the University of Virginia; the Institute for Theoretical Physics, University of California, Santa Barbara; the Tata Institute of Fundamental Research, Bombay; Imperial College, London; and the Institut des Hautes Études Scientifiques, Bures-sur-Yvette, France.

In addition to being a Fellow of the Royal Society of London, Peter served as President of the London Mathematical Society, and a Fellow of both the Institute of Physics and the Royal Society of Arts. He has been a Senior Fellow, Isaac Newton Institute for Mathematical Sciences, University of Cambridge, since 1994, and an Honorary Fellow of Trinity College, Dublin, since 1995. In 2002, he was named a Commander of the Order of the British Empire for his contributions to theoretical physics.

Peter is the author of approximately 100 published papers. He served as editor of the publications of the Newton Institute, Cambridge University Press, from 1992-94, and continues to serve as editor of the *Cambridge Lecture Notes in Physics*, Cambridge University Press. He has also served as a member of the editorial boards of *Mathematical Proceedings of the Cambridge Philosophical Society; Nuclear Physics B; Physica D Nonlinear Phenomena; Journal of Physics; Proceedings of the Royal Society;* and *Nonlinearity*.

It is a great privilege to welcome Peter Goddard to the Institute and to express the enthusiasm of the Board of Trustees and Faculty on his appointment.

Trustees

There were also transitions in the Board of Trustees. Our immense gratitude is expressed to Michel Vaillaud, who served as Trustee of the Institute from 1984 until his election as Trustee Emeritus in May 2004, to Edward J. Nicoll, and to Gavin Wright, Academic Trustee for the School of Social Science. Their terms on the Board were completed in 2004, and we are most grateful for their strong support of the Institute as Trustees.

Trustee Emeritus Charles L. Brown passed away on November 11, 2003. When Charlie joined the Board of Trustees of the Institute in 1979, he was Chairman of AT&T and while in this position presided over the largest corporate reorganization in history. Charlie served the Institute as President of the Corporation and chaired the search committee that recommended Phillip Griffiths as Director. In May, the Institute for Advanced Study joined with his wife Ann Lee in affectionately and with great esteem paying tribute to Charlie, who informed our purpose with steady dignity and for whose valued counsel and leadership we shall be forever grateful.

New Trustees elected on May 8, 2004, were Jeffrey P. Bezos, Professor Peter L. Galison, Sir Martin Rees, and Peter Svennilson.

Jeffrey P. Bezos is Chairman of the Board, President, and Chief Executive Officer of Amazon.com, Inc., which he founded in 1995. A *summa cum laude,* Phi Beta Kappa graduate of Princeton University in electrical engineering and computer science, Jeff initially worked at the intersection of computer science and finance. He led the development of computer systems that helped manage assets for Bankers Trust Company. He also helped build one of the most technically sophisticated quantitative hedge funds on Wall Street for D. E. Shaw & Co. In 1995, Jeff created Amazon.com, Inc., an Internet retailer of books, music, and other information-based products. His revolutionary business model leveraged the Internet's unique ability to deliver huge amounts of information rapidly and efficiently.

Peter L. Galison, a Member at the Institute for Advanced Study in 1994-95, was elected to be the Academic Trustee for the School for Social Science. Peter is the Mallinckrodt Professor of the History of Science and of Physics at Harvard University. In 1997, he was a John D. and Catherine T. MacArthur Foundation Fellow. He was a winner of the 1999 Max Planck Prize given by the Max Planck Gesellschaft and Humboldt Stiftung. Peter Galison's main work explores the complex interaction between the three principal subcultures of twentieth century physics – experimentation, instrumentation, and theory. In addition, he pursues the powerful cross-currents between physics and other fields. He is the author of *How Experiments End* (1987), *Image and Logic: A Material Culture of Microphysics* (1997), and *Einstein's Clocks, Poincare's Maps* (2003).

We are also delighted to welcome the return of Sir Martin Rees, who served as Academic Trustee for the School of Natural Sciences from 1998-2003. Martin is Professor of Cosmology and Astrophysics and Master of Trinity College at the University of Cambridge. He holds the honorary title of Astronomer Royal and also Visiting Professor at Imperial College London and at Leicester University. After studying at the University of Cambridge, he held post-doctoral positions in the United Kingdom and the United States before becoming a professor at Sussex University. In 1973, he became a fellow of King's College and Plumian Professor of Astronomy and Experimental Philosophy at Cambridge (continuing in the latter post until 1991) and served for ten years as director of Cambridge's Institute of Astronomy. From 1992 to 2003 he was a Royal Society Research Professor.

Peter Svennilson is the founder and CEO of Three Crowns Capital, a Bermuda-based company that focuses on helping to start and develop biotech companies. He has been involved in starting, developing or financing such biotechnology companies as Tularik, Rosetta, Inpharmatics, Sunesis Pharmaceuticals, PTC Therapeutics, SomaLogic, Chemo-Centryx and Cumbe. Peter received his Masters in Business Administration from the Stockholm School of Economics, followed by postgraduate study at INSEAD in Fontainebleau. He divides his time between Sweden, the United Kingdom, and Bermuda.

I would like to pay a special tribute to the Vice Chairs of the Board, Martin L. Leibowitz and Richard B. Black, and our President, Charles Simonyi. In addition to all else they do, Charles chairs the Academic Affairs Committee and Rick chairs the Buildings and Grounds Committee. It was the fine work of the Search Committee chaired by Marty that led us to our new Director. I am also grateful to others who chair committees of the Board: Brian Wruble, Budget Committee; Nancy MacMillan, Development Committee; James Simons, Finance Committee; and Peter Kann, Nominating Committee.

At a recent meeting, Vartan Gregorian said that the Institute for Advanced Study is one of the most humbling of institutions. The Institute, truly the university to universities, transcends geography, national boundaries, and disciplines. It embodies the open academic society to which the world aspires. The Institute for Advanced Study remains the only center for advanced study with a permanent Faculty as well as visiting Members across the sciences and humanities. The Faculty, working in concert with the Director, have foreseen early and critical changes and directions in fields, have insisted on a constancy of quality, and have responded when theoretical research has come to play a new and important role in particular fields. This is indicated by our initiatives in biology, computer science, economics, and East Asian Studies. The Institute is clearly functioning at the leading edge in the newer areas as well as maintaining its commitment to the classical fields in which the Institute has such a well-established presence. This report affirms the intellectual vitality of the Institute and its continuing commitment to the advancement of scholarship and fundamental research.

I want to express my great appreciation to all who have been so generous with their time during our year of transition. In 2005, the Institute will celebrate 75 years since its founding, during which time scholars and scientists have come to the Institute to investigate questions about which little is known and the way to discovery largely uncharted. This scholarship entails great risk and commitment but can lead to knowledge that transforms the understanding of our world. The Institute for Advanced Study is critically important, and it is my privilege to serve this institution.

To all who contribute in so many ways – Trustees, Faculty, current and past Members, Friends, and the Director and his staff – I offer my deepest gratitude. We have challenges ahead as well as successes achieved, and with your help I know we can maintain our past and current levels of excellence.

James D. Wolfensohn
Chairman

REPORT OF THE DIRECTOR 2003-04

Before I took up the post of Director in January 2004, I had spent two terms at the Institute, in the fall of 1974 and the spring of 1988. Each time the length of my stay had been constrained by duties in the University of Cambridge. Returning to the Institute I was struck by how little and how much had changed. The Institute remains true to the mission set by its founders of the disinterested pursuit of knowledge, the cultivation of excellence in research and the selection of those who work here on the basis of ability alone. Unlike many academic institutions, its ethos and culture have not changed in the last thirty years.

On the other hand, some notable changes have occurred, particularly since my second visit. The Institute has been strengthened significantly by the addition of new areas of research within each of the four Schools and by additions and improvements to the Institute's buildings. To a great extent these developments reflect the achievements of my predecessor, Phillip Griffiths. Phillip leaves the Institute in the best of health, harmonious and in excellent spirits. It is very well placed to face the challenges that inevitably will lie ahead.

From my initial visits to the Institute last year to prepare for becoming Director, I have been very impressed by the dedication of everyone in the Institute community to the ideals of the Institute. The work of the Institute is strongly supported by a remarkably distinguished Board of Trustees who give freely of their time and expertise. The staff do everything they can to ensure that the Faculty and Members can pursue their research as effectively as possible. And a wider community of friends is actively involved in the intellectual life of the Institute and provides it with strong support.

The opportunities that the Institute provided to me at two crucial stages of my career, it continues to provide both to young postdoctoral scholars and to established senior scholars from a broad range of fields of study across the sciences and the humanities. Above all, the freedom that the Institute provides to pursue fundamental problems, to develop new lines of research, has a major impact on the work of the Members, and those with whom they will interact, for many years beyond their visits here.

The importance of lunch in the Dining Hall is one of the features of Institute life that continues unchanged, except perhaps that the food seems even better. The members of each School still tend to congregate together at separate tables; the physicists still sit at the same table as thirty years ago, for example. I take it to be one of the pleasant duties of the Director to get to know the Members and what they are doing and I have found that a good way to do this is as a privileged interloper at lunch. The vitality of each of the four Schools is evident in the conversation. The work of the Schools is reviewed in some detail later in this Annual Report, and here I shall just mention some of the highlights and special events, but first it is my pleasure to record two new appointments to the Faculty, both in the School of Natural Sciences: Peter Goldreich and Arnold J. Levine.

Adding to our long-standing strength in Astrophysics, Peter Goldreich comes to us from the California Institute of Technology, where he is now the Lee A. DuBridge Professor of Astrophysics and Planetary Physics Emeritus. He has made major contributions over a wide range of astrophysics and planetary science, including the evolution of the rotation

of the planets and their moons, planetary rings, helioseismology and neutron stars. His contributions brought recognition at the highest levels from early in his career. He became a member of the National Academy of Sciences (U.S.A.) at age 33 and was the American Astronomical Society's Henry Norris Russell Lecturer at age 40. Among other major awards, he has received the National Medal of Science and this year he was elected a Foreign Member of the Royal Society. Peter received both his B.S. in engineering physics and his Ph.D. in physics from Cornell University. He was a Postdoctoral Fellow at Cambridge University before joining the faculty of the University of California at Los Angeles and then the faculty at the California Institute of Technology. Throughout his career, Peter has mentored many outstanding younger scientists in astronomy and planetary science and his presence here has already made a significant difference to Members at the Institute where he was a Visiting Professor in 2002-03.

Arnold Levine's appointment as the first biologist on the permanent Faculty is a milestone in the Institute's history. Arnie has had a profound impact on the biomedical sciences, both through the achievements of his research and through his leadership. Now, his vision, integrating the physical and biological sciences, is guiding the development of theoretical biology at the Institute. He has been a leader in cancer research for many years, and many of his students have had a major impact on this field. Arnie received his B.A. from Harpur College, State University of New York at Binghamton and his Ph.D. from the University of Pennsylvania. He was a postdoctoral fellow at the California Institute of Technology before coming to Princeton University as a professor in the biochemistry department. He was subsequently Professor and Chair of the Department of Microbiology at the State University of New York at Stony Brook, School of Medicine, before coming back to Princeton University to lead the Department of Molecular Biology. There, he was appointed President and Chief Executive Officer of Rockefeller University. He chaired the National Institutes of Health commission on AIDS research that planned a new direction for the field. For his achievements in science, Arnie has received nine honorary doctorates from universities within the United States and overseas, as well as significant prizes and awards. At the Institute, Arnie has established the Center for Systems Biology, whose research program encompasses genetics, genomics, molecular aspects of evolution, and aspects of cancer biology. Through the Center, the Institute aims to play a significant role in the continuing revolutionary developments in molecular biology.

In addition to Astrophysics and Theoretical Biology, work on the foundations of Quantum Theory, on Quantum Field Theory and on String Theory continues. String Theory was also the subject of the Prospects in Theoretical Physics program, which took place from July 19–30 in Bloomberg Hall. Professor Chiara Nappi of Princeton University had recruited an outstanding group of leading string theorists to lecture an energetic and enthusiastic group of advanced graduate students from the United States and abroad.

The theme for this year in the School of Social Science was Bioethics, and the activities in this area were led by Visiting Professor Carl Elliott from the University of Minnesota. Scholars from a range of disciplines came together to explore the moral issues raised by the development of new medical procedures and technologies.

This year, the special concentration in the School of Mathematics was Harmonic Analysis and Partial Differential Equations and the program of activity in this area was led by Jean Bourgain and Professor Carlos Kenig from the University of Chicago. Topics for the

School's special programs have to be selected well in advance but this one turned to be particularly timely and the work led to advances in a number of areas of the theory of nonlinear partial differential equations, which are described in greater detail in the report on the School's academic activities. Analysis and nonlinear partial differential equations was also the subject of the Program for Women in Mathematics organized in collaboration with the Department of Mathematics of Princeton University by Professors Karen Uhlenbeck of the University of Texas and Sun-Yung Alice Chang of Princeton University. About 70 undergraduates, graduate students and postdoctoral scholars engaged in a range of discussions and seminars from May 17-27.

Not all of the Institute's mathematical activity occurred on campus; the Park City Mathematics Institute, run under the direction of Herb Clemens and the auspices of the Institute, met this summer from July 11-31 in Park City, Utah. The theme of geometric combinatorics lent itself very well to activities which brought together the various components of the mathematical community in Park City: from fourth grade students, through undergraduates, graduate students and high school teachers to leaders in research. The research program was organized by Ezra Miller and Victor Reiner of the University of Minnesota, and Bernd Sturmfels of the University of California, Berkeley. When I visited for a week the excitement of mathematical enquiry and investigation was evident everywhere: in discussions over the lunch table or in the corridors late into the evening; in watching the fourth graders come to understand the point of precision of definition as they struggled over a number of sessions to identify the features that characterize a rectangle; in Bob MacPherson's beautiful, lucid and compelling lectures on calculating equivariant invariants, in which with mastery he cut through the technical details to expose the essential ideas. As one high school teacher commented, nowhere else could you find such a stimulating mix of mathematicians of all ages and stages interacting in this way.

The unique combination of breadth and depth in the work of the School of Historical Studies was illustrated for me by fascinating lunchtime talks I attended on subjects ranging from Byzantine theology to the significance for national identity of the opera in Vichy France. Such talks, accessible to the whole community, are only a part of a rich pattern of more focused series of seminars and meetings for discussion, which, to give one example, bring together scholars working on different aspects of medieval history from western Europe to Asia.

The reports that Members make on their stays as they leave provide eloquent testimony both to the important opportunities that the Institute provides and to their appreciation of the role of the Institute's staff in making this possible. All of this also comes across strongly when I talk to former members of the Institute when they return here or at the receptions organized by AMIAS (Association of Members of the Institute for Advanced Study) in other parts of the United States or abroad. Since January, receptions accompanied by talks by Institute Faculty or Members have been held in Pasadena, Berkeley, Seattle, Philadelphia and London. Topics have ranged from cryptography through the human genome to human dissection in ancient Greece.

The support provided by the Friends of the Institute, both moral and material, is also something that has grown over the last 25 years. And the Friends add to the cultural life of the Institute community by sponsoring talks and other events. There have been opportunities to hear José Serra, the former Minister of Health of Brazil, speak on the experi-

ence of his country in fighting AIDS and Henry Louis Gates, Jr. on "W.E.B. DuBois and the Encyclopedia Afrikana."

These activities arranged by the Friends are just one of the ways in which the variety of what is on offer at the Institute has grown markedly in recent years. Another is the program of concerts, talks and other musical events organized by our Artist-in-Residence, Jon Magnussen, this year entitled *Recent Pasts 20/21*. In April, Jon, together with baritone André Solomon-Glover, mezzo soprano Mary Nessinger, tenor Scott McCoy and boy soprano James Schure, presented excerpts from *The Folding Cliffs*, an opera-in-development by Jon with a libretto by Gavan Daws based on an epic poetic narrative by W.S. Merwin.

On our first visit here thirty years ago, my wife, Helen, and I found the Institute to be a place that welcomed and supported us and our, then ten-month old, daughter Linda. Now, on our return, we find the Institute even warmer in its welcome to the newcomer and even richer in the experiences it provides. We are enormously grateful to all the staff, Faculty, Members past and present, Trustees and Friends for all they have done to make us feel at home here again. We look forward with enthusiasm to the next year when we shall be celebrating with all of them the 75th anniversary of the founding of the Institute in 1930, its achievements over the years, and its continuing commitment to fundamental research and its cultural value.

Peter Goddard
Director

OFFICE OF THE DIRECTOR
RECORD OF EVENTS

The following is a calendar of events sponsored by the Office of the Director

Academic Year 2003-04

September 24
Member Family Barbecue

October 3
Institute Concert Series
"Sonatas, Interludes and (Cabaret) Songs"
Christian Wolff *For Prepared Piano;* John Cage *Sonatas and Interludes*; selected Cage vocal/piano works including *A Flower, The Wonderful Widow of Eighteen Springs, Nowth upon Nacht, She is Asleep,* and *Sonnekus*[2] (with Satie *Cabaret Songs*); Excerpt from *Roaratorio, An Irish Circus on "Finnegans Wake"*
JOAN LA BARBARA, *mezzo-soprano*
MARGARET LENG TAN, *piano*

Institute Concert Talk
Vocalist and composer JOAN LA BARBARA and pianist MARGARET LENG TAN join Institute Artist-in-Residence JON MAGNUSSEN to discuss the art of piano preparation, multiphonic production, and the connection between Satie's *Cabaret Songs* and John Cage

October 4
Institute Trip
Metropolitan Museum of Art

Institute Concert Series
"Three Voices in the Birch Garden"
Morton Feldman *Three Voices*; John Cage *Music for Three by One; Solos 49, 52* and *67* from *Song Books; Experiences, No. 2; Eight Whiskus* (composed for Joan La Barbara); Joan La Barbara *ShamanSong*
JOAN LA BARBARA, *vocalist/composer*

Recent Pasts 20/21 Lecture
"Experiments in Music around 1950 and some consequences and causes (social-political and musical)"
CHRISTIAN WOLFF, *composer*

October 7
Playreading
Waiting for Lefty by Clifford Odets

October 8
Institute Film Series
The Great Madcap (1949)

October 12
Friends Fireside Chat
"Verdict on Vichy: Power and Prejudice in the Vichy France Regime"
MICHAEL CURTIS, *Distinguished Professor Emeritus of Political Science, Rutgers, the State University of New Jersey*

October 13
AMIAS Movie Mondays
Citizen Kane (1941)

October 22
Friends Forum
"Fighting AIDS in Developing Countries: Brazil's Model of Success"
JOSÉ SERRA, *Director's Visitor*

October 28
Institute Film Series
Cabinet of Dr. Caligari (1921)

October 31
Children's Halloween Celebration

November 4
Playreading
Antigone by Jean Anouilh

November 5
Institute Film Series
The General (1927)

November 7
Culture and Cuisine Series
CAROLIN YOUNG, *Lecturer on Culinary History, Sotheby's*

November 10
AMIAS Movie Mondays
Casablanca (1942)

November 12
Friends Forum
"The Presence of Objects: Medieval Anti-Judaism in Modern Germany"
CAROLINE WALKER BYNUM, *Professor, School of Historical Studies*

November 15
AMIAS Harvest Moon Square Dance

November 19
Institute Concert Series
"An American Collection"
Joan Tower *Petroushskates;* Sebastian Currier *Verge;* George Perle *Sonata a Quattro;* Aaron Copland *Two Threnodies*; Derek Bermel *SchiZm;* Jennifer Higdon *Light Refracted*
MUSIC FROM COPLAND HOUSE, instrumental ensemble (Michael Boriskin and Paul Lustig Dunkel, Co-Directors)

Institute Concert Talk
The ensemble artists from MUSIC FROM COPLAND HOUSE join Institute Artist-in-Residence JON MAGNUSSEN to discuss the works from their concert program

November 21
Institute Concert Series
"An American Collection"
Joan Tower *Petroushskates;* Sebastian Currier *Verge;* George Perle *Sonata a Quattro;* Aaron Copland *Two Threnodies*; Derek Bermel *SchiZm;* Jennifer Higdon *Light Refracted*
MUSIC FROM COPLAND HOUSE, instrumental ensemble (Michael Boriskin and Paul Lustig Dunkel, Co-Directors)

Recent Pasts 20/21 Interview
"The Right Notes: GEORGE PERLE speaks with MICHAEL BORISKIN and JON MAGNUSSEN"

November 22
Institute Trip
American Museum of Natural History

November 23
Institute Concert Series
"An American Collection"
Joan Tower *Petroushskates;* Sebastian Currier *Verge;* George Perle *Sonata a Quattro;* Aaron Copland *Two Threnodies*; Derek Bermel *SchiZm;* Jennifer Higdon *Light Refracted*
MUSIC FROM COPLAND HOUSE instrumental ensemble (Michael Boriskin and Paul Lustig Dunkel, Co-Directors)

November 25
Institute Film Series
Battleship Potemkin (1925)

December 2
Playreading
An American Daughter by Wendy Wasserstein

December 5
Institute Film Series
Illustrious Energy (New Zealand, 1987)

December 8
AMIAS Movie Mondays
Meet Me in St. Louis (1945)

December 10
Institute Lecture
"A Tale of Two Universes"
PAUL STEINHARDT, *Keck Distinguished Visiting Professor, School of Natural Sciences*

December 11
Children's Holiday Celebration

December 17
Institute Film Series
Cluny Brown (1946)

January 6
Playreading
The Lion in Winter by James Goldman

January 8
Institute Welcome Reception for Helen and Peter Goddard

January 17
Institute Trip
The Barnes Foundation

January 21
Institute Lecture
"On the Nature of Proof"
ROBERT MacPHERSON, *Professor, School of Mathematics*

Institute Film Series
Letters From My Windmill (1954)

January 22
Friends of the Institute Welcome Reception for Helen and Peter Goddard

January 24
Institute Trip
The Barnes Foundation

February 3
Playreading
Abraham Lincoln by John Drinkwater

February 7
Midwinter Party

February 13
Institute Film Series
Happy Together (1997)

February 16
AMIAS Movie Mondays
The Day the Earth Stood Still (1951)

February 20
Institute Concert Series
"Special Event: *Photo Album with Music*"
Nuria Schoenberg Nono, daughter of Arnold Schoenberg, joins pianist/composer Stefan Litwin for a conversation about her father and his work, including projected images, unpublished anecdotes and original recordings of Schoenberg speaking; piano works by Schoenberg, Berg, Webern and Eisler.
NURIA SCHOENBERG NONO, *speaker*
STEFAN LITWIN, *piano and moderator-pedal-equipped piano*

Recent Pasts 20/21 Lecture
"Adorno in Darmstadt"
LYDIA GOEHR, *philosopher*

February 21
Institute Concert Series
"Arnold Schoenberg: Broadening the Circle"
J.S. Bach *Fugue in B minor*; Arnold Schoenberg *Three Piano Pieces*, op.11; Franz Liszt *Nuages Gris*; Alban Berg *Sonata, op. 1*; Wagner/Liszt *Isoldes Liebestod*; Erich Itor Kahn *Ciaccona dei tempi di guerra*; Stefan Litwin *Thoreau's Nightmare* (U.S. premiere); and the Eduard Steuermann piano arrangement of Schoenberg's Chamber Symphony, op.9.
STEFAN LITWIN, *piano and moderator-pedal-equipped piano*

February 22
Institute Concert Series
"Arnold Schoenberg: Broadening the Circle"
J.S. Bach *Fugue in B minor*; Arnold Schoenberg *Three Piano Pieces*, op.11; Franz Liszt *Nuages Gris*; Alban Berg *Sonata, op. 1*; Wagner/Liszt *Isoldes Liebestod*; Erich Itor Kahn *Ciaccona dei tempi di guerra*; Stefan Litwin *Thoreau's Nightmare* (U.S. premiere); and the Eduard Steuermann piano arrangement of Schoenberg's Chamber Symphony, op.9.
STEFAN LITWIN, *piano and moderator-pedal-equipped piano*

Institute Concert Talk
Pianist and composer STEFAN LITWIN joins Institute Artist-in-Residence JON MAGNUSSEN for a discussion about the works on the program

February 24
Institute Film Series
The Navigator (1988)

February 25
Institute Lecture
"American Medicine and the American Dream"
CARL ELLIOTT, *Visiting Associate Professor, School of Social Science*

March 2
Playreading
The Best Man by Gore Vidal

March 3
Friends Forum
"W.E.B. Du Bois and the Encyclopedia Africana"
HENRY LOUIS GATES, Jr., *Joint Visitor, Schools of Historical Studies and Social Science*

March 12
Institute Film Series
The Cherry Orchard (1999)

March 22
AMIAS Movie Mondays
Singin' in the Rain (1952)

March 24
Institute Film Series
Guimba the Tyrant (1995)

March 31
Institute Lecture
"The Indispensable Link: Reflecting on Euro-American Relations"
JOSÉ CUTILEIRO, *George F. Kennan Professor, School of Historical Studies*

April 6
Playreading
Pentacost by David Edgar

April 7
Friends Forum
"Metaphorical Concentration in Medicine"
RONALD A. CARSON, *The Harris L. Kempner Distinguished Professor* and *Director of the Institute for the Medical Humanities at the University of Texas Medical Branch*

April 10
Children's Easter Egg Hunt

April 12
AMIAS Movie Mondays
Roman Holiday (1953)

April 24
Institute Trip
Winterthur and Longwood Gardens

April 29
Institute Concert Series
"Wet Ink"
Jon Magnussen and friends present excerpts from *The Folding Cliffs*, an opera-in-development
Music by JON MAGNUSSEN, libretto by GAVAN DAWS

May 4
Playreading
A Walk in the Woods by Lee Blessing

May 16
Institute Trip
Philadelphia Museum of Art

May 17
AMIAS Movie Mondays
Vertigo (1958)

May 20
Institute Special Film Showing
IQ (1994)

DAVID GRAHAM

"The incomparable atmosphere provided by the Institute for Advanced Study has allowed me to finish my book, think carefully about many aspects of the work, and bring it to fruition. The peaceful, contemplative surroundings and the whole ethos of the Institute allowed me to reach deeper levels of thought than for many years."

— Member, School of Historical Studies

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"The Institute is without a doubt an excellent place for research and writing. I have felt well cared for and most of my academic needs have been met before I could even define them … the continued involvement of the faculty emeriti is a major asset to the Institute. Their presence at lunch, at seminars and throughout the Institute adds greatly to the level of conversation and the academic expertise available."

— Member, School of Historical Studies

Afternoon tea in the Common Room, Fuld Hall

THE SCHOOL OF HISTORICAL STUDIES

Faculty

GLEN W. BOWERSOCK
CAROLINE WALKER BYNUM
PATRICIA CRONE, *Andrew W. Mellon Professor*
JOSÉ CUTILEIRO, *George F. Kennan Professor*
NICOLA DI COSMO, *Luce Foundation Professor in East Asian Studies*
JONATHAN ISRAEL
KIRK VARNEDOE *(deceased 8-14-03)*
HEINRICH von STADEN

Professors Emeriti

MARSHALL CLAGETT
GILES CONSTABLE
OLEG GRABAR
CHRISTIAN HABICHT
GEORGE F. KENNAN
IRVING LAVIN
PETER PARET
MORTON WHITE

The School of Historical Studies is concerned principally with the history of Western European, Near Eastern, and East Asian civilizations. Both inside and outside these broad areas of study Faculty and Members have pursued a wide range of topics. The emphasis has been traditionally strong in the fields of Greek and Roman civilization, medieval, early modern and modern European history, and history of art, but over time the School's interests have been enlarged to include Islamic culture, the history of China and Japan, international relations, the history of science, ideas, and more recently, music studies. Well over one thousand Members 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 various fields represented by the School are a product of its own history. Two years after the opening of the School of Mathematics in 1933, a School of Economics and Politics and a School of Humanistic Studies were established. The first professor in Humanistic Studies, Benjamin Dean Meritt, a specialist in Greek epigraphy, was closely associated with excavations in the Athenian Agora. The second appointment to the Faculty of the School of Humanistic Studies was that of the German art historian Erwin Panofsky. Panofsky's work ranged across European art from the middle ages to motion pictures, but he was most closely associated with the development of the field of iconology.

Three additional appointments strengthened the field of classical and Near Eastern studies: Elias Avery Lowe, a Latin palaeographer; Ernst Herzfeld, a Near Eastern archaeolo-

gist; and Hetty Goldman, a pioneering archaeologist who worked at Tarsus in Turkey. Modern history was represented at the Institute from the outset with the appointment of the military and political historian Edward M. Earle. Earle was an original member of the School of Economics and Politics, which merged in 1949 with the School of Humanistic Studies to become the School of Historical Studies.

After World War II, classical studies were further augmented by the appointments of Homer A. Thompson in Greek archaeology, Harold F. Cherniss in Greek philosophy, and Andrew Alföldi in Roman history and numismatics. Medieval history came to the Institute Faculty with Ernst Kantorowicz, whose interests ranged in time from the later phases of classical antiquity to the sixteenth century. The art historical tradition was taken over from Panofsky by Millard Meiss, who completed his work on Burgundian manuscript painting during his years at the Institute.

Additional fields came with the appointments of Sir Ernest Llewelyn Woodward in diplomatic history, James F. Gilliam in Roman military history and papyrology, Kenneth M. Setton in the history of the medieval papacy and the Levant, and Felix Gilbert in renaissance as well as modern German history. A new term professorship in honor of George F. Kennan brought Jack F. Matlock, Jr. to the School as the first Kennan professor in international relations. The School's tradition in the field of art history was recently refocused on the history of Modern Art with the appointment of Kirk Varnedoe in 2002. His series of Mellon lectures examining the nature of abstraction and its recent history, presented at the National Gallery of Art in the spring of 2003, was prepared at the Institute and delivered only months before his untimely death in August, which the Faculty still mourns.

While the School has changed over time, many of the major scholars who came to the Institute in the decades after World War II are still active in School affairs, as illustrated in the list of current faculty and emeriti whose reports appear below. Their work illustrates the School's continued dedication to fields of historical inquiry that it has long supported, alongside an openness to new areas reflected in recent appointments in Islamic and East Asian history. As in the past, the School will continue in the years to come to encourage the exploration or creation of new fields of historical inquiry and the breaking down of traditional academic boundaries.

ACADEMIC ACTIVITIES

FACULTY

PROFESSOR GLEN BOWERSOCK made two trips to the Middle East in the past academic year, one in December to Beirut for a lecture at the American University of Beirut and another in May to Jerusalem and Tel-Aviv for lectures at the Hebrew University and the University of Tel-Aviv. On both trips he had valuable opportunities to see important excavations. These included several sites in areas of downtown Beirut as well as the city of Sepphoris (Diocaesarea) in Lower Galilee, excavated under the direction of former IAS Member Zeev Weiss. Professor Bowersock also attended two meetings of the Consiglio Scientifico of the Istituto di Studi Umanistici in Florence, one in December and one in May. He gave two seminars on ancient biography to students in the Istituto. He

traveled to Helsinki to join former IAS Member, Alan Bowman of Oxford University, for the fifth and final year of consultations to the Academy of Finland on the Finnish work on the papyri from Petra, the excavation of the Jabal Haroun in Petra, and the conservation of the patriarchal library in Alexandria.

Professor Bowersock gave the Charles Alexander Robinson Lecture at Brown University in March, and in early June he guided, together with IAS Member Judith McKenzie, a small group of IAS Friends and Trustees in a private tour of the Petra exhibition at the American Museum of Natural History in New York. He continued to serve as general editor of the series *Revealing Antiquity* at the Harvard University Press, as *responsable* for the Fonds Louis Robert at the Institut de France in Paris, and as a member of several committees at the American Philosophical Society. He was recently elected a foreign Fellow of the Accademia Nazionale dei Lincei in Italy. In the past academic year Professor Bowersock published eight articles, including papers on the Syrian Leja in the Hellenistic age, the Bar Kokhba rebellion, Seneca's knowledge of Greek, and the Second Sophistic. He contributed the introductory chapter on the Nabataeans for the large volume issued in connection with the Petra exhibition in New York. Einaudi is currently preparing an Italian volume of his papers on the classical tradition in modern literature.

PROFESSOR CAROLINE WALKER BYNUM spent her major energies in drafting about half of a monograph on the cult of Christ's blood in fifteenth-century Germany, while also devoting much time to her role as the School's Executive Officer. Departing from her usual focus, she published an article on the legacy of medieval anti-Judaism in modern Germany. Her article, "Soul and Body," appeared in the *Supplement* to the *Dictionary of the Middle Ages*; and an essay on late medieval soteriology titled "The Power in the Blood" was published in the collection *Redemption* from Oxford University Press. She wrote an article on two pilgrimage sites in fifteenth-century northern Europe, a paper on the survival of relics in the sixteenth century, and a general essay on "patterns of female piety" for an exhibit of women's monastic art to be held in 2005 in Bonn and Essen. She lectured at St. John's Seminary in Yonkers, the University of Wisconsin at Madison, the University of Haifa, and Emory University in Atlanta, and gave the LAX lecture at Mt. Holyoke College, a Lilly Foundation Seminar at the National Humanities Center in North Carolina, and a paper at the Renaissance Society of America annual meeting. Her work was introduced to the Princeton community in lectures to the Medieval Studies Program and the Jewish Studies Program at Princeton University, a talk to the IAS Friends, a lecture at Princeton Theological Seminary, and a presentation to the Princeton University Program in Bio-Ethics. She continued to direct Columbia University Ph.D. students and offered an informal reading class for Columbia graduate students preparing for oral exams. At the Institute, she sponsored an informal discussion group in which western medievalists, Byzantinists, Islamicists, and historians of Asia from both the Institute and neighboring universities discussed such topics as urban development, family structures, the nature of commemoration, and religious fraud in a comparative perspective. She served on the Selection Committee for the Yad-Hanadiv Foundation in Jerusalem and as a mentor for the German Historical Institute Transatlantic Seminar for German and American Doctoral Students. In May 2004, she was awarded the degree of Doctor of Humane Letters h.c. from Emory University.

PROFESSOR PATRICIA CRONE's book *Medieval Islamic Political Thought* was published in Britain in January and later in the year in America (under the title *God's Rule: Gov-*

ernment and Islam. Six Centuries of Medieval Islamic Political Thought). Two articles of hers also appeared, one on the pay of client soldiers in the Umayyad period, the other on the nature of an imperfect constitution discussed by al-Farabi in a lost work. She gave lectures on holy war and related subjects at the University of Napoli in November, on Muslim justifications of the conquests at the University of Maryland in April, on medieval Muslim discussions of tyranny at the Middle East Institute in Washington in May, and on the intellectual climate in the tenth-century Middle East in Hamburg in June. In the spring semester she taught a graduate seminar at Princeton University on the interpretation of the Koranic statement, "There is no compulsion in religion," from the earliest exegetes until today (or more precisely until 2002). At the Institute, joint activities were somewhat hampered by the absence in the first term of two of the Islamicist members due to visa trouble, but the seminar was resumed in the second term, and the Arabists also began to read the Koran together on a weekly basis, this last in preparation for a colloquium on the late antique roots of the Koran organized by Professor Crone at the Institute in June. Professor Crone also spent much time reading and commenting on manuscripts for her series of small biographies, *Makers of the Muslim World*, due to be launched next year.

PROFRESSOR JOSÉ CUTILEIRO completed his book, "The Life and Death of Others: The International Community and the End of Yugoslavia," now submitted for publication. He delivered an Institute lecture on transatlantic relations: "The Indispensable Link," and gave the 2004 Lord Acton lecture at the Universidade Católica Portuguesa in Lisbon. He lectured on Euro-American relations at the Woodrow Wilson School, Princeton, and in seminars organized by the Luso-American Foundation and the Instituto Português de Relações Internationais; the Gulbenkian Foundation; the Defense Commission of the Portuguese Parliament; the Instituto de Altos Estudos Militares in Lisbon, and the Bissaya-Barreto Foundation in Coimbra. He participated in colloquia on cultural dialogue at the Faculté des Lettres of the University of Geneva, Switzerland, and at the Gulbenkian Foundation in Portugal. He co-chaired an international conference on "The Mediterranean and North Africa: The New Agenda" under the auspices of the Moroccan and Portuguese Ministers of Foreign Affairs, in Lisbon. He attended the 2003 Annual IISS Global Strategic Review Conference in Leesburg, Virginia. He attended the Eighth Arrabida meeting chaired by Lord Carrington on new threats to international security, European Union enlargements, and Iraq and the West after the war, held in Arrabida, Portugal. He published two articles in *Relações Internationais*, Lisbon. He is a member of the Steering Committee of the Arrabida meetings, a co-director of the Arrabida Conflict Prevention Initiative, Lisbon, and a member of the Council of International Advisers of the Conflict Management Group, Cambridge, Massachusetts. He kept a regular column of international affairs commentary in *Expresso*, the most prestigious Portuguese weekly.

He organized and chaired a symposium on February 18th in honor of George Kennan's 100th birthday. Invited speakers included the Hon. Larry Eagleburger, Professor Karl Kaiser, the Hon. Strobe Talbott, and Mr. Alexander Bessmertnykh.

PROFESSOR NICOLA DI COSMO joined the faculty of the Institute in July 2003 and spent the fall largely learning about the environment and continuing his work on former projects. In September 2003 a book on Manchu-Mongol relations in the early seventeenth century that he co-authored with the Chinese historian Bao Dali was published in the Netherlands (Brill). Over the year, translation rights were negotiated for the Korean and

Chinese edition of his book *Ancient China and Its Enemies*. A volume of essays derived from a conference on military culture in China organized by him in Christchurch, New Zealand during the previous academic year was accepted for publication by Harvard University Press. He has also worked closely with various scholars and Cambridge University Press editors to define and reach an agreement over the publication of the *Cambridge History of Inner Asia*, a project that was finally contracted in the spring 2004. This year he was elected to the China and Inner Asia Council of the Association for Asian Studies, and attended his first meeting in this capacity in March 2004. Until the spring he had been unable to travel abroad due to temporary restrictions caused by immigration procedures. In March he was able to leave the country and subsequently spoke at Cambridge University (March) and McGill University (April). In Cambridge he presented a paper on competing strategies of political legitimacy in the context of the Mongol-Manchu wars of the early seventeenth century. In Montreal he joined a workshop on violence and disorder in the Ming-Qing transition with a paper on war experience. He has also lectured at Rutgers, Georgetown, and Columbia University. On May 7 he lectured at the Institute on the occasion of the Trustees' visit on the subject of war and globalization at the time of the rise of the Manchu dynasty. Aside from the papers for the workshops, both of which are expected to be published, he wrote several short articles on Chinese archaeology for the *Enciclopedia Italiana*, and several book reviews. He has completed the translation and text edition of a Manchu text of the seventeenth century, which will be published by the end of 2004 as a book. Three essays are expected to appear in print over the next year. Two of them relate to the European presence in the Black Sea in the fourteenth century and to the broader issue of the "expansion of Europe" at that time. The third is a study of military technology in the early Manchu state (c. 1600-1680).

During the academic year 2003-04, PROFESSOR JONATHAN ISRAEL has mainly concentrated on bringing near to completion his new book on the early Enlightenment, a volume focusing primarily on the intellectual origins of the modern concepts of democracy, equality, individual freedom and freedom of belief and expression, in the period 1670-1750. The final version of this sequel to his *Radical Enlightenment* (Oxford, 2001) is due to be delivered to the Oxford University Press during the course of the next academic year. A final bout of research for the volume was carried out in the manuscript and rare book departments of the libraries in Goettingen, Los Angeles, Amsterdam, Leiden, The Hague, the Mazarine (Paris), and at the British Library, in London.

Relating to central themes of the book, he gave keynote lectures on the contribution of Spinoza, Bayle and other major thinkers of the period at the special conferences on the 'Radical Enlightenment' which took place in Los Angeles, at the Clarke Library of UCLA, in October 2003, and on 'Les Lumières radicales' at the École Normale Superieure, in Lyon, in February 2004. In addition, he gave the 'Cochrane Lecture' at the University of Chicago (Department of History), on 20 January, on his interpretation of the Radical Enlightenment; the annual 'Dutch Golden Age' public lecture at the University of Amsterdam (April), on the pamphleteer Ericus Walten (1663-97) and the artist Romeyn de Hooghe (c.1645-1708) as republican writers; and lectures on seventeenth-century Dutch republican political theory more generally, in Oxford, and at the University of Pittsburgh (History Department); besides a research paper at the annual conference of the International Society for Intellectual History held at Boğaziçi University (Istanbul), in December on the early eighteenth century European controversy about how to interpret and classify Confucianism as a system of thought.

Relating to other aspects of his research, Professor Israel also gave papers on early modern Iberian crypto-Judaism at the conference on the 'Portuguese New Christians' in the seventeenth century, held at the Centre Culturel Calousse Gulbenkian, in Paris, in November, and on the Dutch occupation of north-east Brazil (1624-54), at the University of Amsterdam, in June, besides participating as both one of the organizers, and one of the lead speakers, in the November 2003 symposium on Anglo-Dutch intellectual dialogue in the late seventeenth century, held at the Folger Library in Washington, chaired by J.G.A. Pocock.

In addition to book reviews, his publications this year were as follows: 'The Dutch Republic, the Czech Lands, and the Beginnings of the Thirty Years' War (1618-1622)' in *Acta Universitatis Palackianae Olomucensis. Facultas Philosophica : Neerlandica* II. *Emblematica et Iconographia* (Olomouc, 2003), pp.19-30; 'The Early Dutch Enlightenment as a Factor in the Wider European Enlightenment,' in W. van Bunge (ed.) *The Early Enlightenment in the Dutch Republic, 1650-1750,* (Leiden, 2003), pp. 215-230; the pamphlet 'Monarchy, Orangism and Republicanism in the Later Dutch Golden Age' (March 2004)(22 pp.) published by the 'Amsterdams Centrum voor de Studie van de Gouden Eeuw', of Amsterdam University, and 'The Intellectual Origins of Modern Democratic Republicanism (1660-1720)', *European Journal of Political Theory* vol. 3 (2004), pp.7-36.

A Dutch edition of Professor Israel's book on European Jewry in the Age of Mercantilism (1550-1750), originally published in Oxford in 1985, appeared under the title *De Joden in Europa, 1550-1750* (Van Wijnen; Franeker, 2003).

PROFESSOR HEINRICH von STADEN gave a lecture at the Santa Fe Institute in July 2003 on the theoretical foundations of Aristotelian biology, with particular attention to the relation between generalizations and the discovery of exceptions. In early September 2003, he contributed a paper to a symposium on 'Écrire et réécrire l'histoire des sciences' at the Fondation des Treilles (Provence). In September he also gave a lecture at the University of Exeter, England, on Galen as an exegete and participated in a symposium in Paris on 'Éditer les textes médicaux grecs à la Renassiance.' In October he lectured at Emory University on the relation between scientific discovery and the interpretation of precursors in Hellenistic medicine, and in November he gave a paper at the University of Erlangen, Germany, on the impact of the early Hellenistic anatomical revolution on Greek conceptions of gender. In December 2003, he gave a lecture at the annual Ancient Philosophy Colloquium at Princeton University on "Medicine and the Soul: Galen on the physiology and therapy of anger." Professor von Staden gave a Wellcome Trust lecture at the University of Newcastle in March 2004 on moral, social, and epistemological responses to medical errors in ancient Greece; the lecture was preceded by a research seminar on Galen's theory of anger. At CalTech he gave a William and Myrtle Harris Distinguished Lecture in early April, and in mid-April he gave a lecture ("Knowing and Showing") on the 'display culture' of early Hippocratic medicine. Professor von Staden gave five lectures at the Istituto di Studi Umanistici (Florence) in early May 2004 on the philosophical and scientific evolution of the concept *techne* in ancient Greece. Three other lectures followed in May: one at a symposium at the Berlin-Brandenburgische Akademie der Wissenschaften, one at an AMIAS meeting in London, and another at the Biomedicum of the University of Helsinki. In June he participated in a conference on ancient anatomy at the University of Birmingham.

During the academic year 2003-04 Professor von Staden received several academic honors, including election as a 'Membre étranger' of the Académie des Inscriptions et

Belles-Lettres, Institut de France (he had previously been a 'Correspondant étranger'). His publications in 2003-04 included several book reviews and "Galen's daimon: reflections on 'irrational' and 'rational,'" in: *Rationnel et irrationnel dans la médecine ancienne et médiévale. Aspects historiques, scientifiques et culturels*, edited by Nicoletta Palmieri (Centre Jean Palerne, Mémoires XXVI, 2003), pp. 15-43; "La lecture comme thérapie dans la médecine gréco-romaine," *Académie des Inscriptions et Belles-Letttres, Comptes rendus des séances de l'année 2002* (Paris, 2002 [2004]), pp. 803-822. Professor von Staden also served as a consultant to a number of universities, research institutes, and foundations in the United States and abroad, and he continued serving on the editorial and managing boards of several journals.

PROFESSORS EMERITI

PROFESSOR MARSHALL CLAGETT, while continuing the preparation of the fourth and last volume of his *Ancient Egyptian Science*, also continued his new studies of the *Liber Calculationum* of the fourteenth century philosopher and logician, Richard Swineshead of Merton College, Oxford. Furthermore, he continued serving on editorial boards of journals in the history of science.

During the academic year 2003-04 PROFESSOR GILES CONSTABLE edited (in collaboration with Giorgio Cracco, Hagen Keller, and Diego Quaglioni) *Il secolo XII: la <renovation> dell'Europa cristiana. Atti della XLIII settimana di studio, Trento, 11-15 settembre 2000,* (Bologna, 2003) and published articles on 'A further note on the conquest of Lisbon in 1147,' 'Abbatial Professions in Normandy and England in the Eleventh and Twelfth Century, with particular attention to Bec,' 'The Image of Bruno of Cologne in his mortuary roll,' and 'L'Échange épistolaire en milieu monastique au Moyen Âge.' He also published five reviews and one memoir. He gave three lectures in Japan (at the Universities of Fukuoka, Kyoto, and Tokyo) in October and November and six lectures in March at the Central European University in Budapest, where he also participated in two doctoral examinations. He spoke at conferences in Cluny, Limoges, Urbana, and Odense. He organized (with Elizabeth Archibald) two sessions in honor of John Boswell at the International Medieval Congress in Kalamazoo in May. He gave a lecture at the University of Roskilde and attended (without speaking) meetings in Troyes, Washington, D.C., and New York (New York University). He also made brief visits to Athens and to London to study the correspondence between Heinrich Schliemann and Benjamin Davidson.

PROFESSOR OLEG GRABAR lectured on Jerusalem to the Princeton Old Guard and to an Episcopal church in Philadelphia, on the state of Islamic art at the University of Paris, the Center for the Study of the Environment in Amman, and the Victoria and Albert Museum in London, on the sacred in Islamic art at the College de France, where he received the Mionnis Prize and medal, and on Islamic art and the West at the Autonomous University in Barcelona; he gave the inaugural lecture on the study of the Qur'an at the Ismaili Institute in London and participated at a seminar on contemporary Islamic art at the Ecole des Hautes Etudes en Sciences Sociales in Paris and participated in the International Congress of Turkish Art held in Amman, Jordan.

His publications were: *Maqamat of Hariri 1237*, A facsimile edition, London 2003; "Dialogue et Images," Les Civilisations dans le regard de l'autre II (UNESCO, Paris, 2003),

pp. 155-162; "From the Icon to Aniconism," Museum International 218 (2003), pp. 46-55; "The Study of Islamic Art," Journal of the David Collection 1 (2003), pp. 9-22.

CHRISTIAN HABICHT worked mainly on the evidence for some three hundred Rhodian eponyms from the third through the first centuries B.C. He continued working on The Hellenistic Monarchies: Selected Papers for the University of Michigan Press. He declined an invitation to attend an international conference at La Coruna, Spain, in September, but submitted a paper "Kronprinzen in der Monarchie der Attaliden?," which was read there and will be published in the Proceedings. He accepted the invitation to be the keynote speaker at a conference to be held at the University of Marburg in July of 2004. In May he attended the Inaugural Lecture of Denis Knoepfler, a former Member of the School, at the Collège de France and his induction into the Académie des Inscriptions et Belles Lettres in Paris. He visited at the Academy the Nachlass of Louis and Jeanne Robert.

His publications were: Obituary Peter Herrmann, Gnomon 75, 2003, 474-479; "Peter Herrmann," Hamburger Universitätsreden, N.S. 4, 2004, 29-51; "Sybotas," HERKOS, Studi in onore di Franco Sartori (2003), 117-118; "Versäumter Götterdienst", Vestnik D.I. 2003, no. 4, 39-49; "Athens after the Chremonidean War: Some Second Thoughts, The Macedonians in Athens 322-229 B.C. (2003), 52-55; "A List of Athenian Magistrates from the Chremonidean War," Horos 14-16 (2000-2003), 89-93; "Sthennis: Postscriptum," Horos 14-16 (2000-2003), 125-127; "Wie sicher ist die Datierung des Archontats des Philokrates ins Jahr 276/5?," Rheinisches Museum 147, 2004, 105-106; "Rhodian Amphora Stamps and Rhodian Eponyms," Revue des Études Anciennes 105, 2003, 541-578. He also wrote, following a special request, a review article on A. Erskine (Ed.), "A Companion to the Hellenistic World" (2003), published in the New England Classical Journal, 31 (2004), 130-138, in May of 2004.

PROFESSOR GEORGE KENNAN celebrated his 100th birthday on February 16th, 2004. Events were held at the Institute for Advanced Study, Princeton University and the Kennan Institute in Washington D.C. to celebrate the occasion. Professor Kennan himself made his only public appearance of the year to give a personal welcome to guests at the Symposium held in his honor at the Institute for Advanced Study on February 18th.

PROFESSOR IRVING LAVIN continues to serve on the editorial boards of a number of scholarly journals, including *Quaderni d'italianistica*, *History of European Ideas*, *Art e Dossier*, *Palladio, rivista di storia dell' architettura e restauro*. He participated as a member of the Board of Trustees of the SacraTech Foundation at St. Louis University. In April and May, he presented the Mellon Lectures at the National Gallery of Art, Washington, D.C. In June, he gave a course of lectures at the Istituto Italiano per gli Studi Filosofici in Naples, Italy. He presented papers in symposia at the University of California at Los Angeles; Pope Gregorio XIII, at the Università di Roma, La Sapienza; and at the meeting of the College Art Association of America. His most recent publications are:

"La mort de Bernin: visions de rédemption," in Alain Tapié, ed., *Baroque vision jésuite. De Tintoret à Rubens*, exhib. cat., Paris, 2003, 105-19

"Decantarse por el Barroco [Frank Gehry y los paños plegados postmodernos]: Going for Baroque [Frank Gehry and the Post-Modern Drapery Fold]," *Croquis*, No. 117, 2003, 40-7

"The Story of O from Giotto to Einstein (Excerpt*)," *Bildwelten des Wissens. Kunsthistorisches Jahrbuch für Bildkritik,* I, 2, 2003, 37-43

"The Angel and the City. Baccio Bandinelli's Project for the Castel Sant'Angelo in Rome," in Peta Motture, ed., *Large Bronzes in the Renaissance* (National Gallery of Art. Studies in the History of Art 64), Washington, 2003, 308-29

"The Rome of Alexander VII. Bernini and the Reverse of the Medal," in Fernando Cecha Cremades, *Arte barroco e ideal clásico. Aspectos del arte cortesano de la segunda mitad del siglo XVII*, Madrid, 2004, 131-41

PROFESSOR PETER PARET gave papers in Madison, Potsdam, and at the plenary session of the annual meetings of the American Historical Association in Washington in January 2004. He published „Bemerkungen über den Krieg als Thema der Kunst in der frühen Neuzeit," in *Mars und die Musen,* ed. Jutta Nowosadtko and Matthias Rogg, LIT Verlag, Hamburg, 2004; "From Ideal to Ambiguity: Johannes von Müller, Clausewitz, and the People in Arms," in *Journal of the History of Ideas,* LXV, 1 (2004); and reviews in *The American Historical Review, Central European History,* and *The International History Review.* Princeton University Press reprinted his collection of essays, *Understanding War;* his and Michael Howard's translation and interpretation of Carl von Clausewitz, *On War;* and *Makers of Modern Strategy,* a collection of 29 essays by 27 authors, which Professor Paret edited in 1986, and to which he contributed three essays. The work has also come out in Italian, Spanish, Portuguese, Greek, and Japanese editions, and in an English language edition in China.

During the year, Professor Paret continued work on a manuscript on history, ideology, and art in 19th and 20th century Germany, which he began in 2003, and hopes to complete this winter. A German translation of his most recent book, *An Artist against the Third Reich: Ernst Barlach, 1933-38,* will appear next year.

PROFESSOR MORTON WHITE has finished reading proofs of his book, *From a Philosophical Point of View: Selected Studies,* which will be published by Princeton University Press at the end of this calendar year. It contains more than forty essays written over more than a half-century. He has written an article entitled "Holmes and Hart on Prediction and Legal Obligation," which will appear in *Transactions of the Charles Peirce Society* and he continues to work on a study of the decline and fall of classical rationalism that will serve as a "prequel" to his book, *A Philosophy of Culture*. Professor White is also working on a sequel to his book, *The Intellectual Versus the City: From Thomas Jefferson to Frank Lloyd Wright*, a sequel in which he considers views that were more favorable to the American city in the nineteenth and twentieth centuries. He has just completed two terms of service on the Council of the American Philosophical Society in Philadelphia.

THE SCHOOL OF HISTORICAL STUDIES

MEMBERS, VISITORS, AND RESEARCH STAFF

I. TZVI ABUSCH
Assyriology
Brandeis University

ENGIN AKARLI
Ottoman History, Islamic Legal History
Brown University

MARKUS ASPER
Classics, History of Ancient Science
University of Konstanz

VIVIAN BARNETT
Art History
Städtische Galerie im Lenbachhaus, Munich

PAOLO BERDINI
Art History
Stanford University

SYLVIA BERRYMAN
Ancient Greek Philosophy
Ohio State University· *s* · *v*, *f*

MICHAEL BROERS
Early Modern Europe, Napoleonic Italy
University of Aberdeen · *f*

VINCENT CARRETTA
Literary History
University of Maryland

CLAUDINE COHEN
History of Science
L'École des Hautes Études en Sciences Sociales · *f*

STANLEY CORNGOLD
Comparative Literature
Princeton University · *v*

EMMA DILLON
Medieval French Music
University of Pennsylvania

WILLIAM DOYLE
French History, 1648-1848
University of Bristol · *s*

TAYEB EL-HIBRI
Islamic History
University of Massachusetts, Amherst · *f*

VEIT ELM
Modern European History
Technical University Berlin

THEODORE EVERGATES
Medieval History
McDaniel College · v, *s*

VINCENZO FERRONE
Modern European History
University of Torino · *v*, *s*

JANE FULCHER
Historical Musicology
Indiana University

HENRY LOUIS GATES
African and African-American History and Culture
Harvard University · *j*

FRANK GRIFFEL
Islamic Intellectual History and Theology
Yale University

CYNTHIA HAHN
Medieval Art History
Florida State University

ELLEN HARRIS
Music History
Massachusetts Institute of Technology · *s*

JOHN HOPE MASON
European Intellectual History
Middlesex University

KATERINA IERODIAKONOU
Ancient Greek Philosophy
University of Oxford · *f*

LAUREN KASSELL
History of Science and Medicine
University of Cambridge

a Research Assistant · *f* First Term · *j* Joint Visitor with School of Social Science · *s* Second Term · *v* Visitor

ROBERT KASTER
Classics
Princeton University · *v*

TIA KOLBABA
Byzantine and Western Medieval History
Rutgers, the State University of New Jersey

ANDREY KOROTAYEV
South Arabian History and Historical Anthropology
Oriental Institute, Moscow

THOMAS KÜHNE
Modern European History
University of Bielefeld

ELLEN LANDAU
Art History
Case Western Reserve University · *s*

KI CHE ANGELA LEUNG
History of Chinese Medicine
Sun Yat-sen Institute for Social Sciences
and Philosophy · *s*

ALEXANDER LINGAS
Historical Musicology/Byzantine Studies
Arizona State University

BEATRICE MANZ
History of the Middle East and Inner Asia
Tufts University

DAVID MARSH
Renaissance Studies
Rutgers, the State University of New Jersey · *v, f*

JUDITH McKENZIE
Archaeology and Classical Architecture
University of Oxford

ROBERT MUCHEMBLED
Early Modern European History
University of Paris-Nord

ALEXEI MURAVIEV
History of the Christian East, Late Antiquity
Institute of World History, Moscow

MIKA NATIF
History of Art
Institute for Advanced Study · *a*

UTA NITSCHKE-STUMPF
History of Architecture/History of Berlin
Institute for Advanced Study · *a*

MICHAEL NYLAN
Chinese Classical Era
University of California, Berkeley

JOHANNES PAHLITZSCH
History of the Near East, Islamic Studies
Freie Universität Berlin · *s*

TESSA RAJAK
Roman and Jewish History
Reading University

AMNERIS ROSELLI
Classics
Università degli Studi di Napoli · *s*

SUZANNE SAÏD
Classics; Greek Literature
Columbia University · *f*

HEINRICH SCHLANGE-SCHÖNINGEN
Ancient and Modern History
Free University of Berlin · *s*

ANDREW SHANKEN
Architectural History
Oberlin College ·*v*

H. ALAN SHAPIRO
Classical Archaeology and Art
Johns Hopkins University · *v, s*

JOHN SHEPHERD
Historical Anthropology (China)
University of Virginia

ADAM SUTCLIFFE
Modern European History, Jewish History
University of Illinois, Urbana-Champaign

DON WYATT
Chinese Intellectual History
Middlebury College · *s*

FROMA ZEITLIN
Classics and Comparative Literature
Princeton University · *v*

a Research Assistant · *f* First Term · *j* Joint Visitor with School of Social Science · *s* Second Term · *v* Visitor

THE SCHOOL OF HISTORICAL STUDIES

RECORD OF EVENTS

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

Academic Year 2003-04

September 29
Historical Studies Lunchtime Colloquium:
Introductions

October 6
Historical Studies Lunchtime Colloquium:
"From Veyne to Pausanias : Reconsidering the Opposition Myth/History"
SUZANNE SAÏD, *Columbia University; Member, School of Historical Studies*

October 13
Historical Studies Lunchtime Colloquium:
"Searching for Equiano"
VINCENT CARRETTA, *University of Maryland; Member, School of Historical Studies*

October 17
School of Historical Studies Lecture:
"The Statutes and Ordinances of the Qin and Han Empires"
MICHAEL LOEWE, *University of Cambridge*

October 20
Historical Studies Lunchtime Colloquium:
"The Historically Informed Performance of Byzantine Chant"
ALEXANDER LINGAS, *Arizona State University; Member, School of Historical Studies*

October 22
Modern European Workshop:
"French Social History, 17th to 18th century"
ROBERT MUCHEMBLED, *University of Paris-Nord; Member, School of Historical Studies*

October 27
Historical Studies Lunchtime Colloquium:
"Renegotiating French Identity: Berlioz during Vichy and the German Occupation"
JANE FULCHER, *Indiana University; Member, School of Historical Studies*

November 3
Historical Studies Lunchtime Colloquium:
"Rousseau: Nature, Human Nature, Individuality"
JOHN HOPE MASON, *Middlesex University; Member, School of Historical Studies*

November 5
Modern European Workshop:
"French Administration in Napoleonic Italy, 1797-1815"
MICHAEL BROERS, *University of Aberdeen; Member, School of Historical Studies*

November 10
Historical Studies Lunchtime Colloquium:
"The Fate and Purpose of the *Miracula Sancti Basilii Magni* in Christian Eastern Literatures"
ALEXEI MURAVIEV, *Institute of World History, Moscow; Member, School of Historical Studies*

November 17
Historical Studies Lunchtime Colloquium:
"The Construction of Meaning in Early Medieval Reliquaries"
CYNTHIA HAHN, *Florida State University; Member, School of Historical Studies*

November 19
Modern European Workshop:
"The Intellectual Significance of Voltaire's Literary Works"
VEIT ELM, *Technical University Berlin; Member, School of Historical Studies*

November 24
Historical Studies Lunchtime Colloquium:
"Law in the Marketplace: Istanbul, 1730-1840"
ENGIN AKARLI, *Brown University; Member, School of Historical Studies*

November 25
Ancient History and Islamic Seminar:
"The Julian Romance in Syriac and Arabic"
ALEXEI MURAVIEV, *Institute of World History, Moscow; Member, School of Historical Studies*

December 1
Historical Studies Lunchtime Colloquium:
"Visualizing Ancient Alexandria"
JUDITH MCKENZIE, *University of Oxford; Member, School of Historical Studies*

December 3
Modern European Workshop:
"French Biology in the Early 18th Century"
CLAUDINE COHEN, *L'École des Hautes Études en Sciences Sociales; Member, School of Historical Studies*

December 5
East Asian Studies/The Institute Film Series:
Illustrious Energy (New Zealand, 1987)

December 8
Historical Studies Lunchtime Colloquium:
"Male Bonding and Shame Culture. Hitler's Soldiers and the Unity of 20th Century German History"
THOMAS KÜHNE, *University of Bielefeld; Member, School of Historical Studies*

December 15
Historical Studies Lunchtime Colloquium:
"Voltaire and Science"
VEIT ELM, *Technical University Berlin; Member, School of Historical Studies*

January 12
Historical Studies Lunchtime Colloquium:
Introductions

January 19
Historical Studies Lunchtime Colloquium:
"The Politics of Spinozism in Late Enlightenment Germany from Moses Mendelssohn to Moses Hess"
ADAM SUTCLIFFE, *University of Illinois, Urbana-Champaign; Member, School of Historical Studies*

January 26
Historical Studies Lunchtime Colloquium:
"Mechanical Explanation in Ancient Greek Natural Philosophy"
SYLVIA BERRYMAN, *Ohio State University; Member, School of Historical Studies*

January 28
Modern European Workshop:
"Rousseau's Religious Turn: From Radical Republicanism to Quasi-stoicism"
JOHN HOPE MASON, *Middlesex University; Member, School of Historical Studies*

January 30
School of Historical Studies Lecture:
"Criminal Justice in China: Its Impact on U.S.-China Relations, Past and Present"
JEROME A. COHEN, *New York University*

February 2
Historical Studies Lunchtime Colloquium:
"Reflections on 'Confucius as a Reformer' and the Reformer as Prophet in Chinese Intellectual Discourse"
DON WYATT, *Middlebury College; Member, School of Historical Studies*

February 9
Historical Studies Lunchtime Colloquium:
"Early Islamic Endowments and the Question of Foreign Influences"
JOHANNES PAHLITZSCH, *Free University of Berlin; Member, School of Historical Studies*

February 18
George F. Kennan Centenary Symposium
Opening Remarks
PETER GODDARD, *Director, Institute for Advanced Study*
JAMES D. WOLFENSOHN, *President, The World Bank*
JOSÉ CUTILEIRO, *George F. Kennan Professor, School of Historical Studies, and former Secretary General of the Western European Union*
JACK F. MATLOCK, JR., *former George F. Kennan Professor, School of Historical Studies, and former Ambassador to the Soviet Union*

"Reflections on a Century"
LAWRENCE F. EAGLEBURGER, *former US Secretary of State*
"George Kennan and Russia"
ALEXANDER A. BESSMERTNYKH, *Foreign Policy Association, and former Foreign Minister of the Soviet Union*
"George Kennan and the New Europe: A German Perspective"
KARL KAISER, *German Council on Foreign Relations*
"The Container Contained"
STROBE TALBOTT, *The Brookings Institution, and former Deputy Secretary of State*

Modern European Workshop:
"'Friendship in the Enlightenment"
ADAM SUTCLIFFE, *University of Illinois, Urbana-Champaign; Member, School of Historical Studies*

February 19
East Asian Studies Seminar:
"Qing Military Institutions at the End of the Eighteenth Century"
YINGCONG DAI, *William Paterson University*

February 23
Historical Studies Lunchtime Colloquium:
"Law and Logic. Towards an Archaeology of Greek Abstract Reason"
MARKUS ASPER, *University of Konstanz; Member, School of Historical Studies*

February 25
Islamicist Seminar:
"The Raven and the Carcass: a Near Eastern Post-Diluvian Reconnaissance Motif Reconsidered"
ALEXEI KOROTAYEV, *Oriental Institute, Moscow; Member, School of Historical Studies*

March 1
Historical Studies Lunchtime Colloquium:
"Body, Sex and Gender: a History of Pleasure in XVIth-XVIIth Century France and England"
ROBERT MUCHEMBLED, *University of Paris-Nord; Member, School of Historical Studies*

March 8
Historical Studies Lunchtime Colloquium:
"Philip Guston in Mexico"
ELLEN LANDAU, *Case Western Reserve University; Member, School of Historical Studies*

March 15
Historical Studies Lunchtime Colloquium:
"Contagion, Quarantine and Stigma in the 19th and 20th Century Leprosy Pandemic: the Case of China"
KI CHE ANGELA LEUNG, *Sun Yat-sen Institute for Social Sciences and Philosophy; Member, School of Historical Studies*

March 16
East Asian Studies Seminar:
"International Identities and the Globalization of Borders, 1880-1920"
ADAM MCKEOWN, *Columbia University*

March 17
Islamicist Seminar:
"The Petra Papyri and other New Finds from Late Antiquity in Jordan"
GLEN BOWERSOCK, *Permanent Faculty, School of Historical Studies*

March 22
Historical Studies Lunchtime Colloquium:
"Two Autochthonous Monotheist Traditions in Pre-Islamic Arabia?"
ANDREY KOROTAYEV, *Oriental Institute, Moscow; Member, School of Historical Studies*

March 24
Semi-Annual Meeting of the Ancient Historians of the Atlantic States:
"Charities for the Rich: Endowments in the Hellenistic World"
JOSHUA SOSIN, *Duke University*
with comments by C.P. JONES, *Harvard University*

Islamicist Seminar:
"A New Work by al-Ghazali?"
FRANK GRIFFEL, *Yale University; Member, School of Historical Studies*

March 29
Historical Studies Lunchtime Colloquium:
"Issues in the Historiography of Byzantine Theology or How the Twelfth Century Influenced the Ninth"
TIA KOLBABA, *Rutgers, the State University of New Jersey; Member, School of Historical Studies*

March 30
East Asian Studies Seminar:
"Unsung Men of War: Acculturated Embodiments of the Martial Ethos in the Song Dynasty"
DON WYATT, *Middlebury College; Member, School of Historical Studies*

March 31
Ancient History Lecture:
"The Chaldaean Oracle: A Late Antique Holy Book"
POLYMNIA ATHANASSIADI, *University of Athens*

April 7
Modern European Workshop:
"Recollections of a Freed Slave in the Early 18th Century"
VINCENT CARRETTA, *University of Maryland; Member, School of Historical Studies*

April 20
School Lecture:
"The Vindolanda Tablets: New Light on the Roman Frontier"
ALAN BOWMAN, *University of Oxford*

April 28
Islamicist Seminar:
"Pious Foundations in Constantinople and Jerusalem: the Endowment Deeds of Saladin's Khanqa (1189) and John II Komnenos' Pantokrator Monastery and Hospital (1136)"
JOHANNES PAHLITZSCH, *Free University of Berlin; Member, School of Historical Studies* and TIA KOLBABA, *Rutgers, the State University of New Jersey; Member, School of Historical Studies*

April 30
East Asian Studies Lecture:
"A Model of Pre-Industrial Demographic Cycle"
NATALIA KOMAROVA, *Rutgers, the State University of New Jersey; Member, Program in Theoretical Biology* and ANDREY KOROTAYEV, *Oriental Institute, Moscow; Member, School of Historical Studies*

In addition to the events listed above, some groups also met informally. This included weekly gatherings over lunch for Members and Visitors in art history and classics, who met to discuss ongoing projects and the specific problems encountered in their research. Individual Faculty members also occasionally arranged other informal gatherings or talks by invited speakers. Although these do not appear on the above list, these informal gatherings also played an important role in the intellectual life of the School.

DAVID GRAHAM

"I have been introduced to a dizzying array of ideas ..."

— Member, School of Mathematics

THE SCHOOL OF MATHEMATICS

Faculty

ENRICO BOMBIERI, *IBM von Neumann Professor*
JEAN BOURGAIN
PIERRE DELIGNE
PHILLIP A. GRIFFITHS *(as of 1-1-04)*
ROBERT P. LANGLANDS, *Hermann Weyl Professor*
ROBERT MacPHERSON
THOMAS SPENCER
VLADIMIR VOEVODSKY
AVI WIGDERSON, *Herbert H. Maass Professor*

Professors Emeriti

ARMAND BOREL *(deceased 8-11-03)*
ATLE SELBERG

ACADEMIC ACTIVITIES

The year's special program in the School of Mathematics, entitled "Harmonic Analysis and Partial Differential Equations," focused on the general analysis around PDEs. The organizers were C. Kenig (U. Chicago) and J. Bourgain (IAS). The program benefitted further from the participation of faculty at Princeton University (S. Klainerman and I. Rodnianski) and Rutgers, the State University of New Jersey (H. Brezis, Y. Li and A. Soffer), who gave seminar talks and interacted frequently with our junior participants.

The general theme of the program was various breakthroughs in the theory of nonlinear dispersive equations, such as the nonlinear Schroedinger (NLS), wave (NLW) and Korteweg de Vries (KdV, KP) type equations; the wave map and Einstein equations; Ginzburg-Landau equations, etc. Past and present mathematical research on these equations offers a variety of related aspects. To mention a few:

1) The global well-posedness and scattering of classical solutions

2) Local well-posedness in rough norms

3) A rigorous theory of singularity formation

4) Properties of the flow in the case of a bounded spatial domain when no dispersion occurs (KAM theories for time quasi-periodic solutions, energy diffusion phenomena, statistical theories, etc.

5) Non-conservative models (such as the Navier-Stokes equations) where dissipation with possible forcing occurs.

In this research, methods from harmonic analysis and dynamical systems play a prominent role, explaining a close interaction with these other fields. In fact it was one of our main

purposes to survey these new developments and often very involved analytical technology.

The program was fortunate to have optimal timing, shortly after several major developments had occurred, some of which were in fact completed at IAS during the year. The following is a brief overview of some of the highlights:

1) Rigorous results on blowup speed and profile for focusing KdV and NLS with quasi-conformal nonlinearity, such as a justification of the {log | logt | /t}^(1/2) stable profile for NLS (G. Perelman, F. Merle and P. Raphael). It settles mathematically numerical predictions of a sometimes controversial nature.

2) Global existence and scattering for the 3D defocusing quintic NLS, a long-standing problem in the field (the radial case was solved five years ago).

3) A new and simpler stability proof for the Einstein vacuum equations (H. Lindblad and I. Rodnianski). The original solution due to D. Christodoulou and S. Klainerman, over ten years ago, was a monumental work. The present treatment of global existence of certain small and decaying solutions gives a slightly weaker result but is much simpler because it avoids certain cumbersome coordinate changes.

4) Optimal regularity theory for vortex lines and minimizers in the 3D Ginzburg-Landau equation.

All these themes were subject to detailed seminar talks given by main players in the field. For instance, a series of expository lectures on quintic NLS were presented by G. Staffilani during the months of April and May.

There were also a number of strictly analysis-oriented seminars. A. Volberg (U. Michigan) surveyed applications of "Bellman function" techniques to the Beltrami equation and the Beurling transform. A. Kiselev spoke about new examples of singular continous spectrum for Schroedinger operators.

On average there were one or two weekly program-related seminars and very often shorter and informal presentations. Our members could also benefit from the ongoing IAS-Princeton-Rutgers PDE seminar, focused this year on more geometric topics.

Another highlight in the program was the March workshop organized at the Institute and co-sponsored by the Clay Mathematics Institute. In addition to the program participants, the workshop was animated by a dozen invited speakers, covering various broad areas in PDE. A. Bressan (Trieste) described the state-of-the-art on 1D hyperbolic conservation laws, L. Caffarelli (Austin) spoke on free boundary problems and T. Tao (UCLA) on Strichartz inequalities on manifolds. Talks were remarkably well-prepared and accessible to a less expert audience; they will be published in a forthcoming issue in *Annals of Mathematics Studies*, Princeton University Press.

Also during the year a small group of postdoctoral members with an interest in geometric representation theory was present at the Institute. This led to the organization of a weekly seminar in geometric representation theory attended by this group plus a few people with related interests from Princeton University. Most of this seminar was devoted to

a short lecture series by the members on their research projects in progress. In addition, several people from outside Princeton were invited to come for a few days to have discussions with the mathematicians in this group and to give one or two lectures in the seminar.

The 2004 Marston Morse Memorial Lectures were delivered by G. Tian from Princeton University on the theme "Geometry and Analysis of Einstein 4-manifolds," a subject close to general relativity.

During the year a number of talks in geometry on Floer homology and four-manifolds were given by T. Mrowka who was here for the year from the Massachusetts Institute of Technology.

Over recent years there has been a very strong presence at the Institute in theoretical computer science and the related mathematics, orchestrated by A. Wigderson and A. Razborov. The main themes were the theory of algorithms, complexity theory, combinatorics and graph theory. They are the focus of an intense activity involving a large number of our members. This year was no exception. Among the recent excitements is an unconditional solution to the problem of efficient deterministic primality testing (in poly-logarithmic time) due to M. Agrawal who was a Member in the School this year, some new strong hardness of approximation results via PCP methods and Fourier analysis) by Khot, Kindler and O'Donnell and a solution to the randomness extraction problem from few indepenent "weak" sources (via additive number theory) by Barak, Impagliazzo and Wigderson.

In mathematical physics there has been ongoing research on subjects such as random matrix theory (T. Spencer, M. Zirnbauer) and statistical Loewner evolution equations (R. Friedrich). There has also been interaction with participants from the PDE program. For instance, in the area of transport in non-homogeneous media, C. Kenig and J. Bourgain established localization in the continuous Anderson-Bernoulli model near the edge of the spectrum, using refined results in the theory of analytical continuation.

The traditional number theory seminars with Princeton University were held at Princeton this year because of a special program there on the Birch and Swinnerton-Dyer conjectures and Galois representations.

This year's math faculty lecture "On the Nature of Proof" was presented by R. MacPherson and called attention to the new challenges on the standard of truth in mathematics due to the emergence of computer assisted "proofs."

After serving as the Director of the Institute for more than twelve years, Phillip Griffiths joined the faculty in the School of Mathematics in January of 2004.

Armand Borel, Professor of Mathematics Emeritus, died on August 11, 2003. He was actively producing original research until the end of his life. His book on compactifications of locally symmetric spaces, joint with L. Ji, will be published posthumously. On November 14 the School held a one-day conference entitled "A Celebration of the Life and Work of Armand Borel" in Wolfensohn Hall. It was attended by Members, people from the Princeton and Rutgers communities and about 40 mathematicians from outside

the area who came for the event. The mathematical part of the program consisted of three lectures. R. MacPherson lectured on Borel's general contributions to mathematics and his work on topology from 1945 until 1960, T. Springer lectured on Borel's seminal work on algebraic groups from 1957 to 1970 and M. Raghunathan lectured on Borel's many contributions to modular forms and arithmetic groups which occupied most of his life. The non-mathematical part of the program consisted of a talk by E. Bombieri on Borel's contributions to the Institute for Advanced Study, a dinner at which several people gave personal reminiscences and a concert in the evening by S. Shashank, an Indian musician whose first U.S. concert had been organized by Borel at the Institute.

Pierre Deligne was elected foreign member of The Accademia Nazionale Dei Lincei as well as honorary member of the London Mathematical Society; Robert Langlands was elected to the American Philosophical Society; Robert MacPherson became a member of the Scientific Advisory Committee of the Mathematical Sciences Research Institute in Berkeley and Phillip Griffiths was elected to the Indian Academy of Sciences, received an honorary Doctor of Science degree from Duke University and the "Ordem Nacional do Merito Cientifico" from the government of Brazil.

THE SCHOOL OF MATHEMATICS

MEMBERS AND VISITORS

MANINDRA AGRAWAL
Computational Complexity Theory, Computational Number Theory
Indian Institute of Technology, Kanpur, India

MIKHAIL ALEKHNOVITCH
Complexity Theory
Massachusetts Institute of Technology

ANDRIS AMBAINIS
Quantum Computation, Computational Complexity
University of Latvia · *s*

IOAN BADULESCU
Lie Groups, Representation Theory
Université de Poitiers, France · *s*

BOAZ BARAK
Cryptography, Complexity Theory
Weizmann Institute of Science, Israel

STEFAN BAUER
Four Dimensional Manifolds
Universität Bielefeld, Germany

DANIEL BISS
Topology
University of Chicago · *f*

SUN-YUNG ALICE CHANG
Geometry and PDEs
Princeton University · *s*

MARIA CHUDNOVSKY
Combinatorics and Graph Theory
Princeton University · *i*

JAMES COLLIANDER
PDEs, Harmonic Analysis
University of Toronto · *f*

MARIANNA CSÖRNYEI
Real Analysis
University College London

GALIA DAFNI
Harmonic Analysis
Concordia University, Canada · *f*

DAVID DOS SANTOS FERREIRA
PDEs
Université De Rennes 1, France · *s*

KIRSTEN EISENTRÄGER
Hilbert's Tenth Problem and Arithmetic Geometry
University of California, Berkeley

ROLAND FRIEDRICH
Rigorous Conformal Quantum Field Theory
Institut des Hautes Études Scienifiques, France · *s*

OSAMU FUJINO
Algebraic Geometry: Birational Geometry, Mori Theory
Kyoto University, Japan

DAVID GABAI
Low-dimensional Topology, Geometry
Princeton University · *v, s*

EZRA GETZLER
Geometry
Northwestern University

JULIA GORDON
Representation Theory of p-adic Groups
University of Michigan

MARK GORESKY
Geometry, Automorphic Forms
Institute for Advanced Study

FENGBO HANG
Geometric Analysis, Nonlinear Partial Differential Equations
Institute for Advanced Study · *i*

RUSSELL IMPAGLIAZZO
Computational Complexity
University of California, San Diego · *f*

ROY JOSHUA
Algebraic Geometry, K-theory
Ohio State University

VADIM KALOSHIN
Dynamical Systems
Institute for Advanced Study · *v, f · s*

dvp Distinguished Visiting Professor · *f* First Term · *i* Veblen Research Instructorship
s Second Term · *v* Visitor

KIRAN KEDLAYA
p-adic Cohomology of Algebraic Varieties
University of California, Berkeley · *f*

CARLOS KENIG
Analysis
University of Chicago · *dvp*

SUBHASH KHOT
Complexity Theory, PCP
Princeton University

ALEXANDER KISELEV
Schrödinger Operators, Reaction Equations
University of Wisconsin, Madison · *s*

MIKHAIL KOGAN
Symplectic Geometry, Algebraic Combinatorics
Northeastern University

JAN KRAJIČEK
Proof Complexity
Academy of Sciences of the Czech Republic · *s*

JOACHIM KRIEGER
Semilinear Wave Equations
Princeton University · *f*

ADEREMI KUKU
K-theory and Non Commutative Algebra/Arithmetic/Geometry
International Centre for Theoretical Physics, Italy

YI-JEN LEE
Gauge Theory and Symplectic Geometry
Princeton University

YANYAN LI
Non-linear PDEs
Rutgers, the State University of New Jersey · *f*

HANS LINDBLAD
Non-linear Differential Equations
University of California, San Diego · *f*

YVAN MARTEL
PDEs
École Polytechnique, France · *f*

KEVIN McGERTY
Geometric Representation Theory
Institute for Advanced Study

FRANK MERLE
PDEs
Université de Cergy-Pontoise, France

IGOR MINEYEV
Geometric Group Theory
University of Illinois

GABRIELE MONDELLO
Cellular Decomposition of Moduli Space of Curves
Università La Sapienza, Italy · *v, f*

TOMASZ MROWKA
Gauge Theory and Low-dimensional Topology
Massachusetts Institute of Technology

CAMIL MUSCALU
Fourier Analysis and PDEs
University of California, Los Angeles

ANDREA NAHMOD
Harmonic Aanalysis and PDEs
University of Massachusetts, Amherst

RYAN O'DONNELL
Complexity and Learning Theory
Massachusetts Institute of Technology

KATE OKIKIOLU
Spectral Geometry, Geometric Analysis
University of California, San Diego · *f*

VICTOR OSTRIK
Tensor Categories, Hecke Algebra
Massachusetts Institute of Technology

PETER OZSVÁTH
Gauge Theory in Dimensions Three and Four
Princeton University

NATASA PAVLOVIC
Partial Regularity Results for Modified Navier-Stokes Equations
University of Illinois, Chicago

GALINA PERELMAN
Non-linear PDEs
École Poltechnique, France · *s*

TONIANN PITASSI
Computational Complexity, Proof Theory, Logic
University of Toronto, Canada · *s*

dvp Distinguished Visiting Professor · *f* First Term · *i* Veblen Research Instructorship
s Second Term · *v* Visitor

GUSTAVO PONCE
Non-linear PDEs
University of California, Santa Barbara · *s*

PIERRE RAPHAEL
Non-linear Dispersive Evolution Equations
Université de Cergy-Pontoise, France · *f*

JACOB RASMUSSEN
Gauge-theoretic Invariants of Manifolds
Harvard University · *i*

ALEXANDER RAZBOROV
Combinatorics, Theoretical Computer Science, Complexity Theory
Institute for Advanced Study

OMER REINGOLD
Cryptography, Computational Complexity
Institute for Advanced Study · *v, f*

RICHARD SCHWARTZ
Discrete Groups, Rank One Symmetric Spaces
University of Maryland

NATHAN SEGERLIND
Propositional Proof Complexity
University of California, San Diego

ADAM SIKORA
Low-dimensional Topology
Institute for Advanced Study · *f*

CHRISTOPHER SKINNER
Number Theory
University of Michigan · *v, f · s*

AVRAHAM SOFFER
PDEs, Spectral and Scattering Theory
Rutgers, the State University of New Jersey

RONALD SOLOMON
Finite Group Theory
Ohio State University · *f*

JAN-PHILIP SOLOVEJ
Mathematical Physics
University of Copenhagen

GIGLIOLA STAFFILANI
Harmonic Analysis and PDEs
Massachusetts Institute of Technology

JACOB STERBENZ
Non-linear Wave Equations
University of Maryland · *i*

GERNOT STROTH
Group Theory
Universität Halle-Wittenberg · *s*

LÁSZLÓ SZÉKELYHIDI
Elliptic Systems, Convex Integration, Calculus of Variations
Max Planck Institute for Mathematics, Germany

ABDOLREZA TAHVILDAR-ZADEH
Non-linear Wave Equations
Rutgers, the State University of New Jersey

HIDEO TAKAOKA
Analysis and Non-linear PDEs
Kobe University, Japan · *s*

YE TIAN
Euler Systems and Iwasawa Theory
Columbia University

SALVATORE TORQUATO
PDEs
Princeton University

YEN-HSI (RICHARD) TSAI
Numerical Analysis
Institute for Advanced Study · *i*

LUIS VEGA
Analysis on Dispersive PDEs
Universidad del Pais Vasco, Spain · *s*

ALEXANDER VOLBERG
Harmonic Analysis
Michigan State University · *s*

ANDREW WILES
Algebraic Number Theory
Institute for Advanced Study · *s*

PETER WINKLER
Discrete Mathematics, Pure and Applied, Probability, Theory of Computing
Bell Laboratories, Lucent Technologies

MARTIN ZIRNBAUER
Disordered Electrons, Random Matrix Theory, Supermanifolds
Universität zu Köln

dvp Distinguished Visiting Professor · *f* First Term · *i* Veblen Research Instructorship
s Second Term · *v* Visitor

THE SCHOOL OF MATHEMATICS

RECORD OF EVENTS

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

Academic Year 2003-04

September 22
Theoretical Computer Science/Discrete Math Seminar I:
"Impossibility Results for the Composition of Secure Two-Party Protocols"
YEHUDA LINDELL, *IBM Watson Research Center*

September 23
Theoretical Computer Science/Discrete Math Seminar II:
"Lower Bounds for Non-Black-Box Zero-Knowledge"
BOAZ BARAK, *Institute for Advanced Study*

September 24
Analysis and PDE Seminar:
"Combinatorial Aspects of Fourier Analysis"
PROFESSOR JEAN BOURGAIN, *Institute for Advanced Study*

September 25
Princeton University/Institute for Advanced Study
Number Theory:
"Constructing Semi-simple Galois Representations with Prescribed Properties"
RAVI RAMAKRISHNA, *Cornell University*

September 29
Theoretical Computer Science/Discrete Math Seminar I:
"Network Models for Game Theory and Economics"
MICHAEL KEARNS, *University of Pennsylvania*

Short Talks by Junior Postdoctoral Members:
"Explicit Constructions of Pseudo-Random Objects"
BOAZ BARAK, *Institute for Advanced Study*
"Hilbert's Tenth Problem and Arithmetic Geometry"
KIRSTEN EISENTRÄGER, *Institute for Advanced Study*
"Probabilistically Checkable Proofs (PCPs) for NP and Inapproximability of NP-hard Problems"
SUBASH KHOT, *Institute for Advanced Study*
"Hyperbolic Groups, Bounded Cohomology, the Baum-Connes Conjecture, etc."
IGOR MINEYEV, *Institute for Advanced Study*
"Knot Polynomials and Homologies"
JACOB RASMUSSEN, *Institute for Advanced Study*

September 30
Theoretical Computer Science/Discrete Math Seminar II:
"On the Computational Power of Classical and Quantum Branching Programs"
FABRID ABLAYEV, *Kazan State University*

Analysis and PDE Seminar:
"On the Local and Global Well-Posedness of the KP-I Equation"
CARLOS E. KENIG, *Institute for Advanced Study*

Short Talks by Junior Postdoctoral Members:
"On the Stable Homology of Aut(F_n)
DANIEL BISS, *Institute for Advanced Study*
"Toric Degenerations of Flag and Schubert Varieties"
MIKHAIL KOGAN, *Institute for Advanced Study*
"Quivers and Affine Algebras"
KEVIN McGERTY, *Institute for Advanced Study*
"Learning Functions from Random Examples"
RYAN O'DONNELL, *Institute for Advanced Study*
"Tensor Categories in Geometric Representation Theory"
VICTOR OSTRIK, *Institute for Advanced Study*

October 1
Mathematics Seminar:
"Algebraic cycles on compact Kahler manifolds"
CLAIRE VOISIN, *Institute of Mathematics of Jussieu*

October 2
Short Talks by Junior Postdoctoral Members:
"Analogies between Number Theory and 3-Dimensional Topology"
ADAM SIKORA, *Institute for Advanced Study*
"About Characters of p-adic Groups and Motivic Integration"
JULIA GORDON, *Institute for Advanced Study*
"A Canonical Bundle Formula"
OSAMU FUJINO, *Institute for Advanced Study*
"De Rham Cohomology in Characteristic p?!"
KIRAN KEDLAYA, *Institute for Advanced Study*
"Euler Systems and BSD Conjecture"
YE TIAN, *Institute for Advanced Study*

October 7
Theoretical Computer Science/Discrete Math Seminar II:
"Memorization and DPLL: Formula Caching Proof Systems"
RUSSELL IMPAGLIAZZO, *Institute for Advanced Study*

Short Talks by Junior Postdoctoral Members:
"Dyadic Models for the Equations of Fluid Motion"
NATASA PAVLOVIC, *Institute for Advanced Study*
"On Some Problems Related to Carleson-Hunt Theorem in Fourier Analysis"
CAMIL MUSCALU, *Institute for Advanced Study*
"The Lengths of Propositional Proofs"
NATHAN SEGERLIND, *Institute for Advanced Study*
"Some Problems in Geometric Measure Theory"
MARIANNA CSÖRNYEI, *Institute for Advanced Study*
"How Hard is it to Find an Explicit Object?"
MICHAIL ALEKHNOVITCH, *Institute for Advanced Study*

October 8
Short Talks by Junior Postdoctoral Members:
"Rank-one Convexity: Geometry of Matrix Space and Applications to PDE"
LÁSZLÓ SZÉKELYHIDI, *Institute for Advanced Study*
"Blow up Dynamics for the Non-Linear Schrödinger Equation"
PIERRE RAPHAEL, *Institute for Advanced Study*
"Local and Global Low Regularity Results for Non-Linear Wave Equations"
JACOB STERBENZ, *Institute for Advanced Study*
"Heterogeneous Multiscale methods for Stiff ODEs"
RICHARD TSAI, *Institute for Advanced Study*
"Global Regularity for Geometric Wave Equations"
JOACHIM KRIEGER, *Institute for Advanced Study*

October 13
Geometric Representation Theory Seminar:
"An Introduction to Motivic Integration"
JULIA GORDON, *Institute for Advanced Study*

October 15
Analysis and PDE Seminar:
"On Asymptotics and Blow-up for GkdV Equations, Part I"
FRANK MERLE, *Institute for Advanced Study*

October 20
Theoretical Computer Science/Discrete Math Seminar I:
"Propositional Logic of Continuous Transformation"
GREGORI MINTS, *Stanford University*

Geometric Representation Theory Seminar:
"An Introduction to Motivic Integration, II"
JULIA GORDON, *Institute for Advanced Study*

October 21
Theoretical Computer Science/Discrete Math Seminar II:
"A New Explicit Construction of Constant-Degree Expander Cayley Graphs"
EYAL ROSENMAN, *The Hebrew University of Jerusalem*

October 22
Analysis and PDE Seminar:
"On Asymptotics and Blow-up for GkdV Equations, Part II"
YVAN MARTEL, *Institute for Advanced Study*

Economics Workshop:
"Toward a Characterization of Truthful Combinatorial Auctions"
AHUVA MU'ALEM, *The Hebrew University of Jerusalem*

October 27
Theoretical Computer Science/Discrete Math Seminar I:
"Probability Theory and Covering Problems"
NICHOLAS PIPPENGER, *Princeton University*

Mathematics Members Seminar:
"De Rham cohomology and zeta functions"
KIRAN KEDLAYA, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"An Introduction to Stacks"
KEVIN McGERTY, *Institute for Advanced Study*

October 28
Theoretical Computer Science/Discrete Math Seminar II:
"A New Explicit Construction of Constant-Degree Expander Cayley Graphs"
EYAL ROZENMAN, *The Hebrew University of Jerusalem*

October 29
Analysis and PDE Seminar:
"The Cauchy Problem for Quasi-linear Schrödinger Equations"
CARLOS KENIG, *Institute for Advanced Study*

November 3
Theoretical Computer Science/Discrete Math Seminar I:
"Multilinear Formulas and Skepticism of Quantum Computing"
SCOTT AARONSON, *University of California, Berkeley*

p-Adic Local Monodromy Seminar:
"Overview"
KIRAN KEDLAYA, *Institute for Advanced Study*

Mathematics Members Seminar:
"What Do We Know About Four Dimensional Manifolds?"
TOMASZ MROWKA, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"An Introduction to Stacks II: this time there's a definition"
KEVIN McGERTY, *Institute for Advanced Study*

November 4
Theoretical Computer Science/Discrete Math Seminar I:
"Priority Algorithms: Greedy Graph Algorithms and Beyond"
RUSSELL IMPAGLIAZZO, *Institute for Advanced Study*

Special Mathematics Seminar:
"Local Langlands Correspondence for Kac-Moody Algebras"
EDWARD FRENKEL, *University of California, Berkeley*

November 5
Analysis and PDE Seminar:
"Almost – Periodically and Diffusion in High Dimensional Systems"
PROFESSOR JEAN BOURGAIN, *Institute for Advanced Study*

November 6
Geometric Representation Theory Seminar:
"Mirkovic-Vilonen Polytopes in Type A"
JARED ANDERSON, *University of Pittsburgh*

November 10
Theoretical Computer Science/Discrete Math Seminar I:
"Folding and Unfolding in Computational Geometry"
ERIK DEMAINE, *Massachusetts Institute of Technology*

p-ADIC Local Monodromy Seminar:
"Frobenius Structures, Dieudonné-Manin Decompositions, and Slopes"
KIRAN KEDLAYA, *Institute for Advanced Study*

Mathematics Members Seminar:
"An Intrinsic Characterization of Sporadic Simple Groups"
RONALD SOLOMON, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Coherent Sheaves on Stacks"
ARAVIND ASOK, *Princeton University*

November 11
Theoretical Computer Science/Discrete Math Seminar II:
"Approximating the Shortest and Closest Vector in a Lattice to Within Sqrt(n) Lie in NP Intersect coNP"
DORIT AHARONOV, *The Hebrew University of Jerusalem*

November 12
Analysis and PDE Seminar:
"Interaction Morawetz Inequalities and Applications to NLS Evolution Problems"
JAMES COLLIANDER, *Institute for Advanced Study*

November 14
A Celebration of the Life and Work of Armand Borel

November 17
Theoretical Computer Science/Discrete Math Seminar I:
"Approximation Algorithms for Packing"
CLAIRE KENYON, *École Polytechnique* and *Institut Universitaire de France*

p-ADIC Local Monodromy Seminar:
"The Robba Ring and Variants"
KIRAN KEDLAYA, *Institute for Advanced Study*

Mathematics Members Seminar:
"Floer Homology and Dehn Surgeries"
PETER OZSVATH, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Stacks and Vector Bundles on Simple G-Varieties"
ARAVIND ASOK, *Princeton University*

November 18
Theoretical Computer Science/Discrete Math Seminar II:
"Exponential Lower Bounds for the Running Time of DPLL Algorithms on Satisfiable Formulas"
MIKHAIL ALEKHNOVITCH, *Institute for Advanced Study,* with EDWARD A. HIRSCH, *Steklov Institute of Mathematics, Russia* and DMITRY ITSYKSON, *St. Petersburg State University, Russia*

November 19
Analysis and PDE Seminar:
"On Classification of Blow-up Behavior for Critical L^2 NLS"
FRANK MERLE, *Institute for Advanced Study*

November 20
Geometric Representation Theory Seminar:
"Remarks on Parabolic Character Sheaves"
TONNY SPRINGER, *Universiteit Utrecht*

November 24
Theoretical Computer Science/Discrete Math Seminar I:
"Boosting in the Presence of Noise"
ADAM KALAI, *Toyota Technological Institute at Chicago*

Analysis and PDE Seminar:
"On Classification of Blow up Behavior for L^2 Critical NLS"
PIERRE RAPHAEL, *Institute for Advanced Study*

Mathematics Members Seminar:
"Particle Packings, Jamming, and Order Metrics"
SALVATORE TORQUATO, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Homotopy Theory and Stacks (or, Homotopy Theory v. Stacks)"
DANIEL BISS, *Institute for Advanced Study, Clay Mathematics Institute* and *University of Chicago*

November 25
Theoretical Computer Science/Discrete Math Seminar II:
"PCP Testers: Towards a Combinatorial Proof of the PCP Theorem"
OMER REINGOLD, *AT&T* and *Institute for Advanced Study*

December 1
Theoretical Computer Science/Discrete Math Seminar I:
"Expander Flows and a sqrt [log n] - Approximation for Graph Expansion/Sparsest Cut"
SANJEEV ARORA, *Princeton University*

p-ADIC Local Monodromy Seminar:
"Analogue of the Dieudonné-Manin Classification"
KIRAN KEDLAYA, *Institute for Advanced Study*

Mathematics Members Seminar:
"Lie Theory for n-Groupoids"
EZRA GETZLER, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"On Cleanness of Cuspidal Local Systems in Bad Characteristic"
VICTOR OSTRIK, *Institute for Advanced Study*

December 2
Theoretical Computer Science/Discrete Math Seminar II:
"Derandomized low degree tests via epsilon-biased sets, with applications to short Locally Testable Codes and PCPs"
PROFESSOR AVI WIGDERSON, *Institute for Advanced Study*

December 3
Analysis and PDE Seminar:
"On Classification of Blow up Behavior for L^2 Critical NLS"
PIERRE RAPHAEL, *Institute for Advanced Study*

December 8
Theoretical Computer Science/Discrete Math Seminar I:
"Complexity of Succinct Zero-sum Games"
VALENTINE KABANETS, *Simon Frazer University*

p-ADIC Local Monodromy Seminar:
"Descending the Dieudonné-Manin Filtration"
KIRAN KEDLAYA, *Institute for Advanced Study*

Mathematics Members Seminar:
"From the charged quantum gas to the non-linear Schrödinger equation–Dyson's N^{7/5}-conjecture"
JAN PHILLIP SOLOVEJ, *Institute for Advanced Study*

December 9
Theoretical Computer Science/Discrete Math Seminar II:
"Learning Mixtures of Product Distributions"
RYAN O'DONNELL, *Institute for Advanced Study*

December 10
Analysis and PDE Seminar:
"Global Well-Posedness and Scattering for Defocusing Quintic NLS on R^3"
JAMES COLLIANDER, *Institute for Advanced Study*

December 15
p-ADIC Local Monodromy Seminar:
"The Link to p-adic Galois Representations: Berger's Thesis"
KIRAN KEDLAYA, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Cluster Algebras Through Examples"
MIKHAIL KOGAN, *Institute for Advanced Study*

January 14
Analysis and PDE Seminar:
"Harmonic Analysis Aspects of Ginzburg-Landau Minimizer Issues"
PROFESSOR JEAN BOURGAIN, *Institute for Advanced Study*

January 19
Theoretical Computer Science/Discrete Math Seminar I:
"Randomly Sampling Graph Colorings"
THOMAS HAYES, *Toyota Technological Institute, Chicago*

January 20
Theoretical Computer Science/Discrete Math Seminar II:
"Multi-Linear Formulas for Permanent and Determinant are of Super-Polynomial Size"
RAN RAZ, *Weizmann Institute of Science, Israel*

Theoretical Computer Science/Discrete Mathematics Seminar III:
"Rank bounds and integrality gaps for Cutting Planes Procedures"
JOSH BURESH-OPPENHEIM, *University of Toronto*

January 21
Analysis and PDE Seminar:
"Selfsimilar Solutions for the Binormal Flow: Singularity Formation"
LUIS VEGA, *Institute for Advanced Study*

School of Mathematics Faculty Lecture:
"On the Nature of Proof"
PROFESSOR ROBERT MacPHERSON, *Institute for Advanced Study*

January 26
Theoretical Computer Science/Discrete Math Seminar I:
"Spectra of Quantized Walks and a $\sqrt{\delta\varepsilon}$ -Rule"
MARIO SZEGEDY, *Rutgers, the State University of New Jersey*

Mathematics Members Seminar:
"Analytic Geometric Aspects of Stochastic Loewner Evolutions"
ROLAND FRIEDRICH, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"K-Theory and G-Theory on Algebraic Stacks: I"
ROY JOSHUA, *Institute for Advanced Study*

January 27
Theoretical Computer Science/Discrete Math Seminar II:
"Metric Decomposition: Coping with Boundaries"
JAMES R. LEE, *University of California, Berkeley*

January 28
Analysis and PDE Seminar:
"Global Existence in Nonlinear Elastodynamics"
TOM SIDERIS, *University of California, Santa Barbara*

February 2
Theoretical Computer Science/Discrete Math Seminar I:
"Probabilistic Generation of Finite Simple Groups, Random Walks, Fuchsian Groups and Witten's zeta Function"
ANER SHALEV, *The Hebrew University of Jerusalem*

Mathematics Members Seminar:
"A Complete Formulation of the Baum-Connes Conjecture for the Action of Discrete Quantum Groups"
ADEREMI KUKU, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Mod-1 Topological G-Theory for Algebraic Stacks"
ROY JOSHUA, *Institute for Advanced Study*

February 3
Theoretical Computer Science/Discrete Math Seminar I:
"Cut Norm, Grothendieck's Inequality and Approximation Algorithms for Dense Graphs"
NOGA ALON, *Tel-Aviv University*

February 4
Analysis and PDE Seminar:
"Free Boundary Regularity for Harmonic Measure and Poisson Kernels"
CARLOS KENIG, *Institute for Advanced Study*

February 9
Theoretical Computer Science/Discrete Math Seminar I:
"Using Hypergraph Homomorphisms to Guess Three Secrets"
NATHAN SEGERLIND, *Institute for Advanced Study*

Mathematics Members Seminar:
"Harish-Chandra Characters and Motivic Integration"
JULIA GORDON, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Quantum Cluster Algebras"
ANDREI ZELEVINSKY, *Northeastern University*

February 10
Theoretical Computer Science/Discrete Math Seminar II:
"Some Vexing Combinatorial and Mixing Problems"
PETER WINKLER, *Bell Labs* and *Institute for Advanced Study*

February 11
Analysis and PDE Seminar:
"On the Interaction of Nearly Parallel Vortex Filaments"
GUSTAVO PONCE, *University of California, Santa Barbara*

February 13
Special Seminar:
"Motivic Integration and the Regular Shalika Germ"
ELLIOTT LAWES, *University of Michigan*

February 16
Theoretical Computer Science/Discrete Math Seminar I:
"Nash Equilibria and Complexity"
CHRISTOS PAPADIMITRIOU, *University of California, Berkeley*

February 17
Theoretical Computer Science/Discrete Math Seminar II:
"The Structure of Clawfree Graphs"
MARIA CHUDNOVSKY, *Princeton University, CMI* and *Institute for Advanced Study*

February 18
Theoretical Computer Science/Discrete Math Seminar II:
"Laplacians, Homology and Hypergraph Matching"
ROY MESHULAM, *Technion-Israel, Institute of Technology*

Analysis and PDE Seminar:
"Partial Regularity Results for the Navier-Stokes Equations with Hyper-Dissipation"
NATASA PAVLOVIC, *Princeton University*

February 19
Geometric Representation Theory:
"t-structures on derived categories of coherent sheaves and representation theory - Part 1"
ROMAN BEZRUKAVNIKOV, *Northwestern University*

February 20
Geometric Representation Theory:
"t-structures on derived categories of coherent sheaves and representation theory - Part 2"
ROMAN BEZRUKAVNIKOV, *Northwestern University*

February 23
Theoretical Computer Science/Discrete Math Seminar I:
"On Separating Nondeterminism and Randomization in Communication Complexity"
RAVI KUMAR, *IBM Almaden Research Center*

Theoretical Computer Science/Discrete Math Seminar II:
"On the Computability of Julia Sets"
MARK BRAVERMAN, *University of Toronto*

Special Mathematics Seminar:
"Lower Bounds for L-Functions at the Edge of the Critical Strip (after Peter Sarnak)"
EREZ LAPID, *The Hebrew University of Jerusalem*

Geometric Representation Theory Seminar:
"Integration of One-forms on p-adic Analytic Spaces"
VLADIMIR BERKOVICH, *Weizmann Institute of Science, Israel*

February 24
Theoretical Computer Science/Discrete Math Seminar III:
"Making Sense of Bounded Arithmetic"
STEPHEN COOK, *University of Toronto*

February 25
Analysis and PDE Seminar:
"Scattering and Singular Spectrum for Schrödinger Operators with Decaying Potentials"
ALEX KISELEV, *Institute for Advanced Study*

March 1
Theoretical Computer Science/Discrete Math Seminar I:
"Quasi-Ramanujan 2-lifts - A New Construction of Expander Graphs"
YONATAN BILU, *The Hebrew University of Jerusalem*

Mathematics Members Seminar:
"Main Conjectures for Modular Forms"
CHRISTOPHER SKINNER, *Institute for Advanced Study*

Joint Princeton/Institute for Advanced Study Number Theory Seminar:
"Congruences Between Stable and Endoscopic Forms and Arithmetic Applications (Work in Progress)"
MICHAEL HARRIS, *Université Paris* and *Harvard University*

Geometric Representation Theory Seminar:
"Intersection Homology of Groupoids"
MARK GORESKY, *Institute for Advanced Study*

March 2
Theoretical Computer Science/Discrete Math Seminar II:
"On a Model for Backtracking"
TONIANN PITASSI, *Institute for Advanced Study*

March 3
Analysis and PDE Seminar:
"The Cauchy Problem for the Hyperbolic-Elliptic Ishimori System"
ANDREA NAHMOD, *University of Massachusetts, Amherst* and *Institute for Advanced Study*

March 8
Theoretical Computer Science/Discrete Math Seminar I:
"Online Concealed Correlation by Boundedly Rational Players"
ABRAHAM NEYMAN, *Institute of Mathematics, The Hebrew University of Jerusalem*

Mathematics Members Seminar:
"A Proof for the Existence of Classical Solutions for the Critical Nonlinear Schrödinger Equation in 3-D"
GIGLIOLA STAFFILANI, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Tensor Categories Attached to Cells in Affine Weyl Groups"
VICTOR OSTRIK, *Institute for Advanced Study*

March 9
Theoretical Computer Science/Discrete Math Seminar II:
"Extracting Randomness from Few Independent Sources"
BOAZ BARAK, *Institute for Advanced Study*

March 10
Analysis and PDE Seminar:
"Asymptotic Stability of Multi-Soliton Solutions for Nonlinear Schrödinger Equations"
GALINA PERELMAN, *Institute for Advanced Study*

March 15
Theoretical Computer Science/Discrete Math Seminar I:
"Locally Testable Cyclic Codes"
AMIR SHPILKA, *Weizmann Institute of Science, Israel*

Joint Princeton University/Institute for Advanced Study Number Theory Seminar:
"The Spherical Unitary Dual for Split p-adic Exceptional Groups"
DAN CIUBOTARU, *Cornell University*

Mathematics Members Seminar:
"Jacquet-Langlands, Multiplicity one and Unitarity"
IOAN BADULESCU, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Character Sheaves and the Drinfeld Double (work in progress)"
VICTOR OSTRIK, *Institute for Advanced Study*

March 16
Theoretical Computer Science/Discrete Math Seminar II:
"BCH Codes, Augmented Tensor Products and Hardness of the Shortest Vector Problem in Lattices"
SUBHASH KHOT, *Institute for Advanced Study*

March 17
Analysis and PDE Seminar:
"Profits and Bonuses of Harmonic Analysis"
ALEXANDER VOLBERG, *Institute for Advanced Study*

March 22
Theoretical Computer Science/Discrete Math Seminar I:
"Spam and Pebbling"
MONI NAOR, *Weizmann Institute of Science, Israel*

Mathematics Members Seminar:
"Decay and Scattering on Black Hole Metrics"
AVY SOFFER, *Institute for Advanced Study*

March 23
Workshop on Mathematical Aspects of Nonlinear PDEs

Theoretical Computer Science/Discrete Math Seminar II:
"Efficient Primality Testing"
MANINDRA AGRAWAL, *Institute for Advanced Study*

March 24
Workshop on Mathematical Aspects of Nonlinear PDEs

March 25
Workshop on Mathematical Aspects of Nonlinear PDEs

March 26
Workshop on Mathematical Aspects of Nonlinear PDEs

March 29
Theoretical Computer Science/Discrete Math Seminar I:
"Graph Products are (almost!) Practical"
MIKE CAPALBO, *Center for Discrete Mathematics and Theoretical Computer Science (DIMACS)*

Mathematics Members Seminar:
"From Random Matrices to Supermanifolds"
MARTIN ZIRNBAUER, *Institute for Advanced Study*

Geometric Representation Theory Seminar:
"Loops in Spherical Varieties and Langlands Duality, Part I"
DAVID NADLER, *University of Chicago*

March 30
Theoretical Computer Science/Discrete Math Seminar II:
"Search by Quantum Walks"
ANDRIS AMBAINIS, *Institute for Advanced Study*

March 31
Analysis and PDE Seminar:
"An example of solution of 1 dimensional periodic Nonlinear Schrödinger Equation with polynomial growth of Sobolev Norms and diffusion in high dimensional Hamiltonian systems"
VADIM KALOSHIN, *Institute for Advanced Study*

April 1
Geometric Representation Theory Seminar:
"Loops in Spherical Varieties and Langlands Duality, Part II"
DAVID NADLER, *University of Chicago*

April 5
Theoretical Computer Science/Discrete Math Seminar I:
"A Near Optimal Bound on Erdos Distinct Distances in High Dimensions"
VAN VU, *University of California, San Diego*

April 6
Theoretical Computer Science/Discrete Math Seminar II:
"Strong Proof Systems and Hard Tautologies"
JAN KRAJIČEK, *Institute for Advanced Study*

April 8
Marston Morse Memorial Lecture:
"Geometry and Analysis of Einstein 4-Manifolds"
GANG TIAN, *Princeton University*

April 9
Marston Morse Memorial Lecture:
"Geometry and Analysis of Einstein 4-Manifolds"
GANG TIAN, *Princeton University*

April 12
Theoretical Computer Science/Discrete Math Seminar I:
"Solving Extremal Problems Using Stability Approach"
BENNY SUDAKOV, *Princeton University*

Joint Princeton University/Institute for Advanced Study Number Theory Seminar:
"Central Values of Twisted L-Functions"
ZHENGYU MAO, *Rutgers, the State University of New Jersey at Newark*

April 13
Theoretical Computer Science/Discrete Math Seminar II:
"Guessing More Secrets via List Decoding"
ALEXANDER RAZBOROV, *Institute for Advanced Study*

April 14
Analysis and PDE Seminar:
"Lectures on Global Well-Posedness and Scattering for the Energy-Critical Schrödinger Equation"
GIGLIOLA STAFFILANI, *Institute for Advanced Study*

April 19
Theoretical Computer Science/Discrete Math Seminar I:
"Some Optimality Results in Bounded-Storage Cryptography"
ANDREW YAO, *Princeton University*

April 20
Theoretical Computer Science/Discrete Math Seminar II:
"Search by Quantum Walks II"
ANDRIS AMBAINIS, *Institute for Advanced Study*

April 21
Analysis and PDE Seminar:
"Lectures on Global Well-Posedness and Scattering for the Energy-Critical Schrödinger Equation"
GIGLIOLA STAFFILANI, *Institute for Advanced Study*

April 26
Theoretical Computer Science/Discrete Math Seminar I:
"Network Failure Detection and Graph Connectivity"
JON KLEINBERG, *Cornell University*

Mathematics Members Seminar:
"Monopoles and Mergers in 4 Dimensions"
STEFAN BAUER, *Institute for Advanced Study*

April 27
Theoretical Computer Science/Discrete Math Seminar II:
"Optimal inapproximability results for MAX-CUT and other 2-variable CSPs?"
RYAN O'DONNELL, *Institute for Advanced Study*

Informal Mathematics Lecture:
"On Floer Homology for Seiberg-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

April 28
Analysis and PDE Seminar:
"Lectures on Global Well-Posedness and Scattering for the Energy-Critical Schrödinger Equation"
GIGLIOLA STAFFILANI, *Institute for Advanced Study*

"Formality Theorems for Hochschild (co)chains of $C^\infty(M)$ on an arbitrary smooth manifold M"
V.A. DOGLUSHEV, *Massachusetts Institute of Technology*

May 3
Theoretical Computer Science/Discrete Math Seminar I:
"Fast Quantum Algorithms for Computing the Unit Group and Class Group of a Number Field"
SEAN HALLGREN, *NEC Research Institute, Princeton*

May 4
Theoretical Computer Science/Discrete Math Seminar II:
"Ruling Out PTAS for Graph Min-Bisection"
SUBHASH KHOT, *Institute for Advanced Study*

Informal Mathematics Lecture:
"On Floer Homology for Seiberg-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

May 5
Analysis and PDE Seminar:
"Lectures on Global Well-Posedness and Scattering for the Energy-Critical Schrödinger Equation"
GIGLIOLA STAFFILANI, *Institute for Advanced Study*

May 10
Theoretical Computer Science/Discrete Math Seminar I:
"New Notions of Security: Universal Composability without Trusted Setup"
MANOJ PRABHAKARAN, *Princeton University*

May 11
Theoretical Computer Science/Discrete Math Seminar II:
"Two Topics on the Interface of Probability and Algorithms"
YUVAL PERES, *University of California, Berkeley*

May 13
Informal Mathematics Lecture:
"On Floer Homology for Seiberg-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

May 17
Theoretical Computer Science/Discrete Math Seminar I:
"Some Results on k-gonal Metrics"
YUVAL RABANI, *Technion-Israel Institute of Technology* and *Cornell University*

May 18
Theoretical Computer Science/Discrete Math Seminar II:
"Ruling out PTAS for Graph Min-Bisection"
SUBHASH KHOT, *Institute for Advanced Study*

May 19
Informal Mathematics Lectures:
"On Floer Homology for Seiberg-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

May 21
Informal Mathematics Lectures:
"On Floer Homology for Seiber-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

May 24
Theoretical Computer Science/Discrete Math Seminar I:
"Algorithmic Construction of Sets for k-Restrictions"
DANA MOSHKOVITZ, *Tel Aviv University*

May 25
Theoretical Computer Science/Discrete Math Seminar II:
"Tournaments, Boxes and Non-Transitive Dice"
PETER WINKLER, *Bell Laboratories/Institute for Advanced Study*

May 26
Informal Mathematics Lectures:
"On Floer Homology for Seiberg-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

May 28
Informal Mathematics Lectures:
"On Floer Homology for Seiberg-Witten Monopoles"
TOM MROWKA, *Institute for Advanced Study*

DAVID GRAHAM

"My colleagues in physics have stimulated good discussions, and I am fortunate to have so many of them. I have enjoyed fruitful collaboration with several of the other Members. The seminar schedule is light enough to allow stretches of uninterrupted free research. Our informal group discussions, frequently featuring research in progress, have been especially helpful."

— Member, School of Natural Sciences

Afternoon tea in the Common Room, Fuld Hall

THE SCHOOL OF NATURAL SCIENCES

Faculty

STEPHEN L. ADLER, Particle Physics

JOHN N. BAHCALL, Astrophysics
Richard Black Professor

PETER GOLDREICH *(as of 1-1-04)*, Astrophysics

JUAN MALDACENA, Theoretical Physics

NATHAN SEIBERG, Theoretical Physics

EDWARD WITTEN, Mathematical Physics
Charles Simonyi Professor

Professor Emeritus

FREEMAN J. DYSON, Mathematical Physics and Astrophysics

Visiting Professor

ARNOLD J. LEVINE, Systems Biology

ACADEMIC ACTIVITIES

PROFESSOR STEPHEN ADLER spent the summer completing revisions of his book entitled "Quantum Theory as an Emergent Phenomenon: The Statistical Dynamics of Matrix Models as the Precursor of Quantum Field Theory." Proofreading and indexing are now complete, and the book will be published by Cambridge University Press in the spring of 2004. This book is a revised and expanded version of the draft preprinted in 2002 on the high energy theory archive (hep-th/0206120), and gives a detailed development of work of Adler and collaborators over the last nine years on the idea that the classical dynamics of non-commutative matrix variables can lead, in the statistical thermodynamic approximation, to an emergent quantum field theory. The book also suggests that Brownian motion corrections to this thermodynamics can give an underlying justification for proposals by Ghirardi, Rimini, and Weber, by Pearle, and others, that stochastic modifications of the Schrödinger equation can give a phenomenology of state vector reduction. In collaboration with Horwitz, Adler studied the general problem of formulating a global unitary fixing for matrix-valued correlations in general matrix models with a global unitary invariance. (This problem is relevant for the Ward identities used in the pre-quantum mechanics developed in Adler's book.) They show that averages over the partition function of global unitary invariant trace polynomials are the same when calculated with any choice of a global unitary fixing, while averages of such polynomials without a trace define matrix-valued correlation functions, that depend on the choice of unitary fixing. The unitary fixing is formulated within the standard Faddeev-Popov framework, in which the squared Vandermonde determinant emerges as a factor of the complete Faddeev-Popov determinant. Adler and Horwitz also give the ghost representation for the FP determinant, and the corresponding BRST invariance of the unitary-fixed partition function. Adler is now starting on various new projects and/or follow-ups

to older ones. One project still on the agenda is a study of the possibility of grand unified models based on the group E_8. Further ideas on this were written up in a paper suggesting that E_8, while generating a singlet condensate, may be gapless, permitting some gluinos to survive to low energies as the standard model fermions. Continued work on phenomenology relating to a possible E_8 unification is planned. Currently, Adler is working on an historical and review article entitled "Anomalies to All Orders," surveying his involvement in anomaly theory, and in particular focusing on the all orders calculations of the chiral and trace anomalies, and their confluence in the context of supersymmetric theories. This article will appear in a book "Fifty Years of Yang-Mills Theory" that is being assembled by Gerard 't Hooft for publication this year by World Scientific.

In the Academic year 2003-04, PROFESSOR JOHN BAHCALL completed work on problems related to solar neutrinos, solar structure, and neutrinoless double beta-decay. Some of the principal results are described below.

Bahcall and Carlos Peña-Garay analyzed all available solar and reactor neutrino data, in addition to atmospheric neutrino data, to provide experimental determinations of the most important solar neutrino fluxes. The calculated and measured results agree remarkably well. For example, the measured value for the basic p-p neutrino flux is (1.02 ± 0.02) times the predicted flux and the measured value for the ^{8}B flux is (1.01 ± 0.04), where the errors shown are the 1σ experimental uncertainties only. The uncertainty for the solar model prediction of the p-p flux is smaller than the measurement uncertainty, but the error for the ^{8}B prediction is much larger than the measurement uncertainty. Bahcall and Peña-Garay introduced several new features in the analysis of solar neutrino data in this paper. The paper of Bahcall and Peña-Garay is sometimes known among solar neutrino physicists as "The Road Map Paper," since it also describes what can be learned from future solar neutrino experiments.

Bahcall and Marc Pinsonneault (Ohio State) determined refined values for the solar model neutrino fluxes using improved values for a number of quantities that are required in the model calculations. This work identified a major problem that is currently being investigated by different research groups, namely, that the calculated depth of the solar convective zone does not agree with helioseismological measurement of the depth (measurement accuracy 0.14%) unless either the radiative opacity is changed or the recent determinations of the solar heavy element abundance are in error.

Together with Aldo Serenelli and Marc Pinsonneault, Bahcall investigated how accurately one can calculate the depth of the solar convective zone with existing data for solar models. They showed that a 7% increase in the standard value of this opacity could explain the discrepancy between the calculated and measured depths of the solar convective zone.

Bahcall, Hitoshi Murayama (UC Berkeley and IAS), and Peña-Garay made an assessment of how well next generation neutrinoless double beta decay and normal neutrino beta decay experiments can answer four fundamental questions. They based their answers on the expected performance of next generation neutrinoless double beta decay experiments and on simulations of the accuracy of calculations of nuclear matrix elements. The four questions they considered are listed below.

1) If neutrinoless double beta decay searches do not detect a signal, and if the spectrum is known to be inverted hierarchy, can we conclude that neutrinos are Dirac particles? 2) If neutrinoless double beta decay searches are negative and a next generation ordinary beta decay experiment detects the neutrino mass scale, can we conclude that neutrinos are Dirac particles? 3) If neutrinoless double beta decay is observed with a large neutrino mass element, what is the total mass in neutrinos? 4) If neutrinoless double beta decay is observed but next generation beta decay searches for a neutrino mass only set a mass upper limit, can we establish whether the mass hierarchy is normal or inverted?

PROFESSOR PETER GOLDREICH's research during the academic year 2003-04 was primarily directed toward understanding the formation of solar system and extrasolar planets. He also resolved puzzles presented by chaotic motions of satellites in the Saturnian system, and elucidated the gauge freedom inherent in celestial mechanics perturbation theory. Some of the results from these projects are outlined below.

Goldreich, together with Yoram Lithwick and Re'em Sari addressed three questions regarding solar system planets. What determined their number? Why are their orbits nearly circular and coplanar? How long did they take to form? They departed from standard treatments of planet formation by demonstrating that as the big bodies got bigger, the small ones got smaller as the result of undergoing a collisional fragmentation cascade. It follows that protoplanets grew rapidly even in the outer solar system. When the surface mass density of the protoplanets matched that of the small bodies they were accreting, dynamical friction was no longer able to balance viscous stirring, so the protoplanets' velocity dispersion increased to the extent that their orbits crossed. What happened next differed in the inner and outer parts of the planetary system. In the inner part, where the ratios of the escape velocities from the surfaces of the planets to the escape velocities from their orbits are smaller than unity, big bodies collided and coalesced after their random velocities became comparable to their escape velocities. In the outer part, where these ratios are larger than unity, the random velocities of some of the big bodies continued to rise until they were ejected. In both parts, the number density of the big bodies eventually decreased to the extent that gravitational interactions among them no longer produced large scale chaos. After that their orbital eccentricities and inclinations were damped by dynamical friction from the remaining small bodies.

Goldreich and Nicole Rappaport demonstrated that the unpredictable motions of the Saturnian satellites Prometheus and Pandora were the result of chaos. Recent HST images show that their longitudes deviate from predictions of ephemerides based on Voyager images. Currently Prometheus is lagging and Pandora leading these predictions by somewhat more than 20°. These discrepancies are fully accounted for by gravitational interactions between the two satellites which peak every 24.8 days at conjunctions and excite chaotic perturbations. The Lyapunov exponent for the Prometheus-Pandora system is of order 0.3 year-1 for satellite masses based on a nominal density of 0.63 g cm-3. Interactions are strongest when the orbits come closest together. This happens at intervals of 6.2 years when their apses are antialigned. Interactions associated with the 121:118 mean motion resonance were identified as the source of the chaos. Differential precession splits this resonance into a quartet of components equally spaced in frequency. Libration widths of the individual components exceed the splitting, resulting in resonance overlap which causes the chaos. A model with 1.5 degrees of freedom captures the essential features of the chaotic dynamics. The Lyapunov exponent of 0.3 yr-1 arises

because the critical argument of the dominant member of the resonant quartet makes approximately two separatrix crossings every 6.2 year precessional cycle.

Michael Efroimsky and Goldreich demonstrated how the internal symmetry of the N-body celestial-mechanics problem can be exploited in orbit calculations. This class of problems is treated by the variation-of-constants method. Whenever a standard system of six planetary equations (in the Lagrange, Delaunay, or other form) is employed for N objects, the trajectory resides on a 9(N-1)-dimensional submanifold of the 12(N-1)-dimensional space spanned by the orbital elements and their time derivatives. The freedom in choosing this submanifold reveals an internal symmetry inherent in the description of the trajectory by orbital elements. This freedom is analogous to the gauge invariance of electrodynamics. In traditional derivations of the planetary equations this freedom is removed by hand through the introduction of the Lagrange constraint, either explicitly (in the variation-of-constants method) or implicitly (in the Hamilton-Jacobi approach). This constraint imposes the condition (called "osculation condition") that both the instantaneous position and velocity be fit by a Keplerian ellipse (or hyperbola), i.e., that the instantaneous Keplerian ellipse (or hyperbola) be tangential to the trajectory. Imposition of any supplementary constraint different from that of Lagrange (but compatible with the equations of motion) would alter the mathematical form of the planetary equations without affecting the physical trajectory. However, for coordinate-dependent perturbations, any gauge different from that of Lagrange makes the Delaunay system non-canonical. Still, it turns out that in a more general case of disturbances dependent also upon velocities, there exists a "generalised Lagrange gauge," i.e., a constraint under which the Delaunay system is canonical (and the orbital elements are osculating in the phase space). This gauge reduces to the regular Lagrange gauge for perturbations that are velocity-independent. The calculation of satellite motion about an oblate precessing planet provides a practical example illustrating how the gauge formalism can be applied to simplify calculations.

During the 2003-04 academic year, PROFESSOR ARNOLD LEVINE worked on the projects described below.

In a cell, hundreds of proteins act together to form signal transduction pathways that both inform the organism and allow it to act upon outside information for sensing nutrient levels, signals to divide, or even various types of stress. Inside the cell these signals are integrated and the responses are coordinated. These proteins are encoded by DNA and a particularly complex stress arises when the DNA is damaged. The replication of damaged DNA results in a several hundred-fold increase in the mutation or error rate during DNA duplication. Thus there is a signal transduction pathway that responds to DNA damage by either stopping progression of cell division and permitting repair of the DNA or initiating a program of cell death or apoptosis, eliminating a clone of cells with mutated DNA. Central to this pathway is the p53 gene and its protein.

After DNA damage proteins that sense the altered DNA structure associate with the lesion assemble a set of repair proteins. Associated with this complex on the damaged DNA are signaling proteins which chemically modify (by phosphorylation and acetylation) the p53 protein. These modifications increase the concentration and alter the conformation of the p53 protein so that it now binds to specific DNA sequences, termed the response element, adjacent to genes which it then specifically directs the transcription of in a cell. These p53 responsive genes then either promote a program of cell cycle division

arrest and DNA repair or initiate a program for apoptosis. One of the p53 responsive genes is called HDM-2 which has a responsive element in the first intron of this gene. Thus an activated p53 protein turns on the synthesis of the HDM-2 protein which in turn binds to the p53 protein and promotes its degradation. This portion of the signal transduction pathway sets up an autoregulatory feedback loop where p53 promotes the synthesis of HDM-2 which in turn binds to and degrades the p53 protein. This predicts that these two proteins may oscillate out of phase with each other in a cell transmitting and regulating a signal for cell cycle arrest or apoptosis. We have tested this idea experimentally by labeling the p53 protein and the HDM-2 protein with green or red fluorescent markers and recording the concentrations of these proteins in single cells. Indeed the concentrations of the p53 protein and the HDM-2 protein do oscillate out of phase in a cell after DNA damage and the number of oscillations recorded by a cell is proportional to the level of DNA damage (a digital signaling) (Lahav et al, 2004, *Nature Genetics*, 36, 147-150). The measurements of the protein concentrations in a large number of cells over time have permitted us to choose which differential equations which describe oscillators may be applicable to model this network.

We have identified 82 genes and their proteins which compose the p53 network or signal transduction pathway. The DNA sequence of this pathway is known in humans for not only one person but in a large number of people. Interestingly this DNA sequence differs between people in about once every 1,000 base pairs out of three billion base pairs in our genome. Thus people differ from each other genetically at about three million positions in their genome. These differences are called single nucleotide polymorphisms or SNPs. We have assembled all of the SNPs in the p53 pathway from the databases of human DNA sequences. There are 1,335 SNPs in the 82 genes of the p53 pathway. Of these 977 are located in the non-protein coding regions of the DNA surrounding these genes and some of these SNPs could impact the control of the timing or levels of the proteins made after DNA damage. There are 358 coding SNPs of which 212 are synonymous SNPs which change a base pair but do not change an amino acid in the protein. Thus in the 82 proteins there are 146 amino acid alterations that could alter their functional activities. We are employing a variety of informatics tools to determine prior to experiments which changes would have the largest predicted impact upon the signal transduction pathway.

We have studied one SNP in more detail. It is a non-coding SNP in the first intron, the regulatory regions, of the HDM-2 gene. This is called SNP-309 and is found in the normal or wild type homozygote form (T:T) in 48% of people, in the (T:G) heterozygous form in 40% of people and the homozygous recessive form (G:G) in 12% of the population. The G:G form in the HDM-2 gene produces more HDM-2 protein and therefore less p53 protein (HDM-2 degrades p53). Thus after DNA damage people with the G:G form of the HDM-2 gene often have cells that undergo less apoptosis and could then be less efficient in eliminating clones of cells that harbor mutations that result from duplicating damaged DNA. To test these ideas, three sets of people who developed cancers, which result from mutations in selected genes, were typed for the SNP-309 by DNA sequencing. In children that developed soft tissue sarcomas those with the G:G and G:T form of this SNP obtained these tumors at an average age of two years while those with the T:T form of this SNP developed cancers at an average age of 14 years. For breast cancers in patients that were predisposed to developing cancers the average age of onset of the G:G and G:T women was 29 years while the T:T women had an average age of onset of 39 years. For adult onset tumors, also soft tissue sarcomas, the G:G individuals had an

average age of onset of 45 while the T:T patients had an average age of onset of 57 years. A detailed statistical analysis of these data had p-values of less than 0.01-0.02. Thus at the level of the gene, the signal transduction pathway, the cell, the organism and the population a good understanding of genetic differences can be uncovered.

PROFESSOR JUAN MALDACENA has worked on a variety of problems in string theory and quantum field theory. Continuing previous studies, he considered the decay of unstable D-branes in string theory. In [1] this process was studied in the context of two dimensional string theories. In this case the tree level string computation is basically the same as in all other string theories. But the two dimensional string theory is precisely dual to a solvable matrix model. So all corrections to the tree level answer can be computed and it can be seen, that in this case, these corrections are rather simple. While the tree level answer suggests that the energy emitted by the brane is infinite, the effect of the higher order corrections is to provide the correct cutoff in the energy so that the total energy emitted is of order $E \sim 1/g_s$, which is the energy of the unstable brane. The cutoff arises from taking into account the initial spread in the wavefunction for the tachyon.

In [2] a duality between two dimensional superstring theories and matrix models was proposed. This was further studied in [3]. These two dimensional superstring theories are non-perturbatively well defined and give an interesting framework for studying non-perturbative processes in string theory. These two dimensional superstring theories are related to particular matrix models that are completely solvable.

In [4] models of brane inflation were studied. It was found that the slow roll condition is rather difficult to achieve. Previous proposals for achieving slow roll were shown to be ineffective in concrete string theory models where all moduli are stabilized. While no model with naturally small slow roll parameters was found, it was argued that with a fine tuning of one part in a hundred one might achieve slow roll inflation in this model.

In [5] a rather speculative proposal was made for understanding the interior of black holes. The idea is that one should think of the interior of a black hole as a fixed final state. Then one cannot transfer any information between the exterior of the black hole and its interior.

In [6] some interesting euclidean supergravity solutions were found. These solutions have two boundaries that are rather similar to the boundaries of AdS, which appear in the context of AdS/CFT. The fact that two boundaries are present make the interpretation of these solutions rather difficult and pose some puzzles for the interpretation AdS/CFT.

During the Academic Year 2003-04, PROFESSOR NATHAN SEIBERG's work had two themes. He studied theories in a noncommutative superspace and the matrix models of noncritical string theory.

He explored a deformation of the standard four dimensional $N = 1$ superspace by making the odd coordinates Θ not anticommuting, but satisfying a Clifford algebra. Consistency determines the other commutation relations of the coordinates. In particular, the ordinary spacetime coordinates x cannot commute. The chiral and vector superfields and their interactions were studied. As in ordinary noncommutative field theory, a change of

variables allows one to express the gauge interactions in terms of component fields, which are subject to standard gauge transformation laws. Unlike ordinary noncommutative field theories, the change of the Lagrangian is a polynomial in the deformation parameter. Despite the deformation, the noncommutative theories still have an antichiral ring with all its usual properties.

In string theory these theories arise on a D-brane in a graviphoton background. With N. Berkovits this background was analyzed in detail. The underlying $N = 2$, $d = 4$ flat space super-Poincaré algebra is deformed to another algebra with eight supercharges. A D-brane in this space preserves a quarter of the supercharges; i.e. $N = 1/2$ supersymmetry is realized linearly, and the remaining $N = 3/2$ supersymmetry is realized nonlinearly.

The second theme of Seiberg's work has been the matrix model description of noncritical strings with $c \leq 1$. With I.R. Klebanov and J. Maldacena, Seiberg considered the unstable D0-brane of two dimensional string theory, described by the boundary state of Zamolodchikov and Zamolodchikov (ZZ) multiplied by the Neumann boundary state for the time coordinate t. In the matrix model, this D0-brane is described by a matrix eigenvalue on top of the upside down harmonic oscillator potential. As suggested by McGreevy and Verlinde, an eigenvalue rolling down the potential describes D-brane decay. As the eigenvalue moves down the potential to the asymptotic region it can be described as a free relativistic fermion. Using bosonization this state is described in terms of a coherent state of the tachyon field in the asymptotic region. This coherent state agrees with the exponential of the closed string one-point function on a disk with Sen's marginal boundary interaction for t which describes D0-brane decay.

With M.R. Douglas, I.R. Klebanov, D. Kutasov, J. Maldacena and E. Martinec the system of two dimensional supergravity coupled to $\hat{c} = 1$ matter was analyzed. After reviewing and extending the traditional descriptions of this class of theories, they provided a matrix model description. The 0B theory is similar to the realization of two dimensional bosonic string theory via matrix quantum mechanics in an inverted harmonic oscillator potential; the difference is that the model is expanded around a non-perturbatively stable vacuum, where the matrix eigenvalues are equally distributed on both sides of the potential. The 0A theory is described by a quiver matrix model.

With I.R. Klebanov and J. Maldacena the similar $\hat{c} < 1$ noncritical strings were analyzed. They proposed that the double scaling behavior of the unitary matrix models, and that of the complex matrix models, is related to type 0B and 0A fermionic string theories. They examined in detail the $\hat{c} = 0$ or pure supergravity case, which is related to the double scaling limit around the Gross-Witten transition, and found that reversing the sign of the Liouville superpotential interchanges the 0A and 0B theories. Also, a smooth transition between weakly coupled string backgrounds with D-branes, and backgrounds with Ramond-Ramond fluxes only was found. Finally, matrix models with multicritical potentials that are conjectured to correspond to 0A/0B string theories based on $(2, 4k)$ superminimal models were also analyzed.

A detailed study of these noncritical theories based on the worldsheet approach was undertaken with D. Shih. They studied both bosonic and supersymmetric (p, q) minimal models coupled to Liouville theory using the ground ring and the various branes of the

theory. From the FZZT brane partition function, there emerges a unified, geometric description of all these theories in terms of an auxiliary Riemann surface $M_{p,q}$ and the corresponding matrix model. In terms of this geometric description, both the FZZT and ZZ branes correspond to line integrals of a certain one-form on $M_{p,q}$. Moreover, there are a finite number of distinct (m, n) ZZ branes; they are located at the singularities of $M_{p,q}$. Finally, the unified treatment of these models suggests that the bosonic and supersymmetric theories with (p, q) odd and relatively prime are identical.

In 2003-04, PROFESSOR EDWARD WITTEN's research focused on perturbative gauge theory, which is one of the basic tools for understanding experiments at accelerators. There are standard textbook recipes for computation, but these are extremely complicated and unwieldy, yet the answers turn out to be surprisingly simple. To understand this better, Witten developed a new approach to perturbative gauge theory via string theory in twistor space. The long-term goal is to get a new window on understanding aspects of gauge theory that are currently out of reach.

PROFESSOR EMERITUS FREEMAN DYSON spent much of the year giving lectures and attending meetings away from Princeton. In October 2003 he visited the Institute for Theoretical and Experimental Physics in Moscow, where he received the Pomeranchuk Prize. The prize is given each year to one Russian and one foreign physicist. This year the prize-winners were Dyson and V.A. Rubakov.

After Dyson's two-year service on the NASA Advisory Council ended, he began serving on the National Academy of Sciences "Committee on Advances in Technology and the Prevention of their Application to Next Generation Biowarfare Threats." This NAS committee is mainly composed of biologists. Dyson is on the committee to make sure that any future diabolical devices invented by physicists will not be overlooked. The committee plans to report its findings in July 2005.

When Dyson is not otherwise engaged, he continues to explore the question whether single gravitons are, in principle, detectable. During the year he has oscillated between affirmative and negative answers to this question. The design of imaginary experiments to detect single gravitons turns out to be a tricky problem. If no such experiment were possible, this would have important implications for the physical meaning of quantum gravity.

THE SCHOOL OF NATURAL SCIENCES

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University of Massachusetts, Amherst · *v*, *f*

ZHAO-XI ZHANG
Particle Physics
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f First Term · *j* Joint with Program in Theoretical Biology · *m* Long Term Member · *s* Second Term · *v* Visitor

THE SCHOOL OF NATURAL SCIENCES

RECORD OF EVENTS

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

Academic Year 2003-04

September 8
Biology Group Meeting: "A Review of Biological Factors Involved in Longevity"
ARNOLD J. LEVINE, *Institute for Advanced Study*

September 15
High Energy Theory Seminar: "QCD Conformal Operators and Integrability"
ANDREI BELITSKY, *University of Maryland*

Institute for Advanced Study Discussion Group: "Cosmic Rays"
CARLOS PEÑA-GARAY, *Institute for Advanced Study*

September 16
Astrophysics Seminar: "Anatomy of the Cosmic-Ray Spectrum"
THOMAS GAISSER, *Bartol Research Institute*

September 18
Physics Group Meeting: "Non-Anticommutative Superspace and N=1/2 Field Theories"
RUTH BRITTO, *Institute for Advanced Study*

September 19
High Energy Theory Lunchtime Seminar: "Phenomenological Aspects of M-Theory"
ALON FARAGGI, *Oxford University*

September 22
Institute for Advanced Study Discussion Group: "Internal Structure of Clusters of Galaxies"
ARTHUR KOSOWSKY, *Rutgers University*

September 23
Astrophysics Seminar: "Internal Motion and Turbulence in Clusters of Galaxies and X-Ray Line Profiles"
RASHID SUNYAEV, *Max Planck Institute for Astrophysics*

September 29
High Energy Theory Seminar: "Warped Grand Unification"
YASUNORI NOMURA, *Fermilab*

Institute for Advanced Study Discussion Group: "Chandra and Swift Surveys"
JONATHAN GRANOT, *Institute for Advanced Study*

September 30
Phenomenology Meeting: "Higgsless Models in Extra Dimensions"
YASUNORI NOMURA, *Fermilab*

Astrophysics Seminar: "Current Results and Future Prospects for Chandra and Swift Surveys"
DONALD SCHNEIDER, *Pennsylvania State University*

October 1
High Energy Theory Special Seminar: "Vortices in String Theory"
DAVID TONG, *Massachusetts Institute of Technology*

October 2
String Cosmology Discussion Group: "Density Perturbations, Spectral Tilt and a Novel Duality"
PAUL STEINHARDT, *Princeton University/Institute for Advanced Study*

October 3
Biology Group Meeting: "A Review of Biological Factors Involved in Longevity, Lecture 2"
ARNOLD J. LEVINE, *Institute for Advanced Study*

High Energy Theory Lunchtime Seminar: "Towards Inflation in String Theory"
JUAN MALDACENA, *Institute for Advanced Study*

October 6
Institute for Advanced Study Discussion Group: "Metal-Poor Stars"
JOOP SCHAYE, *Institute for Advanced Study*

October 7
Institute for Advanced Study Astrophysics Seminar:
"The Frequency of Carbon-enhanced Metal-poor Stars and Inferences on the IMF in the Early Universe"
TIMOTHY BEERS, *Michigan State University*

October 8
Physics Group Meeting: "Multi-Matrix Models and Calabi-Yau Spaces"
FRANK FERRARI, *Institute for Advanced Study* and *Université de Neuchâtel*

Phenomenology Meeting: "Supersymmetry in B-> ϕ K_S"
DANIEL LARSON, *University of California, Berkeley*

October 9
String Cosmology Discussion Group: "Metastable de Sitter Vacua in String Theory"
HERMAN VERLINDE, *Princeton University*

October 13
High Energy Theory Seminar: "Peeking at all Orders in N=4 SUSY"
DAVID KOSOWER, *Saclay, France*

Institute for Advanced Study Discussion Group: "Disks and Jets"
NEAL DALAL, *Institute for Advanced Study*

October 14
Astrophysics Seminar: "Why Flat Disks Make Narrow Jets"
DONALD LYNDEN-BELL, *IOA, University of Cambridge/Institute for Advanced Study*

Phenomenology Meeting: Discussion regarding Hitoshi's current research
HITOSHI MURAYAMA, *University of California, Berkeley/Institute for Advanced Study*

October 15
Physics Group Meeting: "Duality Walls in String Theory"
AMIHAY HANANY, *Massachusetts Institute of Technology/Institute for Advanced Study*

Institute for Advanced Study Informal Seminar: "Neutron Star Surface Radiation: Recent Progress, Surprises, and Future Prospects"
DONG LAI, *Cornell University*

October 16
String Cosmology Discussion Group: "String Theory in Time-Dependent Backgrounds"
JOHN McGREEVY, *Princeton University*

October 17
High Energy Theory Lunchtime Seminar: "Behind the Horizon of the AdS Black Hole"
MATT KLEBAN, *Stanford University/ Institute for Advanced Study*

October 20
Institute for Advanced Study Discussion Group: "Gamma-Ray Bursts"
ALDO SERENELLI, *Max Planck Institute for Astrophysics/Institute for Advanced Study*

October 21
Astrophysics Seminar: "Gamma-Ray Bursts: High Energy Perspectives and Low Energy Surprises"
PETER MESZAROS, *Pennsylvania State University/Institute for Advanced Study*

October 22
Phenomenology Meeting: "Rationalizing Right-Handed Neutrinos"
GRAHAM KRIBS, *University of Wisconsin, Madison/Institute for Advanced Study*

Physics Group Meeting: "Duality Walls in String Theory – Part II"
AMIHAY HANANY, *Institute for Advanced Study/Massachusetts Institute of Technology*

Institute for Advanced Study Informal Seminar: "Formation of Globular Clusters in Hierarchical Cosmology"
OLEG GNEDIN, *STScI*

October 23
String Cosmology Discussion Group: "The State of the Universe: What Do We Know? How Do We Know It? What More Can We Learn?"
GIL HOLDER, *Institute for Advanced Study*

October 27
High Energy Theory Seminar: "Quantum Calabi-Yau and Classical Crystals"
CUMRUN VAFA, *Harvard University*

October 29
Phenomenology Meeting: "Recently Proposed Scenario of Baryogenesis Due to Late, Non-Uniform (Characterized by Hadronic Jets) Reheating"
HOOMAN DAVOUDIASL/*Institute for Advanced Study*

Physics Group Meeting: "Moduli Stabilization in Heterotic M-Theory"
EVGENY BUCHBINDER, *University of Pennsylvania/Institute for Advanced Study*

Center for Systems Biology Lecture Series: "Molecular Mechanisms for the Establishment and Perpetuation of Memory Storage"
ERIC R. KANDEL, M.D., *Columbia University Center for Neurobiology & Behavior*

Institute for Advanced Study Informal Seminar: "The Structure and evolution of Early-Type Galaxies: A Lensing Perspective"
DAVID RUSIN, *University of Pennsylvania*

October 30
String Cosmology Discussion Group: "Implications of the Holographic Principle for Cosmology"
MATTHEW KLEBAN, *Stanford University/ Institute for Advanced Study*

October 31
High Energy Theory Lunchtime Seminar: "Exploring the 4d Superconformal Zoo"
BRIAN WECHT, *University of California, San Diego*

November 3
Institute for Advanced Study Discussion Group: "Voyager"
GILBERT HOLDER, *Institute for Advanced Study*

November 4
Astrophysics Seminar: "Voyager's Race to Interstellar Space"
EDWARD STONE, *California Institute of Technology*

November 5
Phenomenology Meeting: "Discussion on Various Methods of Electroweak Symmetry Breaking"
DANIEL LARSON, *Institute for Advanced Study/University of California, Berkeley*

Institute for Advanced Study Informal Seminar: "Orbital Capture of Young Stars by a Massive Black Hole"
TAL ALEXANDER, *Weizmann Institute*

November 6
String Cosmology Discussion Group: "Through the Bounce in Big Crunch/Big Bang Cosmologies"
ANDREW TOLLEY, *Princeton University*

Institute for Advanced Study Informal Seminar: "Implications of Highly Polarized Gamma-Rays in Gamma-Ray Bursts"
EHUD NAKAR, *Racah Institute for Physics*

November 10
Institute for Advanced Study Discussion Group: "$z > 5$ Universe"
ENRICO RAMIREZ-RUIZ, *University of Cambridge/Institute for Advanced Study*

High Energy Theory Seminar: "Exotic Baryons as Chiral Solitons"
DMITRI DIAKONOV, *NORDITA*

November 11
Astrophysics Seminar: "Mapping the $z > 5$ Universe"
LENNOX COWIE, IFA, *University of Hawaii*

November 12
Phenomenology Meeting: "General Features of the Meson B_c and the Potential of its Study in Near Future Experiments"
ZHAO-XI ZHANG, *Institute of Theoretical Physics, China/Institute for Advanced Study*

November 13
String Cosmology Discussion Group: "Inflation and Leptogenesis"
HITOSHI MURAYAMA, *University of California, Berkeley/Institute for Advanced Study*

November 14
High Energy Theory Lunchtime Seminar: "Structure of Cosmological CP Violation via Neutrino Seesaw"
TIANJUN LI, *Institute for Advanced Study*

November 17
Institute for Advanced Study Discussion Group: "Young Neutron Stars"
ROMAN RAFIKOV, *Institute for Advanced Study*

November 18
Astrophysics Seminar: "Young Neutron Stars–Puzzles and Progress"
CHRIS THOMPSON, *CITA*

November 19
Phenomenology Meeting: "Possible Non-Standard (i.e., due to physics beyond the Standard Model) Interactions of Neutrinos with Matter"
CECILIA LUNARDINI, *Institute for Advanced Study*

Physics Group Meeting: "Back-Reaction to Fluxes and Group Theory"
ALESSANDRO TOMASSIELO, *Ecole Polytechnique, France*

November 20
String Cosmology Discussion Group: "Cosmology with Extra Dimensions: Constraints and Opportunities"
HOOMAN DAVOUDIASL, *Institute for Advanced Study*

November 24
High Energy Theory Seminar: "The Physics of Beauty: Advanced Studies of Heavy Quarks"
MATTHIAS NEUBERT, *Cornell University*

November 26
High Energy Physics Special Seminar: "Remarks on the Brane Dynamics in Two-Dimensional String Theory"
JOERG TESCHNER, *Institute for Theoretical Physics, Berlin/Institute for Advanced Study*

December 1
Institute for Advanced Study Discussion Group: "Transiting Extra-Solar Planets"
BRICE MENARD, *Max Planck Institute for Astrophysics/Institute for Advanced Study*

December 2
Astrophysics Seminar: "Transiting Extrasolar Planets"
TIM BROWN, *National Center for Atmospheric Research*

December 3
Phenomenology Meeting: "Further Thoughts and Speculations, on E_8 and SUSY Breaking"
STEPHEN ADLER, *Institute for Advanced Study*

Institute for Advanced Study Informal Seminar: "Numerical Simulations of Relativistic Jets"
WEIQUN ZHANG, *University of California, Santa Cruz*

Center for Systems Biology Symposium: Systems Biology for the Analysis of Diseases and Drug Discovery

"Can broad genome scale profiling technologies help select better drugs?"
MARK COCKETT, *Bristol-Myers Squibb*

"Metabonomics in predictive and mechanistic toxicology"
BRUCE CAR, *Bristol-Myers Squibb*

"Pharmacogenomic applications in clinical development"
NICHOLAS DRACOPOLI, *Bristol-Myers Squibb*

"Genomic analysis of experimental evolution of yeast"
MAITREYA DUNHAM, *Lewis-Sigler Institute for Integrative Genomics, Princeton University*

"Physical aspects of growth control in fly wing development"
BORIS SHRAIMAN, *BioMaPS Institute, Rutgers, The State University of New Jersey*

"Finding micro RNA targets"
HARLAN ROBINS, *Institute for Advanced Study*

"SNPs in the p53 pathway"
ARNOLD J. LEVINE, *Institute for Advanced Study*

"Systems Biology for optimizing the pharma value chain"
ROBERT N. MCBURNEY, *Beyond Genomics*

December 4
String Cosmology Discussion Group:
"Dark Matter"
DAVID SPERGEL, *Princeton University*

December 8
Institute for Advanced Study Discussion Group:
"Young Stars, Star Clusters and Proto-Planetary Disks"
DEJAN VINKOVIC, *University of Kentucky/ Institute for Advanced Study*

High Energy Theory Seminar: "Ghost Condensation and a Consistent Infrared Modification of Gravity"
NIMA ARKANI-HAMED, *Harvard University*

December 9
Astrophysics Seminar: "Young Stars, Star Clusters, and Proto-Planetary Disks"
LYNNE HILLENBRAND, *California Institute of Technology*

December 10
Institute for Advanced Study Informal Seminar:
"Implicit Gauge Invariance in the N-body Problem of Celestial Mechanics: Practical Applications"
MICHAEL EFROIMSKY, *USNO*

Phenomenology Meeting: "Further Thoughts and Speculations, on E_8 and SUSY Breaking"
STEPHEN ADLER, *Institute for Advanced Study*

December 11
High Energy Physics Special Seminar: "Aspects of Deterministic Quantum Mechanics"
GERARD 't HOOFT, *Institute for Theoretical Physics, The Netherlands*

String Cosmology Discussion Group: "Interacting Dark Matter and Dark Energy"
GLENNYS FARRAR, *New York University*

December 12
High Energy Theory Lunchtime Seminar:
"Perturbative Yang-Mills Theory As A String Theory in Twistor Space"
EDWARD WITTEN, *Institute for Advanced Study*

December 16
Center for Systems Biology Seminar Series:
"Establishing Developmental Competence for Tissue Differentiation"
KEN ZARET, *Fox Chase Cancer Center*

December 17
Center for Systems Biology Lecture Series:
"Of Genes and Genomes"
DAVID BOTSTEIN, *Lewis-Sigler Institute for Integrative Genomics, Princeton University*

Phenomenology Meeting: "Dama vs. Dama: Inelastic Dark Matter"
CARLOS PEÑA-GARAY, *Institute for Advanced Study*

Institute for Advanced Study Informal Seminar:
"Flame Instabilities in Type Ia Supernovae"
MIKE ZINGALE, *University of California, Santa Cruz*

December 19
Institute for Advanced Study Informal Seminar: "High-Energy Astrophysical Neutrinos"
NICOLE BELL, *Fermilab*

January 7
Institute for Advanced Study Informal Seminar: "Do Fundamental Constants of Nature Vary with Time and Distance?"
VICTOR FLAMBAUM, *University of New South Wales/Institute for Advanced Study*

January 9
Institute for Advanced Study Informal Seminar: "Using the Lyman-Alpha Forest to Measure the Mean Optical Depth of the Universe"
KRISTIN BURGESS, *Massachusetts Institute of Technology*

January 14
Phenomenology Meeting: "Aspects and Implications of Flavor Models Based on a U(1) Symmetry"
MARC THORMEIER, *University of Bonn*

Institute for Advanced Study Informal Seminar: "Constraining Galaxy Bias and Cosmology Using Galaxy Clustering Data"
ZHENG ZHENG, *Ohio State University*

January 21
Institute for Advanced Study Informal Seminar: "Element Segregation in Giant Galaxies and X-ray Clusters"
LEONID CHUZHOY, *Technion*

January 23
High Energy Theory Lunchtime Seminar: "Minimal String Theory"
NATHAN SEIBERG, *Institute for Advanced Study*

Center for Systems Biology Seminar Series: "Dissecting Transcriptional Control Networks"
ANIRVAN SENGUPTA, *Rutgers, The State University of New Jersey*

January 26
Phenomenology Meeting: "Theoretical and Experimental Issues Relevant to the Physics of Penta-Quarks"
IGOR KLEBANOV, *Princeton University*

January 27
Institute for Advanced Study Astrophysics Seminar: "Gamma-Ray Bursts: New Controversies and New Prospects"
TSVI PIRAN, *Racah Institute for Physics, Hebrew University*

January 28
Institute for Advanced Study Informal Seminar: "GRBs and Asymmetric Supernovae from Rotating Massive Stars"
ANDREW MacFADYEN, *California Institute of Technology*

February 2
High Energy Theory Seminar: "Quark-Gluon Plasma at Strong and Very Strong Coupling"
EDWARD SHURYAK, *The State University of New York at Stony Brook*

February 3
Astrophysics Seminar: "High Resolution X-Ray Spectroscopy of Active Galactic Nuclei"
STEVEN KAHN, *Stanford University*

February 4
Center for Systems Biology Seminar Series: "Case-Control Association Studies for Complex Trait Genes"
JURG OTT, *The Rockefeller University*

Phenomenology Meeting: "Electroweak Symmetry Breaking in the Context of Anomaly Mediated Supersymmetry Breaking"
RYUICHIRO KITANO, *Institute for Advanced Study*

Physics Group Meeting: "Integrable Spin Chains"
DAVID BERENSTEIN, *Institute for Advanced Study*

February 5
String Cosmology Discussion Group: "Decoupling in an Expanding Universe: Boundary RG Flow Parametrizes New Physics in the CMB"
KOENRAAD SCHALM, *Columbia University*

February 6
High Energy Theory Lunchtime Seminar: "Superstring Loop Amplitudes Using the Pure Spinor Formalism"
NATHAN BERKOVITS, *Universidade Estadual Paulista/Institute for Advanced Study*

February 9
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics": "Helioseismology"
PETER GOLDREICH, *California Institute of Technology/Institute for Advanced Study*

February 10
Astrophysics Seminar: "From Molecular Clouds to Protoplanetary Disks: Evolution of Gas and Ices"
EWINE VAN DISHOECK, *Leiden Observatory*

Februrary 11
Phenomenology Meeting: "QCD and SQCD at Finite Densities"
RONI HARNIK, *University of California, Berkeley*

Physics Group Meeting: "Integrable Spin Chains – Part 2: Solutions of Yang Baxter Equation with Quantum Groups"
DAVID BERENSTEIN, *Institute for Advanced Study*

Center for Systems Biology Lecture Series: "Regulation of Aging by SIR2 in Yeast, Worms, and Mammals"
LEONARD GUARENTE, *Massachusetts Institute of Technology*

February 13
Center for Systems Biology Seminar Series: "Learning Biology from Network-Level Observations"
SAEED TAVAZOIE, *Princeton University*

February 16
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics": "Relic Neutrino Background"
CECILIA LUNARDINI, *Institute for Advanced Study*

February 17
Astrophysics Seminar: "Planetary Cores"
DAVID STEVENSON, *California Institute of Technology*

February 18
Physics Group Meeting: "Twistor Space and Topological String Theory I"
GROUP DISCUSSION

Center for Systems Biology Seminar Series: "Computational Decoding of Gene Regulatory Networks"
NIKOLAUS RAJEWSKY, *New York University*

February 19
String Cosmology Discussion Group: "Strings, Light Scalars, and a Modification of CDM"
STEVEN GUBSER, *Princeton University*

Center for Systems Biology Seminar Series: "A High Frequency Polymorphism in the p53 Pathway Results in the Increased Incidence of Cancer in Humans: An Experimental and Theoretical Approach"
GARETH BOND, *Cancer Institute of New Jersey*

Institute for Advanced Study Informal Seminar: "On Planet-Satellite Formation"
IGNACIO MOSQUEIRA, *NASA Ames Research Center*

February 20
High Energy Theory Lunchtime Seminar: "AdS Tomography"
RAÚL RABADÁN, *Institute for Advanced Study*

Institute for Advanced Study Working Group on Planet Formation
"Overview"
BRICE MENARD, *Max Planck Institute for Astrophysics/Institute for Advanced Study*

February 23
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Tides in Astrophysics"
ROMAN RAFIKOV, *Institute for Advanced Study*

February 24
Astrophysics Seminar: "Signatures of Galaxy Formation in the Intracluster Medium"
MARK VOIT, *Space Telescope Science Institute*

February 25
Phenomenology Meeting: "Implications of a Heavy Z' Gauge Boson"
PAUL LANGACKER, *University of Pennsylvania*

Physics Group Meeting: "Twistor Space and Topological String Theory II"
GROUP DISCUSSION

Institute for Advanced Study Informal Seminar:
"Probing Dense Matter and Strong Gravity Using High-Frequency X-ray Oscillations"
FRED LAMB, *University of Illinois*

March 1
High Energy Theory Seminar: "Orientifolds of Gepner Models"
KENTARO HORI, *University of Toronto*

Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Neutrino Optics"
CARLOS PEÑA-GARAY, *Institute for Advanced Study*

March 2
Astrophysics Seminar: "Theoretical Understanding of the Luminosity Function of Planetary Nebulae"
ACHIM WEISS, *Max Planck Institute for Astrophysics*

March 3
Phenomenology Meeting: "Gluino Mass and Thermal Leptogenesis"
MASAHIRO IBE, *University of Tokyo*

Physics Group Meeting: "Kac-Moody Theoretic Approach to M-Theories"
AXEL KLEINSCHMDT, *Oxford University*

Center for Systems Biology Seminar Series: "On Switches, Gates and Clocks: Life in the Time of Systems Biology"
STANISLAS LEIBLER, *The Rockefeller University*

March 4
String Cosmology Discussion Group: "Ghost Inflation"
MATTHIAS ZALDARRIAGA, *New York University*

March 5
High Energy Theory Lunchtime Seminar:
"Supersymmetric Pati-Salam Models from Type IIA Orientifolds with Intersecting D6-Branes"
TIANJUN LI, *Institute for Advanced Study*

Institute for Advanced Study Working Group on Planet Formation:
"Imaging of Protoplanetary Disks"
DEJAN VINKOVIC, *University of Kentucky/ Institute for Advanced Study*

March 8
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"21 cm"
NEAL DALAL, *Institute for Advanced Study*

March 9
Astrophysics Seminar: "Simulating Accretion Disks Around Kerr Black Holes"
JOHN HAWLEY, *University of Virginia*

March 10
Institute for Advanced Study Informal Seminar:
"Cosmic Dust from the Cradle to the Grave: Adventures in Dirt Astrophysics"
MICHAEL SITKO, *University of Cincinnati*

Phenomenology Meeting: "Locked (or "new old") Inflation"
JUSTIN KHOURY, *Columbia University*

March 11
Physics Group Meeting: "Twistor Space and Topological String Theory III"
GROUP DISCUSSION

March 12
Institute for Advanced Study Working Group on Planet Formation:
"Particle-Gas Dynamics"
ANDREW YOUDIN, *Princeton University*

March 15
High Energy Theory Seminar: "Viscosity from Gravity"
DAM THANH SON, *University of Washington*

March 16
Institute for Advanced Study Special Astronomy Colloquium:
"The Hubble Ultra-Deep Field"
STEVE BECKWITH, *Director, Space Telescope Science Institute*

March 17
Phenomenology Meeting: "Astrophysical Probes of Quantum Gravity; Lorentz Violations at the Plank Scale"
PETER MESZAROS, *Pennsylvania State University/Institute for Advanced Study*

Physics Group Meeting: "Topological String Theory in Twistor Space IV"
GROUP DISCUSSION

March 18
String Cosmology Discussion Group:
"Post-Inflationary Curvature Perturbations"
ANDREI GRUZINOV, *New York University*

March 19
High Energy Theory Lunchtime Seminar:
"Wormholes in ADS"
JUAN MALDACENA, *Institute for Advanced Study*

March 23
Astrophysics Seminar: "Circumstellar Rings: The Kuiper Belt and Beyond"
EUGENE CHIANG, *University of California, Berekley*

March 24
Institute for Advanced Study Informal Seminar:
"Stars Plunging Into Quasar Accretion Disks and the M-sigma Relation"
JORDI MIRALDA-ESCUDE, *The Ohio State University*

Phenomenology Meeting: "Revisiting Axion Cosmology with Precision CMBR Measurements"
AARON PIERCE, *SLAC*

Physics Group Meeting: "Topological String Theory in Twistor Space V: Conformal Supergravity, Topological S-Duality, and Other Topics"
GROUP DISCUSSION

March 26
Center for Systems Biology Seminar Series:
"The Matrix Reloaded: Evolutionary Insights Into Transcription Factor Binding"
CURTIS CALLAN, *Princeton University*

Institute for Advanced Study Working Group on Planet Formation:
"Debris Disks"
MARC KUCHNER, *Princeton University*

March 29
High Energy Theory Seminar: "CFT's and SUSY Breaking"
RAMAN SUNDRUM, *Johns Hopkins University*

Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Second Order Power Spectrum"
BRICE MENARD, *Max Planck Institute for Astrophysics/Institute for Advanced Study*

March 30
Astrophysics Seminar: "First Results from the Galaxy Evolution Explorer"
DAVID SCHIMINOVICH, *Columbia University*

March 31
Phenomenology Meeting: "Effective Lagrangians for Theories with Multiple Dilatons"
BRENT NELSON, *University of Pennsylvania*

Physics Group Meeting: "Strings in AdS_3 and Liouville Theory"
GASTÓN GIRIBET, *Instituto de Astronomía y Física del Espacio/Institute for Advanced Study*

Center for Systems Biology Seminar Series:
"Analysis of Copy Number Variation in Cancer and Normal Genomes: Mathematical and Cognitive Problems"
MICHAEL WIGLER, *Cold Spring Harbor Laboratory*

April 2
Institute for Advanced Study Working Group on Planet Formation:
"From Planetesimals to Planets"
PETER GOLDREICH, *Institute for Advanced Study/Caltech*

High Energy Theory Lunchtime Seminar:
"Gravitational Baryogenesis"
RYUICHIRO KITANO, *Institute for Advanced Study*

April 6
Astrophysics Seminar: "Neutron Stars, Pulsar Wind Nebulae, and Their Supernovae"
ROGER CHEVALIER, *University of Virginia*

April 7
Phenomenology Meeting: "Summary of the APS Neutrino Study: Main Issues"
PAUL LANGACKER, *University of Pennsylvania*

Physics Group Meeting: Informal Discussion:
"Number Theory and Calabi-Yau Manifolds"
PHILLIP CANDELAS & XENIA DE LA OSSA, *Oxford University*

Institute for Advanced Study Informal Seminar:
"Cosmic Energy Inventory: A New View of the Universe"
MASATAKA FUKUGITA, *ICRR/Institute for Advanced Study*
JIM PEEBLES, *Princeton University*

April 9
Institute for Advanced Study Working Group on Planet Formation:
"Giant Planets: Core Instability"
ROMAN RAFIKOV, *Institute for Advanced Study*

April 12
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Meteors"
DEJAN VINKOVIC, *University of Kentucky/ Institute for Advanced Study*

High Energy Theory Seminar: "Gravity in a Higgs Phase"
MARKUS LUTY, *University of Maryland*

April 13
Astrophysics Seminar: "Black Hole Formation at High Redshift"
MARTIN REES, *University of Cambridge, Institute of Astronomy*

April 14
Institute for Advanced Study Informal Seminar:
"Gravitational Lensing and Dark Energy"
BHUVNESH JAIN, *University of Pennsylvania*

April 15
String Cosmology Discussion Group:
"Challenges for Brane Gas Cosmology"
ROBERT BRANDENBERGER, *Brown University*

April 16
High Energy Theory Seminar: "The (2, 0) Supersymmetric Theory of Tensor Multiplets and Self-Dual Strings in Six Dimensions"
MANS HENNINGSON, *Chalmers University*

April 19
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Stability Considerations in Stars"
ALDO SERENELLI, *Max Planck Institute for Astrophysics/Institute for Advanced Study*

High Energy Theory Seminar: "Hagedorn and Gregorry-Laflamme Transitions in Yang Mills"
SHIRAZ MINWALLA, *Harvard University*

April 20
Astrophysics Seminar: "Neutrinos from Heaven: Lessons for Particle Physics"
YOSEF NIR, *Weizmann Institute of Science*

April 21
Phenomenology Meeting: "Warped Unification, Proton Stability and Dark Matter"
KAUSTUBH AGASHE, *Johns Hopkins University*

Physics Group Meeting: "Sine-Liouville Theories, Matrix Models and 2D Black Holes"
INFORMAL DISCUSSION

Institute for Advanced Study Informal Seminar:
"Observing Neutral Hydrogen in the Reionization Epoch"
STEVE FURLANETTO, *California Institute of Technology*

April 23
Center for Systems Biology Seminar Series:
"The Promoter Architecture of Genes that Encode the Ribosomal Proteins of Mammals and Other Vertebrates"
ROBERT PERRY, *Fox Chase Cancer Center*

April 26
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"The Cyclic Model Simplified"
PAUL STEINHARDT, *Princeton University/ Institute for Advanced Study*

April 27
Astrophysics Seminar: "The Nearby Universe"
JOHN HUCHRA, *Harvard-Smithsonian Center for Astrophysics*

April 28
Institute for Advanced Study Informal Seminar:
"Resonances in Accretion Disks as the Origin of Kilo Hertz Quasi Oscillations in Low-Mass X-Ray Binaries"
WILLIAM LEE, *Instituto de Astronomia, Universidad Nacional Autonoma de Mexico*

Physics Group Meeting: "Liouville Theory and Noncritical Strings"
INFORMAL DISCUSSION

April 29
String Cosmology Discussion Group: "The Fluctuation Spectrum in Big Crunch/Big Bang Cosmologies"
BURT OVRUT, *University of Pennsylvania*

April 30
High Energy Theory Lunchtime Seminar: "An S-Duality Between Critical and Super-Critical String Theories"
SIMEON HELLERMAN, *Stanford University/ Institute for Advanced Study*

May 3
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Introduction to CMB Fluctuations"
GILBERT HOLDER, *Institute for Advanced Study*

May 4
Astrophysics Seminar: "Evidence from Type Ia Supernovae for a Decelerating, then Accelerating Universe and Dark Energy"
ALEX FILIPPENKO, *University of California, Berkeley*

Center for Systems Biology Seminar Series:
"Preliminary Analysis of a Colon Cancer Microarray Dataset"
HAO LIU, *University of Medicine and Dentistry of New Jersey*

May 5
Phenomenology Meeting: "Probing the Planck Scale with Proton Decay"
HITOSHI MURAYAMA, *University of California, Berkeley/Institute for Advanced Study*

High Energy Theory Special Seminar: "Black Hole Attractors and the Topological String"
ANDREW STROMINGER, *Harvard University*

May 12
Phenomenology Meeting: "Supersymmetry breaking and UV Insensitivity: A Second Model"
DAVID KAPLAN, *Johns Hopkins University*

Physics Group Meeting: "Aspects of Minimal String Theory"
DAVID SHIH, *Princeton University*

May 14
High Energy Theory Lunchtime Seminar:
"From Bounces to Wormholes"
JUSTIN VAZQUEZ-PORITZ, *University of Cincinnati/University of Kentucky*

Institute for Advanced Study Working Group on Planet Formation:
"Excitation of Excentricities"
SCOTT TREMAINE, *Princeton University*

May 17
High Energy Theory Seminar: "Quantum Foam and Topological Strings"
CUMRUN VAFA, *Harvard University*

Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Neutron Stars: A Historical Perspective"
ENRICO RAMIREZ-RUIZ, *University of Cambridge/Institute for Advanced Study*

May 19
Physics Group Meeting: "Flux Compactifications and the Giant Inflation"
OLIVER DeWOLFE, *Princeton University*

May 21
Institute for Advanced Study Working Group on Planet Formation:
"The Formation of Planetesimals"
ANDREW YOUDIN, *Princeton University*

May 25
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"The Lyman-alpha Forest"
JOOP SCHAYE, *Institute for Advanced Study*

May 26
Institute for Advanced Study Informal Seminar:
"The ALPACA Optical Imaging Survey: Deep, Wide, Frequent, Multiband"
ARLIN CROTTS, *Columbia University*

Physics Group Meeting: "Moduli Fixing in Flux Vacua – Group Discussion"
BOGDAN FLOREA, *Rutgers, The State University of New Jersey*

May 27
String Cosmology Discussion Group: "Toward a Dual Description of a Big Crunch Singularity"
GARY HOROWITZ, *University of California, Santa Barbara*

May 28
High Energy Theory Lunchtime Seminar:
"Does Anomaly Mediation Save the World?"
HITOSHI MURAYAMA, *University of California, Berkeley/Institute for Advanced Study*

Center for Systems Biology Seminar Series:
"Genetics and the Incidence of Cancer"
ALFRED G. KNUDSON, *Fox Chase Cancer Center*

May 31
Institute for Advanced Study Discussion Group on the "Physics of Astrophysics":
"Collisionless Shocks"
JONATHAN GRANOT, *Institute for Advanced Study*

June 2
Physics Group Meeting: "Distributions of Flux Vacua"
FREDERIK DENEF, *Rutgers, The State University of New Jersey*

June 8
Center for Systems Biology/DIMACS Workshop: Genomic Instability in Cancer: Biological and Mathematical Approaches

"Genomic Instability in Aging Somatic and Germ Line Cells"
GEORGE M. MARTIN, *University of Washington*

"Evidence that Some Microsatellite Variation is Functional"
CHRISTOPHER J. WILLS, *University of California at San Diego*

"Does cancer solve an optimization problem?"
NATALIA L. KOMAROVA, *Rutgers, The State University of New Jersey/Institute for Advanced Study*

"Mutator Phenotype in Cancer"
LAWRENCE A. LOEB, *University of Washington*

"Transposable elements and genome instability"
ABRAM GABRIEL, *Rutgers, The State University of New Jersey*

"The potential role of retrotransposons in genomic instability of cancers"
CHRIS HARRIS, *Verto Institute*

"DNA damage and genetic instability: insights from mathematical models"
DOMINIK WODARZ, *University of California at Irvine*

"Phenotypic variation, hyper-mutation and the success of antibiotic treatment: some theory and real work (experiments)"
BRUCE R. LEVIN, *Emory University*

June 9
Center for Systems Biology/DIMACS Workshop: Genomic Instability in Cancer: Biological and Mathematical Approaches

"Understanding the somatic genetic basis of prostate cancer"
WILLIAM R. SELLERS, *Dana-Farber Cancer Institute*

"Measuring gene copy differences in cancer and normal genomes"
MICHAEL H. WIGLER, *Cold Spring Harbor Laboratory*

"Simple models of predisposition, progression, and epidemiology"
STEVEN A. FRANK, *University of California at Irvine*

"Somatic evolution of cancer"
MARTIN A. NOWAK, *Harvard University*

"Is it necessary to invoke genomic instability to explain cancer rates in human populations?"
SURESH H. MOOLGAVKAR, *Fred Hutchinson Cancer Research Center*

"The Forms of Genomic Instability in Colorectal Cancer"
RICHARD BOLAND, *Baylor University Medical Center*

"Negative Clonal Selection in Tumor Evolution: Relative Importance of Dominant and Recessive Reduced Fitness Mutations"
ROBERT A. BECKMAN, *Centocor, Inc.*

Physics Group Meeting:
"Zamolodchikov Operator-Valued Relations for the $SL(2,R)_k$ WZW Model"
GAETANO BERTOLDI, *Massachusettes Institute of Technology/Institute for Advanced Study*

June 11
High Energy Theory Lunchtime Seminar: "A 6-Dimensional Higgsless Standard Model"
SATYANARAYAN NANDI, *Oklahoma State University*

June 15, 2004
Center for Systems Biology/Siemens Corporate Research Symposium: Systems Biology: Towards Personalized Medicine

"Towards Robust Imaging and Data Fusion Systems Supporting Cardiovascular Pharmacogenomics"
XIANG ZHOU, *Siemens Corporate Research*

"Prediction and Analysis of RNA Conformational Changes"
BRUCE A. SHAPIRO, *National Cancer Institute*

"Intelligent Data Analysis for Biomedical Applications"
CLAUS NEUBAUER, *Siemens Corporate Research*

"Tissue specific codon usage"
HARLAN ROBINS, *Institute for Advanced Study*

"Transcriptional Profiles in Cells in Growth and Cancer"
DAVID BOTSTEIN, *Lewis-Sigler Institute for Integrative Genomics, Princeton University*

"Gene expression changes in early and late tumors of the colon"
DANIEL A. NOTTERMAN, *University of Medicine & Dentistry of New Jersey*

"Specificity of Protein-DNA Interaction in Transcription Control: Physics, Evolution and Bioinformatics"
ANIRVAN SENGUPTA, *BioMaPS Institute, Rutgers, The State University of New Jersey*

"Single Nucleotide Polymorphisms and Cancer"
ARNOLD J. LEVINE, *Institute for Advanced Study*

DAVID GRAHAM

"I have just completed the most enjoyable, rewarding, and productive year of my academic career. I was particularly delighted by the collegial atmosphere fostered by the Institute. I cannot imagine living within a more pleasant, intellectually rich, and sociable intellectual community."

— Member, School of Social Science

Members in the Mathematics-Natural Sciences Library, Fuld Hall

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 Professors

ADAM ASHFORTH
CARL ELLIOTT

ACADEMIC ACTIVITIES

The School of Social Science invited eighteen scholars from a pool of 133 applicants from the United States and abroad to be part of the School's scholarly community as Members for the 2003-04 academic year. Four visitors and two research assistants participated in the year's activities, along with one scholar who was a joint visitor in the School of Social Science and the School of Historical Studies. The National Endowment for the Humanities partially or fully funded three Members. Economists were supported by a grant from the Andrew W. Mellon Foundation, as well as the Richard B. Fisher and the Deutsche Bank Memberships. Fields of inquiry of the group included anthropology (two), economics (five), history (two), law (one), philosophy (two), political science (five), psychology (one), religion (two) and sociology (four).

The thematic focus for 2003-04 was Bioethics. The School appointed Carl Elliott, Associate Professor and Director of Graduate Studies, Center for Bioethics at the University of Minnesota, as an Associate Visiting Professor to lead the research activities as Faculty and visiting Members explored a range of moral issues related to the ways in which medical technologies (drugs, procedures, diagnostics, genetic testing and engineering, and surgeries) have changed or eroded the boundaries between public and private and so raised new dilemmas for the law, public policy, and individual rights.

The School conducted three seminar series: the Social Science Thursday Luncheon Seminar, the Bioethics Thematic Seminar, and the IAS/Princeton University Economics Workshop. The thematic seminar drew regular participants from Princeton's Center on Human Values and several prominent guest speakers including Ronald A. Carson, Director of the Institute of Medical Humanities at the University of Texas, whose three-week visit was supported by a grant from the Friends of the Institute. The thematic seminar also generated a more informal bioethics roundtable discussion group that convened regularly over the course of the year.

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

VISITING ASSOCIATE PROFESSOR ADAM ASHFORTH presented lectures at Princeton University (twice) and the Yale Law School on challenges posed for democratic governance in contemporary South Africa by the pervasive fear of witchcraft in African communities. He was keynote speaker at the conference *Struggling with the State in Colonial and Post-Colonial Africa* at the University of Chicago, where he discussed the imperatives of studying local African cultural dynamics emerging from global efforts to stem the AIDS epidemic – a presentation he also made to the Social Science Luncheon Seminar at the Institute. He participated in a Paris workshop entitled *Empire and Dissent: Reflecting on History*, part of a series of meetings sponsored by the Social Science Research Council and the Fonds d'Analyse des Sociétés Politiques exploring the history of social movements and global power, where he presented arguments for new ways of conceptualizing religion and resistance in the history of colonialism in Africa. In November and April he attended the meetings of the International Scientific Advisory Board of the Africa Centre for Health and Population Studies in Kwa-Zulu Natal, South Africa, where he is developing a multinational research initiative to study the social and cultural dynamics surrounding the rollout of anti-retroviral drugs to treat HIV/AIDS in a poor African rural area with severe HIV prevalence. He also completed revisions of his book "Witchcraft, Violence, and Democracy in South Africa," which will be published by the University of Chicago Press in the fall.

During the academic year 2003-04, VISITING ASSOCIATE PROFESSOR CARL ELLIOTT delivered the Courtney Townsend Lecture in Medical Humanities at the University of Texas Medical Branch in Galveston, Texas, and the Cowan Memorial Lecture at the University of Utah Medical School. He was elected a Fellow of The Hastings Center and made an Honorary Associate Professor of the Center for Bioethics at the University of Otago in New Zealand. Professor Elliott also lectured at Harvard Medical School, the Mayo Clinic, Mount Sinai Medical School, Williams College, Mount Holyoke College, Duke University Divinity School, the Princeton University Center for Human Values, the Rutgers University Center for Health, Health Policy and Aging Research, California State Polytechnic University at Pomona, the University of Virginia, Akron General Medical Center, Wake Forest University and the University of Chicago. His book, *Better Than Well: American Medicine Meets the American Dream* (Norton, 2003) was the subject of a session at the American Philosophical Association Pacific Division in Pasadena, California. He published articles in *The London Review of Books*, *The American Prospect*, *The Boston Review*, *Slate*, *The Wilson Quarterly*, *The Believer*, *Studies in the History and Philosophy of Biology and Biological Science* and *Dissent*. With his co-editor, Tod Chambers, Carl Elliott completed work on a collection of essays, *Prozac as a Way of Life*, to be published by the University of North Carolina Press in September, 2004.

PROFESSOR EMERITUS CLIFFORD GEERTZ gave the Tenth Annual Sidney Mintz Lecture at Johns Hopkins University in November 2003: "What Is a State If It Is Not a Sovereign?: Reflections on Politics in Complicated Places." It will be published in the December 2004 *Current Anthropology*. In May 2004 he gave the Frazer Lecture at Cambridge University, jointly sponsored by the Department of Social Anthropology and the Centre for Research in the Arts, Social Sciences and Humanities: "Shifting Aims, Moving Targets: On the Anthropology of Religion." He then visited the EHESS in Paris

in connection with the publication of the French translation of his book on the Suq in Morocco. In the context of the series "Dialogues of Cultures and Civilizations" sponsored by the Stiftung Schloss Neuhardenberg GmbH in Berlin, Professor Geertz participated in a debate and discussion in June on "Religious Nationalisms as a Sign of Modernity" and visited the Wissenschaftskolleg zu Berlin. During the year he was appointed Senior Fellow, Center for Cultural Sociology, Yale University, and Member of the Editorial Board, *Culture and Politics*.

Throughout the 2003-04 academic year, PROFESSOR EMERITUS ALBERT O. HIRSCHMAN continued to receive commendations for his seminal contributions to sociopolitical/economic theory. Among these accolades were the following awards and publications: on August 28, 2003, Professor Hirschman was honored at the American Political Science Association's Annual Meeting in Philadelphia by the 2003 Benjamin E. Lippincott Award. The Lippincott Award, established by the APSA to "recognize a work of exceptional quality by a political theorist that is still considered significant after a time span of at least 15 years since the original date of publication," was conferred to Professor Hirschman for his noted work, *The Passion and the Interests: Political Arguments for Capitalism Before Its Triumph* (Princeton University Press, 1977). On May 23, 2004, Professor Hirschman was awarded the degree, Doctor of Humane Letters, *honoris causa* from Amherst College. This honorary doctorate, presented at Amherst's 183rd Commencement ceremony, marked the twentieth such degree of Professor Hirschman's career. This academic year also brought several additional translations of Professor Hirschman's works, including, for the first time, translations in Persian: *The Rhetoric of Reaction* (late 2003) and *Exit, Voice and Loyalty* (early 2004). A Persian edition of *Shifting Involvements* is planned for completion in late 2004. In addition, it was announced that a Japanese edition of *Exit, Voice, and Loyalty* is expected by 2006.

In July and August 2003, PROFESSOR ERIC MASKIN delivered his presidential address to the Econometric Society at regional meetings in Sydney, Stockholm, and Panama on the subject of cooperative game theory. He also spoke on this subject at the 2003 International Game Theory Conference at Stony Brook, at seminars at the London School of Economics, Paris, and Barcelona, and in lecture courses at Princeton University, Seoul National University and the University of Tokyo. In June, he delivered the Toulouse lectures at the University of Toulouse on "Bargaining, Coalitions, and Externalities." In January 2004, Professor Maskin gave a set of lectures on auction theory at the Institute for Advanced Study at Wuhan University, where he was named an honorary professor. Professor Maskin spoke on the virtues of majority rule as an election method at the University of Rochester, Georgetown University, the University of Tokyo and Seoul National University (where he also gave the sixth T.S. Kim Memorial lecture). A popular account of this work (with Partha Dasgupta) appeared in the March 2004 issue of *Scientific American*. In April, he gave a talk at Stanford University on the advantages and drawbacks of accountability in government. He was elected a corresponding fellow of the British Academy in July 2004.

PROFESSOR JOAN SCOTT completed her book on the French movement for sexual equality in politics. She also edited (with Debra Keates) a collection of essays called *Going Public: Feminism and the Changing Private Sphere*, which will be published by the University of Illinois Press in 2005. She published "French Universalism in the 90's," *differences* 15.2 (2004). "Feminism's History," *Journal of Women's History* 16:1 is forth-

coming in 2005. She lectured at Yale University, the University of California, Berkeley, the University of Chicago, and Randolph Macon Women's College. She was a visiting distinguished professor at Wayne State University and the keynote speaker at The International Conference on the History of Women and Gender in Mexico, held in Guadalajara. Professor Scott continues as a senior fellow of the School of Criticism and Theory; as an adjunct professor in the Department of History at Rutgers, the State University of New Jersey; and as the chair of the Committee on Academic Freedom and Tenure of the American Association of University Professors. In August, Professor Scott will receive the degree of Doctor *honoris causa* from the University of Bergen, Norway.

During the academic year 2003-04, PROFESSOR MICHAEL WALZER gave the Minerva Lecture on Human Rights at Tel Aviv University, the keynote speech of the Association for Jewish Studies 35th Annual Conference in Boston, and the opening address of the "Lezioni Norberto Bobbio. Etica e politica" lecture series in Turin; he also lectured at the United States Military Academy at West Point, Rutgers, the State University of New Jersey, SUNY Binghamton, Yeshiva University in New York, Georgetown University, the University of Florida, the University of Tulsa, the University of Central Oklahoma, the Heinrich Böll Foundation in Berlin, the Einstein Forum in Potsdam, the Centre of Contemporary Culture of Barcelona, the Universidad Internacional Menéndez Pelayo in Valencia, the Complutense University of Madrid, and Bar-Ilan University in Israel. New editions of his books *The Company of Critics*, *Exodus and Revolution*, and *What it Means to Be an American* were released in Italian; a book-length interview with Professor Walzer *(Lalibertà e i suoi nemici)* by La Stampa journalist Maurizio Molinari came out as well. Greek and Slovak translations of his *Thick and Thin: Moral Argument at Home and Abroad* appeared, as well as Portuguese translations of his *Just and Unjust Wars* and *Spheres of Justice*. His book *On Toleration* was translated into Slovak and Ukrainian. His Horkheimer Lectures, published in German in 1999, appeared in French. A new collection of his essays and articles entitled *Arguing About War* was published by Yale University Press.

THE SCHOOL OF SOCIAL SCIENCE

MEMBERS, VISITORS, AND RESEARCH STAFF

CHARLES L. BOSK
Sociology
University of Pennsylvania

PHILIPPE BOURGOIS
Anthropology
University of California, San Francisco · *n*

TOD CHAMBERS
Religion
Northwestern University · *n*

LOUIS C. CHARLAND
Philosophy
University of Western Ontario

PAULA COSSART
History
École des Hautes Études en Sciences Sociale · *a*

JOSEPH E. DAVIS
Sociology
University of Virginia

RAYMOND DE VRIES
Sociology
University of Minnesota *and* St. Olaf College

GLENN ELLISON
Economics
Massachusetts Institute of Technology · *m*

SARA FISHER ELLISON
Economics
Massachusetts Institute of Technology

HENRY LOUIS GATES, Jr.
History
Harvard University · *jv*

BARUCH KNEI-PAZ
Political Science
The Hebrew University of Jerusalem · *v*

MADELINE KOCHEN
Law and Political Science
Harvard University · *a*

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McGill University

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INSEAD · *v*

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University of Sydney

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University of Chicago · *n*

EKATERINA ZHURAVSKAYA
Economics
Center for Economic and Financial Research, Moscow · *m*

NOAM J. ZOHAR
Philosophy
Bar Ilan University

a Research Assistant · *f* First Term · *jv* Joint Visitor with School of Historical Studies
m Mellon Supported · *n* NEH Supported · *s* Second Term · *v* Visitor

THE SCHOOL OF SOCIAL SCIENCE

RECORD OF EVENTS

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

Academic Year 2003-04

October 1
Bioethics Thematic Seminar: Planning Session
CARL ELLIOTT, *University of Minnesota; Visiting Associate Professor, School of Social Science*

October 1
IAS/Princeton University Economics Workshop: "Contracting on Time"
SERGEI GURIEV, *Princeton University*

October 2
Social Science Thursday Luncheon Seminar: "Devising a Natural Death: A Technical Solution for a Normative Quandary?"
NOAM ZOHAR, *Bar Ilan University; Member, School of Social Science*

October 8
IAS/Princeton University Economics Workshop: "Knife-Edge or Plateau: When Do Market Models Tip?"
GLENN ELLISON, *Massachusetts Institute of Technology; Member, School of Social Science* (with Drew Fudenberg)

October 9
Social Science Thursday Luncheon Seminar: "Inequality and Global Justice"
NANCY KOKAZ, *University of Toronto; Member, School of Social Science*

October 13
IAS/Princeton University Economics Workshop: "Asymmetric Information Without Single-Crossing Properties"
ALOISIO PESSOA de ARAUJO, *Instituto de Matemática Pura e Aplicada*

October 15
Bioethics Thematic Seminar: "Sick Ethicists"
TOD CHAMBERS, *Northwestern University; Member, School of Social Science*

October 16
Social Science Thursday Luncheon Seminar: "Decentralization and Political Institutions"
EKATERINA ZHURAVSKAYA, *Center for Economic and Financial Research, Moscow; Member, School of Social Science*

October 22
IAS/Princeton University Economics Workshop (A joint workshop with the Institute's School of Mathematics): "Towards a Characterization of Truthful Combinatorial Auctions"
AHUVA MU'ALEM, *Hebrew University* (with Ron Lavi and Noam Nisan)

October 23
Social Science Thursday Luncheon Seminar: "Decentralizing Organizations to Cope with Complexity"
TIMOTHY VAN ZANDT, *INSEAD; Visitor, School of Social Science*

October 29
IAS/Princeton University Economics Workshop: "Patent Thickets: Strategic Patenting of Complex Technologies"
JAMES BESSEN, *Research on Innovation* and *Massachusetts Institute of Technology*

Bioethics Thematic Seminar: "Professional Expertise and Moral Cowardice"
CHARLES L. BOSK, *University of Pennsylvania; Member, School of Social Science*

October 30
Social Science Thursday Luncheon Seminar: "French Universalism in the Nineties"
JOAN WALLACH SCOTT, *Professor, School of Social Science*

November 5
IAS/Princeton University Economics Workshop: "Institutional Subversion: Evidence from Russian Regions"
EKATERINA ZHURAVSKAYA, *Center for Economic and Financial Research, Moscow; Member, School of Social Science* and HANS RAUSING, *CEFIR, Moscow*

November 6
Social Science Thursday Luncheon Seminar: "Shaming AI"
ELIZABETH A. WILSON, *University of Sydney; Member, School of Social Science*

November 12
Bioethics Thematic Seminar: "Bioethics in Pluralistic Settings"
LEIGH TURNER, *McGill University; Member, School of Social Science*

November 12
IAS/Princeton University Economics Workshop: "Equilibrium Information Disclosure Grade Inflation and Unraveling"
MICHAEL SCHWARZ, *Harvard University*

November 13
Social Science Thursday Luncheon Seminar: "The Effects of Political Pressure and Bargaining Clout on Pharmaceutical Prices"
SARA FISHER ELLISON, *Massachusetts Institute of Technology; Member, School of Social Science*

November 18
Bioethics Roundtable

November 19
IAS/Princeton University Economics Workshop: "Are Vaccines More Profitable Than Drugs?"
CHRISTOPHER SNYDER, *University of Chicago* and *George Washington University*

November 20
Social Science Thursday Luncheon Seminar: "Continuity and Change in the Study of Medical Error"
CHARLES L. BOSK, *University of Pennsylvania; Member, School of Social Science*

December 2
Bioethics Roundtable

December 3
IAS/Princeton University Economics Workshop: "Competition and Complexity"
HAMID SABOURIAN, *Cambridge University* (with Douglas Gale)

December 4
Social Science Thursday Luncheon Seminar: "Heroin, Crack and Homelessness in Black and White: Photo-Ethnography from San Francisco"
PHILIPPE BOURGOIS, *University of California, San Francisco; Member, School of Social Science*

December 10
Bioethics Thematic Seminar: "The Human Subjects Research Industry"
ADRIANA PETRYNA, *New School University; Member, School of Social Science*

December 10
IAS/Princeton University Economics Workshop: "Top down = bottom up = one shot: (In) efficiency and matching and sorting"
MICHAEL ROTHSCHILD, *Princeton University* (with Meg Meyer)

December 11
Social Science Thursday Luncheon Seminar: "What's in a Signature? Maurice Halbwachs and the French-German Culture Wars"
WOLF LEPENIES, *Wissenschaftskolleg zu Berlin; Visitor, School of Social Science*

December 16
Bioethics Roundtable

January 7
Bioethics Thematic Seminar: "Substance Abusers in the County Hospital and in Public Health Prevention Services: An Ethnographic Study of Homeless Heroin Injectors and Crack Smokers"
PHILIPPE BOURGOIS, *University of California, San Francisco; Member, School of Social Science*

January 13
Bioethics Roundtable

January 21
Bioethics Thematic Seminar: "Bioethics as Occupation, Profession, and Social Movement"
RAYMOND DE VRIES, *University of Minnesota* and *St. Olaf College; Member, School of Social Science*

January 29
Social Science Thursday Luncheon Seminar: "A Pleasing Birth: What Midwifery in the Netherlands Can Teach Us About Doing Health Care Reform Better"
RAYMOND DE VRIES, *University of Minnesota* and *St. Olaf College; Member, School of Social Science*

February 2
IAS/Princeton University Economics Workshop: "Opportunistic Political Cycles: Test in a Young Democracy Setting"
EKATERINA ZHURAVSKAYA, *Center for Economic and Financial Research, Moscow; Member, School of Social Science* (with Akhmed Akhmedov)

February 4
Bioethics Thematic Seminar: "Virtually All Human Beings as Rightholders: A Non-speciesist Approach"
S. MATTHEW LIAO, *Center for Human Values, Princeton University*

February 5
Social Science Thursday Luncheon Seminar: "Virtual Disabilities: On the Internet Nobody Knows You're Not a Very Sick Puppy"
TOD CHAMBERS, *Northwestern University; Member, School of Social Science*

February 9
IAS/Princeton University Economics Workshop: "Imprecise Probabilistic Beliefs"
KLAUS NEHRING, *University of California, Davis; Member, School of Social Science*

February 10
Bioethics Roundtable

February 12
Social Science Thursday Luncheon Seminar: "Clean Elections and the Great Unwashed: Educating Voters in the Philippines"
FREDERIC C. SCHAFFER, *Massachusetts Institute of Technology; Member, School of Social Science*

February 18
Bioethics Thematic Seminar: "Diagnosing Your Self: Pharmaceutical Marketing and Public Representations of Social Anxiety Disorder"
JOSEPH E. DAVIS, *University of Virginia; Member, School of Social Science*

February 19
Social Science Thursday Luncheon Seminar: "Responsibility and Historic Injustice"
IRIS MARION YOUNG, *University of Chicago; Member, School of Social Science*

February 23
IAS/Princeton University Economics Workshop: "Tax Sensitivity and Home State Preferences in Internet Purchasing"
SARA FISHER ELLISON, *Massachusetts Institute of Technology; Member, School of Social Science*

February 26
Social Science Thursday Luncheon Seminar: "Bioethics, Biotechnology, and Anti-Aging Interventions"
LEIGH TURNER, *McGill University; Member, School of Social Science*

March 1
IAS/Princeton University Economics Workshop: "The Digital Envelope: A Crash Course in Modern Cryptography"
AVI WIGDERSON, *Institute for Advanced Study; Professor, School of Mathematics*

March 3
Bioethics Thematic Seminar: "Guinea Pigs on the Payroll"
TRUDO LEMMENS, *University of Toronto; Member, School of Social Science*

March 4
Social Science Thursday Luncheon Seminar: "Add-on Pricing: Why Are Hotel Minibars So Expensive? Should We Care?"
GLENN ELLISON, *Massachusetts Institute of Technology; Member, School of Social Science*

March 8
IAS School of Social Science/School of Mathematics Joint Seminar: "Online Concealed Correlation by Boundedly Rational Players"
ABRAHAM NEYMAN, *Hebrew University* (with Gilad Bavly)

March 8
IAS/Princeton University Economics Workshop: "Strategy-Proof Social Choice Without Dictators"
CLEMENS PUPPE, *Institut für Wirtschaftstheorie und OR Universität Karlsruhe (TH)* (with Klaus Nehring)

March 9
Bioethics Roundtable

March 11
Social Science Thursday Luncheon Seminar: "Beyond Humanitarian Intervention: Human Rights in Global Society"
MICHAEL WALZER, *Professor, School of Social Science*

March 15
IAS/Princeton University Economics Workshop: "Knowledge Disclosure, Patents, and Optimal Organization of Research and Development"
SUDIPTO BHATTACHARYA, *London School of Economics and Political Science*

March 17
Bioethics Thematic Seminar: "Genetic Enhancement and the Revenge of the Pod People"
CARL ELLIOTT, *University of Minnesota; Associate Visiting Professor, School of Social Science*

March 18
Social Science Thursday Luncheon Seminar: "What is Diversity?"
KLAUS NEHRING, *University of California, Davis; Member, School of Social Science*

March 23
Bioethics Roundtable

March 25
Social Science Thursday Luncheon Seminar: "Identity Politics in Action: An Israeli Case History and Some General Reflections on the Consequences of Multiculturalism"
BARUCH KNEI-PAZ, *The Hebrew University of Jerusalem; Visitor, School of Social Science*

March 31
Bioethics Thematic Seminar: "Ethics of Heroin Prescription"
LOUIS C. CHARLAND, *University of Western Ontario; Member, School of Social Science*

April 1
Social Science Thursday Luncheon Seminar: "The Human Subjects Research Industry"
ADRIANA PETRYNA, *New School University; Member, School of Social Science*

April 14
Bioethics Thematic Seminar: "Why Bioethics Belongs in the Humanities"
RONALD A. CARSON, *The University of Texas Medical Branch*

April 15
Social Science Thursday Luncheon Seminar: "A Madness for Identity"
LOUIS C. CHARLAND, *University of Western Ontario; Member, School of Social Science*

April 19
IAS/Princeton University Economics Workshop: "The Rawlsian Principle and Secession-Proofness in Large Heterogeneous Societies"
SHLOMO WEBER, *Southern Methodist University* (with Michel Le Breton and Jacques Dreze)

April 20
Bioethics Roundtable

April 22
Social Science Thursday Luncheon Seminar: "French Identity in Flux: Vichy's Collaboration and Antigone's Operatic Triumph"
JANE FULCHER, *Indiana University; Member, School of Historical Studies*

April 27
Bioethics Roundtable

April 28
Bioethics Thematic Seminar: "Genetic Differences and Human Identities"
ERIK PARENS, *The Hastings Center*

April 29
Social Science Thursday Luncheon Seminar: "America Behind the Color Line"
HENRY LOUIS GATES, Jr., *Harvard University; Joint Visitor, School of Social Science* and *School of Historical Studies*

May 6
Social Science Thursday Luncheon Seminar: "Miss Lonelyhearts Visits the Hospital: Bioethics and the Advice Industry"
CARL ELLIOTT, *University of Minnesota; Associate Visiting Professor, School of Social Science*

May 12
Bioethics Thematic Seminar: "Cooperation Despite Disagreement: Further Thoughts"
NOAM ZOHAR, *Bar Ilan University; Member, School of Social Science*

May 13
Social Science Thursday Luncheon Seminar: "Trading in the Temple of Science: The Commercialization of Medical Research"
TRUDO LEMMENS, *University of Toronto; Member, School of Social Science*

May 17
IAS/Princeton University Economics Workshop: "Why Don't Harvard Economists Publish More in Top Journals?"
GLENN ELLISON, *Massachusetts Institute of Technology; Member, School of Social Science*

May 18
Bioethics Roundtable

May 20
Social Science Thursday Luncheon Seminar: "ART and Culture in the Land of the Zulus: Preliminary Notes on Anti-Retroviral Rollout in Rural Africa"
ADAM ASHFORTH, *Associate Visiting Professor, School of Social Science*

May 26
Bioethics Thematic Seminar: "The Intellectual Significance of Medicine Today"
STEPHEN E. TOULMIN, *University of Southern California*

May 27
Social Science Thursday Luncheon Seminar: "The Psychological Reproduces the Social: Sexual Abuse as a Trauma"
JOSEPH E. DAVIS, *University of Virginia; Member, School of Social Science*

June 1
Bioethics Roundtable

June 21
IAS/Princeton University Economics Workshop: "Determinants of Entrepreneurship in Russia"
EKATERINA ZHURAVSKAYA, *Center for Economic and Financial Research, Moscow; Member, School of Social Science*

JEFF GOLDBERG/ESTO

"This has been an extremely productive and enjoyable year for me, and thus, I thank the Institute for Advanced Study for inviting me and creating such a wonderful atmosphere here. I heard many exciting seminars and interacted with many short-term and long-term visitors ... Thank you for this great year."

— Member, School of Mathematics

Simonyi Hall

SPECIAL PROGRAMS

PROGRAM IN INTERDISCIPLINARY STUDIES

Faculty
PIET HUT

PROFESSOR PIET HUT brought the new interdisciplinary program into its second year. His visitors came from a variety of fields, including physics and astrophysics, computer science, cognitive science, psychology, political science, and philosophy.

Professor Hut's main focus of research is astrophysics. He published several papers on various aspects of stellar dynamics. He was co-author on two papers in *Nature*, on the formation of binaries in the outskirts of our planetary system, and on simulations of star clusters in M82.

Currently, his main research project in astrophysics is the development of the Kali code, a new software tool for simulations of dense stellar systems, which he is developing in collaboration with Jun Makino, from Tokyo University. This project is based on the philosophy that complete documentation is central for any large-scale software development to succeed. As a side product, Hut and Makino are writing a series of textbooks titled The Art of Computational Science. They have published the first few volumes in this series on their web site www.ArtCompSci.org.

Professor Hut co-organized three workshops in the MODEST series (for MOdeling DEnse STellar systems), which he had started two years before, when he organized MODEST-1 in New York City. MODEST-3 was held in Melbourne, Australia, in July 2003. MODEST-4 was held in Geneva, Switzerland, in January 2004. MODEST-4a, held in Strasbourg, France, in March 2004, was the first satellite meeting, in the form of a Spring School for graduate students interested in working with N-body simulations. The School featured four days of hands-on computer modeling under the guidance of Professor Hut and four colleagues.

Together with planetary scientist Clark Chapman, Apollo astronaut Russell Schweickart, and shuttle astronaut and half-year-long inhabitant of the International Space Station Ed Lu, Professor Hut organized various activities to promote a space mission to practice asteroid deflection, with the aim of making the Earth a safer place. They published an article about their approach in *Scientific American* in November 2003, and organized a one-day meeting back-to-back with the AIAA Planetary Defense Conference: Protecting Earth from Asteroids, in February 2004.

ARTIST-IN-RESIDENCE PROGRAM

Jon Magnussen, Composer

The 2003-04 academic year marked the beginning of *Recent Pasts 20/21*, a new direction for the Institute for Advanced Study's Artist-in-Residence Program. Over a four-year period, the music of the past century will be explored through chamber music concerts and talks. 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 early 21st centuries.

During the past half-century, contemporary western art music has witnessed a period of exponential growth in the multiplicity of compositional styles it embraces. The modernist aesthetic, once the only legitimate choice for composers, has given way to a plurality of alternatives, inspired by a multiplicity of influences. While creating a wonderfully varied musical landscape, these circumstances are changing the concert experience, and as a result, the art music itself is being transformed.

The 2003-04 music series focused on three areas: *NEW TRADITIONS, PART I (Sonatas, Interludes and Cabaret Songs)* explored the music and ideas of composers John Cage, Morton Feldman, and Christian Wolff, with performances by Joan La Barbara, composer and vocalist, with Margaret Leng Tan, piano; *MUSICAL KALEIDOSCOPES, PART I (An American Collection)* focused on the music of American composers Aaron Copland, Joan Tower, Sebastian Currier, George Perle, Derek Bermel and Jennifer Higdon with performances by *Music from Copland House* (Derek Bermel, clarinet; Michael Boriskin, piano; Paul Lustig Dunkel, flute; Wilhelmina Smith, cello; with guest artists Curtis Macomber, violin and Danielle Farina, viola); and *LINEAGES, PART I (Arnold Schoenberg: Broadening the Circle)* explored the music and ideas of Arnold Schoenberg through the music of J.S. Bach, Franz Liszt, Alban Berg, Wagner/Liszt, Erich Itor Kahn, Stefan Litwin, and Steuermann/Schoenberg, with performances by Stefan Litwin, piano. The last event of the season featured Jon Magnussen and Gavan Daws hosting *Wet Ink*, a work-in-progress performance featuring portions of their forthcoming opera.

Speakers in the series included composer Christian Wolff (*"Experiments in Music around 1950 and some consequences and causes (social-political and musical)"*), American composer George Perle and pianist Michael Boriskin (*"The Right Notes: George Perle speaks with Michael Boriskin and Jon Magnussen"*), and philosopher Lydia Goehr (*"Adorno in Darmstadt"*).

In addition to the concerts and lectures, a special event—*Photo Album with Music*— was offered by Stefan Litwin, piano, with Nuria Schoenberg Nono, daughter of Arnold Schoenberg. Emphasizing Schoenberg the person, this unique event portrayed, in conversation format, his relationships with pupils and family, and revealed the cultural and political situations he experienced, enhanced by projected images, unpublished anecdotes and original recordings of Schoenberg speaking. Piano works by Schoenberg, Berg, Webern and Eisler were performed by Litwin.

In addition to directing *Recent Pasts 20/21*, Magnussen was commissioned by American Ballet Theatre to create a score for choreographer Robert Hill's narrative work *Dorian*. The 55-minute orchestration of chamber music by Chausson, Schumann and Chopin was

scored for full orchestra, solo violin and solo piano, and conducted by David Lamarche at its City Center (New York) premiere on October 30, 2004.

In the late fall, Magnussen began work on his opera, *The Folding Cliffs*, from which excerpts of the work-in-progress were performed on April 29, 2004 in Wolfensohn Hall (*WET INK*). Performers included baritone André Solomon-Glover, mezzo soprano Mary Nessinger, tenor Scott McCoy, boy soprano James Schure, and Magnussen as pianist and director. After the performance of excerpts, librettist Gavan Daws and Magnussen discussed the operatic undertaking and answered questions from the audience.

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.

JOSÉ SERRA

Director's Visitor José Serra was Brazilian Minister of Health from 1998 to 2002. As such, Professor Serra was concerned with the issues of intellectual property and the evolution of drug strategies, particularly in the context of the treatment of AIDS. Brazil's anti-AIDS campaign and AIDS policy is considered the best among developing countries. In October 2003, Dr. Serra presented a talk on the subject of "Fighting AIDS in Developing Countries: Brazil's Model of Success," to the Friends of the Institute for Advanced Study, as part of the Friends Forum series.

LAURA SANGUINETI WHITE

Director's Visitor Laura Sanguineti White is the chair of the Italian department at Rutgers, the State University of New Jersey. She specializes in early medieval literature, Petrarch, Boccaccio, the epic, and seventeenth and eighteenth century Italy. During her tenure as Director's Visitor, Professor White completed a one-volume English edition of selections from the 58-volume Venetian diaries of Marin Sanudo (1496-1533) that she co-edited with the late Dr. Patricia Labalme.

INSTITUTE FOR ADVANCED STUDY/ PARK CITY MATHEMATICS INSTITUTE

The IAS/Park City Mathematics Institute (PCMI) is an integrated mathematics program sponsored since 1994 by the Institute for Advanced Study. Participants in PCMI include research mathematicians, graduate students, undergraduate students, mathematics education researchers, undergraduate faculty, and high school teachers. The interaction among these diverse groups fosters a stronger sense of the mathematical enterprise as a whole, in that it raises awareness of the roles of professionals with diverse responsibilities in mathematics-based professions

The annual three-week Summer Session is the flagship activity of PCMI. Additional programs take place throughout the year and include the year-long High School Teacher Program and the Lecture Publication Series.

A major development for PCMI in 2003-04 was the receipt of a three-year Math Science Partnership Initiatives grant from the National Science Foundation. Totaling some $5.5 million over three years, the funding provides for an expanded Summer Session High School Teacher Program and for 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). The in-year program is known as PD^3, which stands for "PCMI and Districts Partner to Design Professional Development." In each district, the PCMI three-fold model of 1) continuing to do mathematics, 2) analyzing practice, and 3) becoming a resource to one's peers, will be tailored and implemented as the official professional development program for math teachers in selected middle and high schools in each district. Teachers and administrators from each of the three school districts will participate fully in designing professional development offerings that, based on PCMI's three-fold model, will be unique to the needs of their own teachers and curriculum. PCMI's was the only Institute Prototype award given in the Math Science Partnership program's 2003 cohort of grants.

Summer Session
The 14th annual Summer Session of the IAS/Park City Mathematics Institute (PCMI) was held July 11-July 31, 2004, in Park City, Utah. This year's PCMI Summer Session, with a total of 375 participants (PCMI's largest attendance recorded to date) included the following programs:

Research Program in Mathematics
Graduate Summer School
Undergraduate Summer Program
High School Teacher Program
Undergraduate Faculty Program
Mathematics Education Research Program
Mathematician's Study Group on State Standards
NCTM/ASSM Conference on State Standards

As is the case each year, a specific area of mathematics was chosen to provide the focus for the overall programming. The mathematical topic for the 2004 Summer Session was *Geometric Combinatorics;* this topic informed the work of the Graduate Summer School, the Research Program and the Undergraduate Program. The Mathematics Education topic for 2004 was the *Elementary Teaching Lab*. The mathematics education topic in the High School Teachers Program was *From Policy to Practice: Partnerships with School Districts*.

Each of the programs met daily for its own series of courses and seminars. The groups also met together for an afternoon Cross Program Activity two or three days per week. A complete listing of courses, seminars and activities follows.

Graduate Summer School and Research Program
Organized by Ezra Miller, University of Minnesota, Victor Reiner, University of Minnesota, and Bernd Sturmfels, University of California at Berkeley, the Graduate Summer School met for three formal lectures and one or two problem sessions each day.

PCMI was very pleased to have the participation of Clay Mathematics Institute Senior Scholars Richard Stanley and Bernd Sturmfels in the Summer Session. Professor Sturm-

fels delivered a public lecture entitled "Tropical mathematics" and Professor Stanley delivered a public lecture entitled "Tilings." Professors Stanley and Sturmfels participated actively in the Graduate Summer School and Research Program.

Graduate Summer School lecturers and course titles:

1. Alexander Barvinok, University of Michigan
   Lattice points, polyhedra, and complexity

2. Sergey Fomin, University of Michigan
   Root systems and generalized associahedra

3. Robin Forman, Rice University
   Topics in combinatorial differential topology and geometry

4. Mark Haiman, University of California at Berkeley
   Geometry of q- and q, t-analogs in combinatorial enumeration

5. Robert MacPherson, Institute for Advanced Study
   Calculating equivariant invariants

6. Richard Stanley, Massachusetts Institute of Technology, Clay Senior Scholar in Residence
   Hyperplane arrangements

7. Michelle Wachs, University of Miami
   Poset Topology: Applications and Tools

8. Guenter Ziegler, Technical University Berlin
   Convex polytopes

There is much anticipation of the set of course lecture notes that are being generated from the Graduate Summer School for publication by the American Mathematical Society (Park City Mathematics Series Volume 14).

The Research Program
The Research Program had about 50 participants. This program's main formal activities were seminars, usually two per day during the first two weeks, and one per day during the third week. There was also ample opportunity for less formal interaction in the Research Program. Blackboards in the hallway of the conference center facilitated impromptu conversations, and various seminar rooms with tables and blackboards were available during parts of the day and evenings.

Research Program Seminars:
The geometric Littlewood-Richardson Rule; Ravi Vakil
The kissing problem in four dimensions; Oleg Musin
Matroids, motives and Feynman integration; Patrick Brosnan
Theorems and conjectures about k-Schur functions; Jennifer Morse
Miniscule flag manifolds, and the Horn recursion; Kevin Purbhoo

An introduction to Coxeter matroids; Neil White
Computing Toric Residues; Ivan Soprunov
Graph Varieties; Jeremy Martin
Alternating signs of quiver coefficients; Anders Buch
Lattice Theory Questions Concerning Reflexive Polytopes; John Morgan
Polytopes and Tensor Product Multiplicities; Tyrell McAllister
Cambrian Lattices and Generalized Associahedra; Nathan Reading
Old and new ideas of constructing nonrepresentable oriented matroids; Komei Fukuda
The bounded complex of hyperplane arrangements is pure; Xun Dong
Subspace arrangements of curve singularities and a q-analogue of the Alexander polynomial; Beifang Chen
Hypertoric Varieties; Nick Proudfoot
Polyhedral combinatorics of the McKay correspondence; Diane Maclagan
Quadratic triangulations; Christian Haase
Local cohomology of semigroup rings and GKZ systems; Laura Matusevich
Amoebas, matroids and phylogenic trees; Federico Ardila
Partition arrangements, Garnir modules, and q-Lascoux resolution; Alexander Woo
The reality of sign imbalance; Jenya Soprunova
Discrete Morse theory for posets and a GL n(q)-analogue of the partition lattice; Patricia Hersh
Geometric vertex decompositions; Alexander Yong
Young tableaux are facets of a simplicial complex; Allen Knutson
Combinatorics of Tropical Linear Spaces; David Speyer
Hyperplane arrangements and representations of graded Hecle algebras; Cathy Kriloff
Permutohedra, minimal matrices and Kronecker products; Ernesto Vallejo
Equivariant cohomology of the Quot schem via GKM; Linda Chen
Tropical Halfspaces; Michael Joswig
Graph Coloring Manifolds; Frank Lutz
Topological obstructions to graph colorings; Dmitry Kozlov
Non-crossing partitions for arbitrary Coxeter groups; John McCammond
The totally nonnegative part of the Grassmannian, and a q-analogue of the Eulerian numbers; Lauren Williams
Cake-cutting by flags of faces and hemispheres; Francis Su
A combinatorial model for Macdonald polynomials; Jim Haglund

The High School Teacher Program
Forty-seven 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 some product that could be shared with their colleagues both at PCMI and more broadly through the PCMI website. This year presented a particular challenge as the program scaled up to include 18 additional teachers from the three sites — Seattle, Washington, McAllen, Texas, and Cincinnati, Ohio — that are part of the Math Science Partnership project known as PD^3 (*PCMI and Districts Partner to Develop Professional Development*).

Eight of the teachers were returning for a second year, including four who were tapped for a third year to work with the staff as leaders and support for the other participants. One of the 2003 International Seminar teachers from Ecuador joined the program this summer and brought a very interesting perspective on teaching and learning mathematics.

The other participants came from a variety of geographic locations including Ohio, Michigan, Pennsylvania, New Mexico, New Hampshire, North Carolina, Maryland, New Jersey, and California, and ranged from teachers with only two years of teaching experience to seasoned veterans. The teachers represented Professional Development and Outreach groups from Los Angeles, Seattle, New Jersey, and Cincinnati, as well as those who came as individuals.

The mathematics session, *Stories that Count: The Art and Craft of Combinatorial Proofs*, focused on combinatorics, using materials created for the fourth year by Al Cuoco from the Educational Development Corporation and alumni of the PROMYS program out of Boston University. Under the leadership of two PROMYS teachers, participants built "trains" with rods and used them to explore key concepts in combinatorics. An underlying theme was how combinatorial thinking can be used to illuminate ideas from more mainstream courses, like algebra, arithmetic, and geometry. In the session on Reflecting on Practice, participants examined student work on mathematics problems, analyzed mathematical tasks for opportunities to develop rich mathematics, and searched for research that addressed issues in teaching and learning mathematics. Some of the participants took advantage of the teaching laboratory for fifth grade students taught by Deborah Ball and spent time observing the sessions and taking part in a discussion after a cross program presentation by Ball and her students. For two hours each afternoon, participants participated in one of five working groups - data analysis, functions, geometry, lesson study, and combinatorics. During this time they explored technology, developed lessons, classroom activities, and drafts of potential articles on interesting and useful mathematics that will be tested in their classrooms when appropriate, reviewed during the coming year, revised when necessary, and posted on the PCMI website.

During the first week, five mathematics supervisors, along with the district and university representatives from the three PD^3 sites, took part in the sessions for the high school teachers and met separately to help the PD^3 partners shape and focus the PD^3 mission. Throughout the three weeks, PD^3 teachers held special sessions to lay out plans for their work back in their schools and districts.

The Professional Development and Outreach Groups that meet during the school year are closely related to the summer High School Teacher Program. This summer the program welcomed participants from Los Angeles, New Mexico, New Jersey, Utah, Washington, the San Francisco area, and Cincinnati. Advisors from New Mexico, Washington, Texas, New Jersey, Utah, and Michigan attended during the first week of the program and took part in the math supervisor PD^3 sessions. A more focused program for the Professional Development and Outreach leaders as a group is under consideration for 2005.

Undergraduate Faculty Program

This year's Undergraduate Faculty Program at PCMI was entitled "Combinatorics in Concert: for Teaching, Research, Outreach and Recreation" and featured two parts — a morning course that surveyed topics in geometric combinatorics (in synergy with the conference theme), and an afternoon session in which participants discussed various items related to professional development and worked on group projects. The organizer and facilitator was Francis Edward Su of Harvey Mudd College, with assistance from Daniel Goroff, Harvard University, and the PCMI Steering Committee. There were 16 participants in the Undergraduate Faculty Program. Most of them were new to geometric combinatorics and saw the program as an excellent opportunity to grow professionally and retrain in a new area.

The morning course lectures were designed to equip participants, if they wished, to understand some of the Research Program talks. Several participants noted on their exit surveys that they were, indeed, regularly attending one or two other lectures every day in addition to the morning course. The morning course also attracted a mixture of undergraduate and graduate participants as well as a few people from the Research Program. On average, the morning course had about 20 participants (about 12 of which were Undergraduate Faculty Program participants), though that number was as high as 30 on days in which the lecture topic was popular (e.g., tropical geometry).

Tom Roby lectured on Japanese Lesson Study and on high-school outreach. A lecture by Richard Hill on high school transitions to college was held in conjunction with the High School Teacher Program. Thus, there was a lot of cross-program interaction. In addition, David Perkinson discussed undergraduate research projects on polytopes, and Dan Schaal led a couple of sessions on how to run a Research Experience for Undergraduates. Program organizer Francis Su hosted a session on how to start and run a college problem-solving seminar.

Besides these discussions, the participants were assigned a group project that would help them assimilate all they were learning. Participants were divided into three groups and each group was to prepare two course modules and one outreach lecture based on some of the material on geometric combinatorics that they learned at PCMI. The goal was to make ideas from geometric combinatorics accessible for use in undergraduate courses (course modules), as well as to other audiences (outreach lectures). All groups presented their work on the final day. PDF files of their work (as well as other items from the program) may be accessed at http://www.math.hmc.edu/~su/pcmi/.

Mathematics Education Research Program: 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 eight days and enrolled nineteen students. Classes were held from 10:00a.m.-12:15p.m., with an additional 30 minutes of homework each day. The research topic of the PCMI Summer Session, Geometric Combinatorics, was explored using rectangles constructed from unit square tiles. The students' work connected arithmetic, geometric, and algebraic representations and ideas. Emphasis was placed on looking for and identifying patterns, generalizing, using definitions, and justifying claims. Important topics included factorization, primes, squares, and rectangles. At the end of the first week, students shared their work in a cross-program presentation.

Elementary Mathematics Laboratory participants attended 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.

In the months ahead, a team at the University of Michigan will be looking closely at the classroom records that were generated and collected during the summer course. They will continue the analyses that were begun during the summer with the aim of developing usable knowledge and educational materials to support the professional learning of mathematics teachers and the work of mathematics teacher educators.

Undergraduate Summer School
The Undergraduate Summer School for 2004, as in previous years, was built around two courses, an introductory course designed for students having just completed calculus and linear algebra, and an advanced course for students with a more extensive mathematical background. This year the introductory course was offered by Edward Swartz (Cornell University), "From polytopes to enumeration," and the advanced course was offered by Rekha Thomas (University of Washington), "Groebner bases and polytopes."

One factor in this year's success was the nature of the Summer Session's topic, geometric combinatorics. This is an area that does not require as much specialized background as many other mathematical topics, and it has many interesting results that are intuitively understandable and pleasingly visual. Another factor was the pedagogical skill of the two instructors. Both were well-organized in their presentations and interacted well with the students.

Many of the undergraduates attended selected courses from the Graduate Summer School. It is interesting to observe that there were only small differences this year in the individual schedules chosen by the introductory students as opposed to the schedules chosen by the advanced students. According to our detailed interim evaluations, nearly every student attended both of the Undergraduate Summer School courses, about half of the students attended at least parts of the Undergraduate Faculty Program course (a higher percentage of the introductory students attended the Undergraduate Faculty Program course than the advanced students), while most of the undergraduates attended at least some the Graduate Summer School lectures. Four students (two introductory, two advanced) indicated attending some of the Research Program lectures. The vast majority attended at least some of the cross-program presentations.

From an undergraduate evaluation:

"I absolutely love the people in the program, and PCMI staff are wonderful. The organizers have clearly spent a lot of time and effort in planning every hour of the programs! I really like how all the lecture notes from all the programs are put out….. and how well everything's organized. Most of all, I really like that there's a lot of interaction between the different people in the program. Famous professors and researchers are remarkably approachable to us humble undergraduates, and the assigned seatings during lunch have really helped meet other members of the program. Going to the graduate lectures has also been very stimulating."

A National Math View
Hosted at PCMI this summer was a three-day workshop jointly sponsored by the National Council of Teachers of Mathematics (NCTM) and the Association of State Supervisors of Mathematics (ASSM). Johnny Lott, Immediate Past President of the NCTM, organized this workshop as a method of analyzing and collecting data about the Mathematics Standards of the 50 United States. The goal was to assess how close or far away the United States is from a national mathematics curriculum. Working in 13 teams, each team including a cross representation of ASSM members, NCTM Board Members and selected mathematicians, the workshop analyzed the various Standards by grade level strands. It is expected that the results of this group's work will be disseminated in early 2005.

Mathematician's Study Group on State Standards
A distinctive feature of PCMI 2004 was the concurrent workshop to compare the Mathematics Standards documents of the 50 states, in an attempt to determine the extent to which a national curriculum can be said to exist. Working beside the NCTM and ASSM participants was a group of approximately a dozen university mathematicians.

Directly following the NCTM/ASSM meeting, a group of mathematicians met to discuss and comment on the current state of the States' Mathematics Standards. Each participant read the standards documents from five states, with all such documents covered by someone in the group. The participants were:

Jerome Dancis, University of Maryland
Jerry Dwyer, Texas Technical University
Roger Howe, Yale University (chair)
Solomon Friedberg, Boston College
Bertram Fristedt, University of Minnesota
Harvey Keynes, University of Minnesota
James Lewis, University of Nebraska (co-chair)
Andrew Magid, University of Oklahoma
James Milgram, Stanford University
Frank Quinn, Virginia Polytechnic Institute
Alan Tucker, State University of New York at Stony Brook
W. Steven Wilson, Johns Hopkins University

The outcomes of the Study Group debates will be further refined and summarized in a report, which is currently under preparation and scheduled for release in the Fall of 2004.

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 Cross Program Activities were held two or three afternoons each week as well as various evening activities and participant-coordinated weekend trips.

One very popular activity was "Pizza and Problem Solving," organized by Francis Su, the Undergraduate Faculty Program organizer. On each of two Thursday evenings, between 200 and 250 participants attended, representing all the programs at PCMI (including the State Math Supervisors who were participating in the NCTM/ASSM conference on State Standards). 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.

Cross Program Activities Lectures:

Michigan State University's Capstone Course; Sharon Senk, Michigan State University, and Richard Hill, Michigan State University

Clay Mathematics Senior Scholars Lecture: Tilings; Richard Stanley, Massachusetts Institute of Technology

Clay Mathematics Senior Scholars Lecture: Tropical Mathematics; Bernd Sturmfels, University of California at Berkeley

Kaplan Math Circles; Robert and Ellen Kaplan, Harvard University

Elementary Mathematics Lab; Deborah Ball, University of Michigan

The National Security Agency; Michelle Wagner, National Security Agency

A New Primal Screen; Carl Pomerance, Dartmouth College

Felix Klein's Seminars on Mathematics Education; Yuri Tschinkel, University of Pennsylvania

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, now 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*

It is expected that Volume 11 will be published in 2005. All volumes are available either from the American Mathematical Society or through popular bookstores such as Barnes and Noble.

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 undergraduate students and are published independently of the Park City Mathematics Series mentioned above. Published thus far are:

Lectures on Contemporary Probability by Gregory F. Lawler and Lester N. Coyle
An Introduction to the Mathematical Theory of Waves by Roger Knobel
Codes and Curves by Judy L. Walker

The High School Teacher Program has begun dissemination of its teacher-created materials and other resources via a special website created by the Math Forum at Drexel University.

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The Wolfensohn Family Foundation
The Spencer Foundation
The Clay Mathematics Institute
Chautauqua Workshop Programs

Appreciation is also extended to the Department of Mathematics at the University of Utah for additional office space for PCMI administration during the academic year.

2004 Graduate Summer School/Research Program Organizers:
Ezra Miller, Professor, University of Minnesota
Victor Reiner, Professor, University of Minnesota
Bernd Sturmfels, Professor, University of California at Berkeley, Editor

Lecture Series:
David R. Morrison, Professor, Duke University

High School Teachers Program:
Gail Burrill, Instructor, Michigan State University
James R. King, Professor, University of Washington
Carol Hattan, Teacher, Skyview High School

Mathematics Education Research Program:
Joan Ferrini-Mundy, Associate Dean for Science and Mathematics Education, College of Natural Science of Michigan State University
Timothy Kelly, Professor, Hamilton College

Member at large:
John C. Polking, Professor, Rice University

Recruitment:
Nathaniel Whitaker, Professor, University of Massachusetts at Amherst

Research Program:
Karl Rubin, Professor, Stanford University

Undergraduate Faculty Program:
Daniel Goroff, Professor, Harvard University

Undergraduate Program:
William Barker, Professor, Bowdoin College
Roger Howe, Professor, Yale University

The research topic for the summer of 2005 will be *Mathematical Biology*, organized by Mark Chaplain, University of Dundee; James Keener, University of Utah; Mark Lewis, University of Alberta; and Philip Maini, Oxford University.

PROGRAM FOR WOMEN IN MATHEMATICS

The eleventh annual Program for Women in Mathematics was held at the Institute for Advanced Study from May 17-27, 2004. The research topic was analysis and nonlinear PDEs. The program, sponsored by the Institute for Advanced Study and Princeton University, is designed to bring women students in contact with postdoctoral scholars and active professional mathematicians, and to encourage women to further their mathematics education by offering deep mathematical content as well as extensive mentoring opportunities.

More than 60 women were on campus for the 11-day program of lectures, seminars, working problem groups, and mentoring and networking sessions. Students and mentors took part in the life of the Institute and had the opportunity to meet other mathematicians in residence here and at Princeton University. In addition to program participants, both the undergraduate and graduate courses had a number of attendees from the Institute for Advanced Study and from Princeton University as well as other institutions in the area. A daily schedule was posted on the website.

Lesley Ward, Harvey Mudd College, and Cristina Pereyra, University of New Mexico, taught the Beginning Lecture Course. The course aimed to expose students to the basics of harmonic analysis, ranging from Fourier's heat equation, and the decomposition of functions into sums of cosines and sines (frequency analysis) to dyadic harmonic analysis (or decomposition into Haar basis functions, involving time localization).

Jill Pipher, Brown University, and Gigliola Staffilani, Massachusetts Institute of Technology and Member, IAS School of Mathematics, gave the Advanced Lecture Course. The lecturers presented some classical and more modern methods in the study of the linear and nonlinear wave equations when data are assigned at the initial time. They showed that abstract functional analysis, harmonic analysis and Fourier analysis can be used to solve a very "Physical" problem.

Cynthia Diane Rudin, Princeton University, led the Women-in-Science Seminar assisted by Jean Steiner, Courant Institute of Mathematical Sciences. The following seminars were presented during the program: Shelley Costa, Swarthmore College, *A Female Mathematical Public in 18th-century Britain*; Vita Rabinowitz, Gender Equity Project, Hunter College, *Women in Science and Mathematics: Where we stand and what we need to know*; and John B. Conway, National Science Foundation, *NSF Grants*. Panel discussions included *How to Survive Graduate School* with panelists Rhonda Hughes, Bryn Mawr College, Andrea Nahmod, Institute for Advanced Study, graduate student Carole Womeldorf, Johns Hopkins University, and Cynthia Rudin, Princeton University; *Women in Industrial and Applied Mathematics* with panelists Bonnie Ray, IBM, Tessy Papavasiliou, Columbia University, Corinna Cortes, Google, and Olga Troyanskaya, Princeton University; and *A Day in the Life* with panelists Ingrid Daubechies, Princeton University, Amy Cohen-Corwin, Rutgers, the State University of New Jersey, Nancy Hingston, The College of New Jersey, and Svetlana Roudenko, Duke University. Cynthia Rudin, Princeton University, led a reading group, Impeccable Advice.

Natasa Pavlovic, Member, IAS School of Mathematics, organized the Research Seminars. The following seminars were presented during the program: Jean Steiner, Courant Insti-

tute of Mathematical Sciences, *Determinants, Traces and "Hearing" the Shape of Space*; Jill Pipher, Brown University, *Multiparameter Harmonic Analysis*; Bin Zheng, Coastal Carolina University, *Pythagorean Triples*; Lesley Ward, Harvey Mudd College, *Translation-Averaging in Dyadic Function Spaces*; Cristina Pereyra, University of New Mexico, *Haar Multipliers meet Bellman functions*; Katrin Wehrheim, Princeton University, *Mean value inequalities and energy quantization for nonlinear boundary value problems*; Raluca Felea, University of Rochester, *Composition calculus for Fourier integral operators with fold and blowdown singularities*; Gigliola Staffilani, Massachusetts Institute of Technology; Sarah Raynor, The Fields Institute and University of Toronto, *Soliton Stability for the Korteweb-deVries Equation in Spaces of Low Regularity*; Kristin Shaw, University of British Columbia, *Symmetric Functions and Littlewood-Richardson Coefficients*; Svetlana Roudenko, Duke University, *Level Set Operators vs. Oscillatory Integral Operators*; Sarah McAllister, Louisiana State University, *On stabilized approximations of semigroups*; and Shirley Yap, University of Pennsylvania.

Colloquia speakers included Thomas Spencer, Professor of Mathematics at the Institute for Advanced Study, *A review of Schrodinger dynamics with random potentials*; Jean Taylor, Courant Institute of Mathematical Sciences, New York University, and Professor Emerita at Rutgers, the State University of New Jersey, *Which PDE to study? Expanding Mathematics through Materials Science*; Anna Gilbert, AT&T Research, *Approximation, algorithms, and approximation again*; Chuu-Lian Terng, Northeastern University, *The modified 2 + 1 chiral model*; and Sun-Yung Alice Chang, Princeton University, *On a blow up sequence of functions for conformal invariant equations*.

Princeton University professors Sun-Yung Alice Chang and Ingrid Daubechies and graduate student Cynthia Rudin planned a special day of lectures and other activities at Princeton University on Tuesday, May 25. The day ended with a panel discussion on "Women in Industrial and Applied Mathematics," arranged by the Genomics Institute, followed by a reception and dinner.

Organizing Committee
The Women's Program Committee assists in planning and promoting the program and recruiting lecturers and participants. The program was organized by Karen Uhlenbeck, the Sid W. Richardson Foundation Regents' Chair in Mathematics at the University of Texas at Austin, and Sun-Yung Alice Chang, Professor of Mathematics, Princeton University. Committee members include: Ingrid Daubechies, Princeton University; Antonella Grassi, University of Pennsylvania; Nancy Hingston, The College of New Jersey; Rhonda Hughes, Bryn Mawr College; Robert MacPherson, Institute for Advanced Study; Cynthia Rudin, Graduate Student, Princeton University; Janet Talvacchia, Swarthmore College; and Lisa Traynor, Bryn Mawr College.

11th Anniversary Reunion Celebration
This year marked the 11th Anniversary of the Program for Women in Mathematics at the Institute for Advanced Study. Past participants were invited to the Institute May 21-22, for a weekend of talks including colloquium speaker Anna Gilbert, AT&T Research, *Approximation, algorithms, and approximation again*; research poster sessions organized by Cynthia Rudin, Princeton University; social activities; and panel discussions. Past participant Gail Ratcliff, East Carolina University, was the panel moderator. Panelists included former participants Katherine Kirkwood, Sweet Briar College; Florence Lin,

University of Southern California; Jennica Sherwood, Vanderbilt University; and Margaret Symington, Georgia Institute of Technology. Over the past eleven years, hundreds of young women have participated in the program and gone on to successful and rewarding careers in mathematics. The field is enriched by their presence.

We are grateful to the National Science Foundation and to The Starr Foundation for their generous support of the Program for Women in Mathematics.

PROSPECTS IN THEORETICAL PHYSICS

Prospects in Theoretical Physics (PiTP) is an intensive two-week summer program designed for graduate students considering a career in theoretical physics. First held by the School of Natural Sciences in the summer of 2002, the program provides lecture courses and informal sessions on the latest advances and open questions in various areas of theoretical physics. The participation of women, minorities, and students from institutions that do not have extensive programs in theoretical physics or access to research universities, is especially encouraged.

The 2004 Prospects in Theoretical Physics program, "String Theory," was held from July 18 to July 30 on the campus of the Institute for Advanced Study. The program was designed for advanced string theorists (4th and 5th year graduate students) and 56 students were accepted into the program. The students lived in the Institute's housing complex during the two-week program.

The scientific program was comprised of three lectures each day, all at the advanced level, and discussion sessions with the lecturers each afternoon. Unlike the two previous PiTP programs that were at a more introductory level, this program was designed more as a workshop than a typical summer school. The daily schedule was posted on the website and the program lectures attracted many students, post-docs and professors from nearby institutions.

Prospects in Theoretical Physics builds on the strong relationship of the research groups at the Institute and Princeton University, and many faculty members from both institutions are actively involved in the program. PiTP is under the direction of Chiara R. Nappi, Princeton University Physics Professor, and an organizing committee of local physicists. An alphabetical listing of 2004 lecturers and their topics follows:

Curtis G. Callan, Princeton University
Aspects of string quantization in AdS5xS5: perturbative approaches and comparison with N=4 SYM

Louise Dolan, University of North Carolina at Chapel Hill
Integrability in superconformal Yang Mills theory

Steven S. Gubser, Princeton University
Scalar interactions in the dark sector

Kenneth Intriligator, University of California at San Diego
4D Superconformal field theories and c-theorems

Nissan Itzhaki, Princeton University
Unstable D-branes and closed strings

Igor R. Klebanov, Princeton University
D-branes on the Conifold and Gauge/Gravity Duality

Juan Maldacena, Institute for Advanced Study
Strings in two dimensions

Burt Ovrut, University of Pennsylvania
Physical Vacua in Heterotic Theory

Alexander M. Polyakov, Princeton University
Two Talks in Search of a Title

Leonardo Rastelli, Princeton University
General lessons for open/closed duality from non-critical strings

Nathan Seiberg, Institute for Advanced Study
Matrix Models

Stephen Shenker, Stanford University
Behind the Horizon

Paul J. Steinhardt, Princeton University
Contracting Universes and the Big Crunch/Big Bang Singularity

Charles B. Thorn, University of Florida at Gainesville
Quantum Field Theory in the Language of String

Edward Witten, Institute for Advanced Study
Twistor String Theory

Prospects in Theoretical Physics is one of the first outreach activities the Institute for Advanced Study has created specifically for graduate students. Because of its strength as a center for research in theoretical physics, the Institute is uniquely positioned to contribute to efforts to attract and retain this next generation of young theoretical physicists, thereby providing an important service to the field.

Prospects in Theoretical Physics 2004 was supported by The Concordia Foundation and J. Seward Johnson, Sr. Charitable Trusts.

BENJAMIN DITTO

"Each day, I learn something new ... PCMI brings together senior mathematicians and leading academicians in a particular field. Interacting with them, watching their lectures, is a great feeling."

— Undergraduate Participant,
IAS/Park City Mathematics Institute Summer Program, 2004

IAS/Park City Mathematics Institute program participants

THE LIBRARIES

The Historical Studies-Social Science Library (Marcia Tucker, Librarian) contains some 100,000 volumes and has subscriptions to about 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.

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. The library has microfilm copies of the papers of both 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 located on the second floor of Fuld Hall and contains some 30,000 volumes (bound periodicals and monographs) and subscribes to nearly 175 journals. The Astrophysics collection (books and journals) is located in Bloomberg Hall. The subject areas covered by the library are pure and applied mathematics, astrophysics, and theoretical, particle, and mathematical physics.

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, access to databases in the fields of Classical Studies, the History of Science, Islamic and French studies, and connection software to the Internet for additional information resources. 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 Harvey S. Firestone Memorial Library and the nineteen special-subject libraries in the Princeton University Library system, and also 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.

DAVID GRAHAM

"The Institute and its School of Natural Sciences provide a wonderfully stimulating atmosphere for exploring and developing new ideas in physics beyond the standard model."

— Member, School of Natural Sciences

INDEPENDENT AUDITORS' REPORT

The Board of Trustees,
Institute for Advanced Study -
Louis Bamberger and Mrs. Felix Fuld Foundation

We have audited the accompanying balance sheet of Institute for Advanced Study - Louis Bamberger and Mrs. Felix Fuld Foundation (the "Institute") as of June 30, 2004, 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 prior year's summarized comparative information has been derived from the Institute's June 30, 2003 financial statements, and in our report dated October 13, 2003, we expressed an unqualified opinion on those financial 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 examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes 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, such financial statements present fairly, in all material respects, the financial position of the Institute at June 30, 2004, and the changes in its net assets and its cash flows for the year ended June 30, 2004, in conformity with accounting principles generally accepted in the United States of America.

Deloitte & Touche

October 1, 2004

BALANCE SHEET
JUNE 30, 2004 (WITH COMPARATIVE TOTALS FOR 2003)

ASSETS	2004	2003
CASH	$ 1,241,115	$ 427,017
SHORT-TERM INVESTMENTS - Held by Trustee	2,746,268	2,700,144
ACCOUNTS RECEIVABLE	227,871	242,692
GOVERNMENT GRANTS AND CONTRACTS RECEIVABLE	2,540,437	2,245,288
ACCRUED INVESTMENT INCOME	358,836	859,650
PREPAID AND OTHER ASSETS	560,683	609,139
CONTRIBUTIONS RECEIVABLE - NET	846,899	650,074
UNAMORTIZED DEBT ISSUANCE EXPENSE - NET	630,239	681,648
LAND, BUILDINGS AND IMPROVEMENTS, EQUIPMENT AND RARE BOOK COLLECTION - NET	49,751,068	49,277,972
INVESTMENTS	475,759,963	375,039,116
TOTAL	$534,663,379	$432,732,740

See notes to financial statements.

LIABILITIES AND FUND BALANCES	2004	2003
ACCOUNTS PAYABLE AND ACCRUED EXPENSES	$ 15,220,420	$ 10,163,108
REFUNDABLE ADVANCES	4,865,645	5,756,456
LIABILITIES UNDER SPLIT-INTEREST AGREEMENTS	2,286,775	2,258,924
NOTE PAYABLE	863,811	921,457
ACCRUED INVESTMENT MANAGEMENT FEES	2,722	41,443
LONG-TERM DEBT	47,155,691	48,633,307
Total liabilities	70,395,064	67,774,695
NET ASSETS:		
Unrestricted	307,523,897	241,012,330
Temporarily restricted	110,649,123	79,308,331
Permanently restricted	46,095,295	44,637,384
Total net assets	464,268,315	364,958,045
TOTAL	$ 534,663,379	$ 432,732,740

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2004 (WITH COMPARATIVE TOTALS FOR 2003)

	UNRESTRICTED	TEMPORARILY RESTRICTED
REVENUES, GAINS AND OTHER SUPPORT:		
Private contributions and grants	$ 2,092,555	$ 4,761,958
Government grants		4,535,133
Income on long-term investments	2,688,022	990,222
Net realized and unrealized gains and on long-term investments (includes $37,709,828 and $5,849,647 in unrealized gains in 2004 and 2003, respectively)	38,179,709	17,329,038
Gain on sale of capital assets	173,921	
Net assets released from restrictions - satisfaction of program restrictions	17,812,035	(17,812,035)
Total revenues, gains and other support	60,946,242	9,804,316
EXPENSES:		
School of Mathematics	7,255,202	
School of Natural Sciences	6,250,711	
School of Historical Studies	5,059,623	
School of Social Science	3,187,343	
Libraries and other academic expenses	6,154,379	
Administration and general	7,954,929	
Post retirement benefits	4,724,605	
Auxiliary activity - tenants' housing expenses, net of unrestricted revenue	$ 504,451	
Total expenses	41,091,243	
CHANGES IN NET ASSETS	19,854,999	9,804,316
NET ASSETS, BEGINNING OF YEAR	241,012,330	79,308,331
CHANGE IN ACCOUNTING (Note 1)	46,656,568	21,536,476
NET ASSETS, END OF YEAR	$307,523,897	$110,649,123

See notes to financial statements.

2004		
PERMANENTLY RESTRICTED	TOTAL 2004	TOTAL 2003
$ 1,457,911	$ 8,312,424	$ 9,355,202
	4,535,133	4,231,644
	3,678,244	6,880,409
	55,508,747	23,524,861
	173,921	257,503
		-
1,457,911	72,208,469	44,249,619
	7,255,202	7,147,007
	6,250,711	6,244,583
	5,059,623	5,187,322
	3,187,343	3,088,458
	6,154,379	5,997,577
	7,954,929	7,513,7623
	4,724,605	
	504,451	412,360
	41,091,243	35,591,069
1,457,911	31,117,226	8,658,550
44,637,384	364,958,045	356,299,495
	68,193,044	
$46,095,295	$464,268,315	$364,958,045

STATEMENT OF CASH FLOWS
YEAR ENDED JUNE 30, 2004 (WITH COMPARATIVE TOTALS FOR 2003)

	2004	2003
CASH FLOWS FROM OPERATING ACTIVITIES:		
Change in net assets	$ 31,117,226	$ 8,658,550
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation	3,743,418	3,435,000
Gain on sale of capital assets	(173,921)	(257,503)
Contributions restricted for long-term investments	(2,892,059)	(1,770,627)
Net realized and unrealized gains on long-term investments	(55,508,747)	(23,683,821)
Amortization of debt issuance expense	51,409	53,095
Amortization of bond discount	37,384	38,568
Changes in assets/liabilities:		
(Increase) in accounts receivable, and grants and contracts receivable	(280,328)	(1,038,898)
Decrease in accrued investment income	500,813	877,027
Decrease (increase) in prepaid and other assets	48,456	(164,725)
(Increase) decrease in contributions receivable	(196,825)	402,710
Increase in accounts payable	5,057,312	772,396
(Decrease) in refundable advances	(890,811)	(1,281,866)
(Decrease) in accrued management fees	(38,721)	(398,435)
Net cash used in operating activities	(19,425,394)	(14,358,529)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of capital assets	2,266,440	2,299,072
Purchase of capital assets	(6,309,034)	(4,068,685)
Proceeds from sale of investments	1,248,052,752	958,000,243
Purchase of investments	(1,225,071,806)	(948,457,127)
Net cash provided by investing activities	18,938,352	7,773,503
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from contributions restricted for:		
Investment in endowment	1,357,100	1,734,793
Investment in plant	1,534,959	35,834
	2,892,059	1,770,627
Other financing activities:		
Increase (decrease) in liabilities under split-interest agreements	27,851	(385,896)
Repayment of long-term debt	(1,515,000)	(1,445,000)
Repayments of note payable	(57,646)	(56,511)
Decrease in investments held by trustee	(46,124)	3,813,407
	(1,590,919)	1,926,000
Net cash provided by financing activities	1,301,140	3,696,627
NET INCREASE (DECREASE) IN CASH	814,098	(2,888,399)
CASH, BEGINNING OF YEAR	427,017	3,315,416
CASH, END OF YEAR	$ 1,241,115	$ 427,017
SUPPLEMENTAL DATA:		
Interest paid	$ 2,802,393	$ 2,956,387

See notes to financial statements.

NOTES TO FINANCIAL STATEMENTS
YEAR ENDED JUNE 30, 2004

1. SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

The Institute for Advanced Study (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."

Basis of Presentation – The accompanying financial statements are prepared on the accrual basis and are presented in accordance with recommendations contained in Not-for-Profit Organizations issued by the American Institute of Certified Public Accountants.

The reporting of contributions and pledges distinguishes between contributions received that increase permanently restricted net assets, temporarily restricted net assets, and unrestricted net assets. Recognition of the expiration of donor-imposed restrictions occurs in the period in which the restrictions expired.

Net assets and revenue, gains and losses are classified based on the existence or absence of donor-imposed restrictions. Amounts for each of the three classes of net assets - permanently restricted, temporarily restricted and unrestricted - are displayed in the statement of activities.

True endowment funds are subject to the restrictions of the gift instruments, which require that the principal be invested in perpetuity; only income earned and gained on such funds may be utilized. Quasi-endowment funds have been established by the governing board to function as endowment funds and any portion of these funds may be expended. Unrestricted quasi-endowment funds have no external restrictions. However, certain of these funds have been internally designated to support specific needs of the Institute.

All gains and losses arising from the sale, collection, or other disposition of investments and other noncash assets are accounted for in the fund that owned such assets. Ordinary income earned on investments and receivables is generally accounted for in the fund owning such assets. However, unrestricted income earned on investments of endowment and similar funds is accounted for as revenue in unrestricted operating funds, and restricted income is accounted for as deferred restricted revenue until used in accordance with the terms of the restriction or transferred to endowment and similar funds.

Restricted Net Assets – The Institute has classified gifts of cash and other assets as restricted net assets, if they are received with donor specifications, as either temporarily restricted or permanently restricted net assets. Temporarily restricted net assets are amounts that have been restricted in purpose and/or time by donor specification. Permanently restricted net assets have resulted from donors' specifications that contributions be invested in perpetuity and that, generally, only the income generated on such amounts be used. When a donor restriction expires, that is, when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restrictions.

Use of Estimates – The preparation of financial statements in conformity with generally accepted accounting principals requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements. Estimates also affect the reported amounts of revenues and expenses during the reported period. Actual results could differ from those estimates.

Cash and Cash Equivalents –The Institute considers all highly liquid short-term investments purchased with an original maturity of less than three months to be cash equivalents. The Institute maintains demand deposits with major banks, the majority of which are held in one bank.

Contributions Receivable – The Institute records unconditional promises to give (pledges) at the fair value on the date received. The Institute's policy regarding the recording of promises to give is to include all promises received during the last five years as pledges receivable. A reserve for uncollectible promises is recorded to reduce the total pledge amount to its realizable value. Pledges are recorded at the present value of their expected future cash flows, net of allowance for doubtful accounts. The discount rates used for multi-year pledges are based on treasury bond rates which, commensurate to the term that the pledges are due. The discount rates range from 1.09% to 5.65%. Amortization of the discount is included in gifts and donation revenue.

Investments – Effective July 1, 2003, the Institute changed its method of accounting for investments. All investments, including short-term investments, investments in marketable securities, limited partnerships and hedge and offshore funds, are now reported in the financial statements at fair value, based upon quoted market price. Net asset value, as determined by the Funds, reflects the underlying assets held by the Funds and any investment gain or loss. Prior to July 1, 2003, investments in limited partnerships and hedge and offshore funds were recorded at cost.

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 and second mortgages to full-time faculty, administrative employees, and resident scholars who have met certain requirements stipulated by the Board.

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).

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 or transferred to the quasi-endowment funds.

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.

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, 2004 were net of accumulated amortization of $336,550.

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.

2. CONTRIBUTIONS RECEIVABLE

Unconditional promises to give at June 30, 2004 were as follows:

Unconditional promises to give:	
Less than one year	$ 440,000
One to five years	437,457
	877,457
Discount on promises to give	(30,558)
	$ 846,899

3. INVESTMENTS

Endowment and similar funds investments at June 30, 2004 are comprised of the following:

Limited partnerships	$ 94,871,340
Hedge and offshore funds	300,523,026
Debt securities	72,949,455
Mortgages from faculty and staff	3,750,653
Total pooled investments	472,094,474
Funds invested separately:	
Charitable remainder and pooled income trusts	3,665,489
Total	$ 475,759,963

The Institute's proportionate share of ordinary expense and net realized gains attributed to its limited partnership investments was $1,224,133 and $9,985,334, respectively, for the year ended June 30, 2004.

The Institute's interests in limited partnerships and offshore Funds represent 20% and 63%, respectively, 83% collectively of total investments held by the Institute at June 30, 2004. 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 non-marketable investments) and nondisclosure of portfolio composition.

Substantially all of the assets of endowment and similar funds 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 table summarizes the investment return and its classification in the statement of activities for the year ended June 30, 2004:

	UNRESTRICTED	TEMPORARILY RESTRICTED	TOTAL
Dividends and interest	$ 2,688,022	$ 990,222	$ 3,678,244
Realized gain on investments reported at fair value	12,329,260	5,469,659	17,798,919
Unrealized gain	25,850,449	11,859,379	37,709,828
Total realized and unrealized gain	$38,179,709	$17,329,038	$55,508,747

Short-term investments 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, 2004, the market value of such securities approximates their carrying value.

During July 2004, the Institute invested $14,000,000 in two additional offshore private funds. Funds were obtained through a partial liquidation of the Institute's fixed income (debt) portfolio.

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, 2004 follows:

Land and improvements	$ 1,243,862
Buildings and improvements	70,120,960
Equipment	20,246,163
Rare book collection	203,508
Joint ownership property	1,522,142
Total	93,336,635
Less accumulated depreciation	(43,585,567)
Net book value	$49,751,068

During 1997, the Institute entered into a Deed of Pathway and Conservation Easement (the "Easement") whereby the Institute received $11,794,600 in cash and $1,274,196 in contributions receivable at June 30, 1997, in consideration for the sale of land development rights for certain Institute properties. The Easement requires that those properties, set forth therein, be preserved to the greatest extent possible in their existing natural, scenic, open, wooded and agricultural state and be protected from uses inconsistent therewith.

Of the $11,794,600 in cash received by the Institute, $5,625,000 represents monies received from the New Jersey Green Acres Fund to be repaid by the parties to the Easement. The Institute's pro rata share of $863,811 has been recorded as a note payable in the accompanying statement of financial position at June 30, 2004. The note payable bears interest at a rate of 2% and requires semi-annual payments through January 8, 2017.

The note is payable as follows at June 30, 2004:

2005	$ 58,805
2006	59,987
2007	61,193
2008	62,423
2009	63,678
Through 2017	557,725
Total note payable	$ 863,811

5. LONG-TERM DEBT

A summary of long-term debt at June 30, 2004 follows:

Series F & G 1997 - NJEFA	$37,025,000
Series A 2001 - NJEFA	10,600,000
Less unamortized bond discount	(469,309)
Total long-term debt	$47,155,691

Interest expense on long-term debt for the year ended June 30, 2004 was $2,516,574.

In November 1997, the Institute received proceeds of the New Jersey Educational Facilities 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, 2004:

2005	$ 1,585,000
2006	1,665,000
2007	1,745,000
2008	1,825,000
2009	1,915,000
Through 2031	38,890,000
Total	$ 47,625,000

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 participants' compensation in accordance with the formula set forth in the plan documents on a nondiscriminatory basis. Contributions for the year ended June 30, 2004 totaled approximately $1,501,634.

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 components of the periodic expense for these postretirement benefits for 2004 are as follows:

Postretirement Benefit Costs:	
Service Cost - benefits attributable to service during the year	$ 384,866
Interest Cost on Accumulated Postretirement Benefit Obligation	595,004
Total	$ 979,870

The actuarial and recorded liabilities for these benefits, none of which have been funded, are as follows at June 30, 2004:

Accumulated postretirement benefit obligation:	
Retirees	$4,851,673
Fully eligible active plan participants	1,728,741
Other active plan participants	3,139,254
Total	$9,719,668

For measurement purposes, an 10.6% trend rate was used for 2004 health care costs, with the rate decreasing ratably until the year 2013, and then remaining constant at 5.0% thereafter. The health care cost trend rate assumption has a significant effect on the amounts reported. For example, a 1% increase in the health care trend rate would increase the accumulated postretirement benefit obligation by approximately $1,389,000 at June 30, 2004 and the net periodic cost by approximately $154,333 for the year. The weighted average discount rate used in determining the accumulated postretirement benefit obligation was 6.25%.

7. FUNDS HELD IN TRUST BY OTHERS

The Institute is the residuary beneficiary of a trust and, upon the death of the life tenant, will be entitled to receive the corpus thereof. The approximate market value of the trust's assets, as reported by the administrator of the trust, aggregated $3,297,858 as of June 30, 2004, and is not included in the accompanying financial statements.

8. FUNCTIONAL ALLOCATION OF EXPENSES

The costs of providing the various programs and other activities have been summarized on a functional basis in the statement of activities and cash flows. Accordingly, certain costs have been allocated among the programs and supporting services benefited. The net costs incurred by the Institute in operating both the Dining Hall ($486,739 net of $759,392 in revenues) and members' housing ($1,624,571 net of $1,548,696 in revenues) have been allocated among the programs and supporting services benefited. Included in the net costs incurred by the Institute that are allocated among the programs is $1,044,555 of depreciation expense. An overhead charge is allocated to certain schools generally based upon their ability to recover such costs under the terms of various grants and contracts. Overhead allocated from administration and general expenses to various programs totaled $4,810,394 for the year ended June 30, 2004.

Interest expense on plant fund debt, net of interest income on short-term investments, is allocated to schools based upon their occupancy of academic buildings funded with such debt. Allocated interest expense totaled $2,516,574 for the year ended June 30, 2004.

The Institute provides academic services to a community of scholars, including permanent faculty and visiting members. Expenses related to providing these services are as follows:

	2004
Expenses incurred were for:	
Salaries, wages, and benefits	$23,408,938
Stipends	6,018,335
Honoraria	420,718
Grants to other organizations	144,975
Supplies and travel	2,906,844
Services and professional fees	4,014,231
Depreciation	2,698,863
Interest	1,478,339
Total expenses	$41,091,243

9. TEMPORARILY AND PERMANENTLY RESTRICTED ASSETS

Restricted net assets are available for the following purposes at June 30, 2004:

Temporarily restricted net assets are restricted to:	
Academic Services:	
Educational Programs	$110,649,123
Permanently restricted net assets are restricted to:	
Investments to be held in perpetuity, the income from which is expendable to support academic services	$46,095,295

Net assets were released from donor restrictions by incurring expenses satisfying the restricted purposes or by occurrence of other events specified by donors.

10. 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 balance sheet, 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.

June 30, 2004	ESTIMATED FAIR VALUE
Assets:	
Cash	$ 1,241,115
Investments	475,759,963
Grant/contributions receivable	2,540,437
Liabilities:	
Long-term debt	47,155,691
Note payable	863,811

The fair value of investments is based on fair market prices. The fair market valuation of grant/contributions receivable was estimated based on past cash collection experience. For long-term debt, the fair values are estimated using the interest rates currently offered for debt with similar terms and remaining maturities. The estimated fair value of mortgages for faculty and staff is based upon similar terms at which similar institutions would provide as part of an overall compensation package to such individuals. The estimated fair value of the note payable is based on the discounted value of the future cash flows expected to be received from the note.

The fair value estimates presented are based on information available to the Institute as of June 30, 2004, and have not been revalued since that date. While the Institute is not aware of any significant factors that would affect the estimates since that date, current estimates of fair value could differ significantly from the amounts disclosed.

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