INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

2000 – 2001

PRINCETON · NEW JERSEY

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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 sustained its founding principle for over seventy years. This commitment has yielded an unsurpassed record of definitive scholarship.

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 life-long research interests and thereby determine professional careers. The Institute provides more mature scholars with the opportunity to take a new direction 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. In our era, a time when pure research and scholarly activities are undervalued, these opportunities are exceedingly rare.

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 180 visiting Members from universities and research institutions throughout the world. The Institute's nearly 5,000 former Members hold positions of intellectual and scientific leadership in the United States and abroad. More than a dozen Nobel laureates have been Institute Faculty or Members, and many more are winners of the Wolf or MacArthur prizes. Twenty-nine out of forty-two 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.

" 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

Fuld Hall

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JON MAGNUSSEN

ROBERT TAUB

"I did not exactly know what to expect, but what I found has surpassed all my expectations. It seemed that everybody here was (and is) determined to provide us with the best environment possible for an intellectually productive and fruitful stay."

— *Member, School of Historical Studies*

The Common Room

REPORT OF THE CHAIRMAN 2000-01

As I reflect on this past year, I see more clearly than ever the amazing intellectual richness of the Institute for Advanced Study and the invaluable opportunities it offers to travel freely in the realms of knowledge. It is of vital importance that we continue to meet successfully the many challenges inherent in creating an environment where the best scholarship and science are encouraged and can thrive. We must do all that we can to ensure the free pursuit of knowledge for those who will need these opportunities in years to come.

At our spring meeting of the Board of Trustees, one of our Faculty members spoke eloquently about the difficulties of working in political climates that are prejudicial to objective scholarship and that exert powerful pressure to bend scholarship to conform to the prevailing political perspective. As we discussed this issue, we were reminded of the importance of the Institute's scholarly climate, where the freedom to pursue knowledge without pressure or prejudice is at the heart of all the work that takes place. The Institute has been dedicated to the preservation and support of unrestricted scholarship since its founding in 1930.

Although the Institute remains faithful to its original mission, I observe that change of many kinds is a constant at the Institute. While its Director and Faculty provide the stable presence that anchors and guides the work of each School, every September the majority of the scholars working here are new to the Institute community. These scholars come to the Institute from universities large and small throughout the world - in fact, half of these individuals come from countries other than the United States. With their varied interests and experience, each year they create an intellectual environment that is always different from the ones that preceded it and the ones that will follow. This is a type of change that serves the community well, and provides a fertile base for the interactions that occur here.

A second kind of change is the exploration of new fields of knowledge. New directions in scholarship can be observed in each of the Institute's four Schools, as well as the program in theoretical biology, and the Director will address this in greater detail in his report.

Significant change can be noted on the Institute campus also. A highlight of the year was the groundbreaking ceremony for Bloomberg Hall, which will be the new home of the School of Natural Sciences. This is the first new construction that has taken place on the Institute campus since the completion in 1993 of Simonyi Hall for the School of Mathematics and Wolfensohn Hall for Institute lectures and concerts. A structure composed of new and existing buildings that will total 30,000 square feet when completed, Bloomberg Hall's 17,000 square feet of new construction will link two buildings constructed in 1948 and 1953. Named in honor of Trustee Michael Bloomberg, to recognize his leadership and generous support, Bloomberg Hall will mark a new era in the School of Natural Sciences, currently housed in three separate buildings. An important goal in housing the entire School in one building is to encourage the informal interactions which are a central part of both scientific research and postdoctoral education in the sciences.

Another area of change affects the Board itself, to which I am pleased to welcome four new trustees: John H. D'Arms, Nancy S. MacMillan, Edward J. Nicoll, and James H. Simons. John H. D'Arms, since 1997 the President of the American Council of Learned Societies, is also an Adjunct Professor of History and Classics at Columbia University. He was previously Professor of Classical Studies and Professor of History at the University of Michigan, Dean of the Horace H. Rackham School of Graduate Studies, and Vice Provost for Academic Affairs. From 1977 to 1980, he was Director of the American Academy in Rome and the A.W. Mellon Professor in its School of Classical Studies. His scholarly work focuses on the history and archaeology of Ancient Rome and the Bay of Naples. A graduate of Princeton University and New College, Oxford, Dr. D'Arms earned his Ph.D in classical philology from Harvard University. He was a Member in the School of Historical Studies at the Institute in 1975-76.

Nancy S. MacMillan has served as publisher of the Princeton Alumni Weekly, the official alumni magazine of Princeton University, since 1990. A graduate of Connecticut College, Mrs. MacMillan also holds a master's degree in economics from Hunter College and an M.B.A. in finance from Rider University. She has been an active volunteer for various nonprofit organizations and institutions in the Princeton community, and for many years has served as chair of the American Repertory Ballet. Mrs. MacMillan is a grandniece of Herbert Maass, who was counsel to Louis Bamberger, his sister Mrs. Felix Fuld, and Dr. Abraham Flexner during their deliberations over founding the Institute. Mr. Maass served as a founding Trustee, chaired several committees, and was Chairman of the Board from 1946-1957.

Edward J. Nicoll is the Chairman and Chief Executive Officer of Datek Online Holdings Corp., a financial services and technology enterprise that is the parent company of four separately managed subsidiaries: Datek Online Brokerage Services LLC; iClearing Corporation; Big Think; and The Island ECN. Before joining Datek, Mr. Nicoll was co-founder and president of Waterhouse Investor Services, Inc., which, under his leadership, became the nation's second largest discount brokerage firm. He is also a trustee of the New Community Foundation. Mr. Nicoll holds a J.D. from Yale University Law School; he was the first student to be admitted to the Law School with no prior college experience. While at Yale he was appointed a fellow of the Olin Center for Studies in Law, Economics, and Public Policy.

James H. Simons is the founder and president of Renaissance Technologies Corporation, an investment management firm dedicated to the use of mathematical methods. Prior to founding Renaissance, Dr. Simons served as chairman of the Mathematics Department at the State University of New York at Stony Brook, was a cryptanalyst at the Institute for Defense Analysis in Princeton and was a professor of mathematics at the Massachusetts Institute of Technology and Harvard University. His work in mathematics includes the discovery and application of certain measurements called the Chern-Simons Invariants, which have wide use, particularly in theoretical physics. Dr. Simons, who was a Member in the Institute's School of Mathematics in 1972-73, received his bachelor's degree from the Massachusetts Institute of Technology and his Ph.D. in mathematics from the University of California at Berkeley.

The terms of two Trustees ended this year, and we are extremely appreciative of how generously each has served the Institute, which has benefited greatly from their participation on our Board.

Anne d'Harnoncourt joined the Board of Trustees of the Institute in 1994 as the Academic Trustee for the School of Historical Studies. During the past seven years, she has enriched our discussions with her knowledge of the complexity of cultural institutions and her deep conviction that true quality, clearly revealed, will find the sponsorship it deserves. We have valued immensely her positive presence and are grateful for all she has done to deepen our understanding of the purposes we serve. We particularly appreciate that although Ms. d'Harnoncourt's Board term originally ended in 1999, she graciously agreed to a two-year reappointment term.

Helene Kaplan joined the Institute's Board of Trustees in 1987. During her fifteen years on the Institute's Board, she was a Member of the Executive Committee, chair of the Nominating Committee for two terms (1989-1995), served on the Search Committee that chose a new Director in 1991, co-chaired the Decadal Review Committee (1995-1997), and chaired the Academic Affairs Committee from its inception in 1997 to her resignation in 2001. In addition, Mrs. Kaplan contributed expert advice on a variety of legal matters. She has been an incomparable partner, combining deliberative skills with decisive intervention. Her wisdom, counsel, and action have helped to shape and sustain the Institute in its ongoing mission.

A significant aspect of our Board's commitment to preserving a flourishing environment for scholarship is maintaining the financial resources that have received such careful and committed stewardship from the Institute's Trustees since its founding in 1930. The Institute's broad financial investment strategy is based on the fact that without the advantages of tuition or other streams of earned income, the Institute is much more dependent upon its endowment than are most institutions. Because of this, it is appropriate to take a relatively conservative and long-term viewpoint. The academic growth that the Institute plans and implements each year is vital to the Institute's continuing intellectual richness, but even though this growth is carefully planned and comparatively modest, it still presents a challenge to the budget. The pressure to provide additional resources to support the Institute's work is significant, and we must always be concerned that our current stewardship will support the Institute's next seventy years as admirably as past stewardship has supported the first seventy.

I am particularly pleased to note that over the past ten years, the Institute has made significant strides in broadening the base of support for its work. With this increased support from Trustees and other individuals, from foundations, and from state and federal government, the Institute has been able to strengthen each School, provide the flexibility to explore new fields, create and sustain strong and successful outreach programs, maintain and build new facilities, enhance the computing environment at the Institute, and preserve nearly 600 acres of Institute woods and farmlands.

To all who make this unique mix of continuity and change such rich ground for the pursuit of knowledge - to the Faculty, current and past Members, Friends, Trustees, the Director and his Staff - I offer my deepest gratitude.

James D. Wolfensohn
Chairman

I am pleased to announce the appointment of José Cutileiro as the George F. Kennan Professor in the School of Historical Studies. An influential diplomat who has made history as well as studied it, Professor Cutileiro has had a distinguished career that combines scholarship with public service. Born in 1934, Professor Cutileiro read architecture and medicine in Lisbon before receiving a Diploma in Anthropology (1964) and a doctorate (1968) from Oxford University, where he became a Research Fellow of St. Antony's College (1968-71). He was lecturer in Social Anthropology at the London School of Economics and Political Science from 1971 to 1974, when he began a twenty-year career with the Portuguese Foreign Service. He was the first Portuguese Permanent Representative to the Council of Europe (1977-80), Ambassador in Maputo (1980-83), Head of the Portuguese Delegation to the Stockholm Conference on Disarmament in Europe (1984-86), Political Director at the Foreign Ministry (1986-88), Ambassador in Pretoria (1989-91), Special Adviser to the Foreign Minister (1992-94), and the first President of the Portuguese Diplomatic Institute (1994). Secretary General of the Western European Union from 1994-1999, Professor Cutileiro is currently the Special Representative of the U.N. Commission on Human Rights for Bosnia and Herzegovina and the Federal Republic of Yugoslavia. The author of two published collections of poems (1959, 1961), Professor Cutileiro has also written numerous articles and opinion pieces in newspapers and periodicals, and a monograph, A *Portuguese Rural Society* (1971).

Irving Lavin, a Faculty member in the School of Historical Studies, became Professor Emeritus as of June 30. Professor Lavin received degrees in art history from New York University (M.A. 1953) and Harvard (M.A. 1953; Ph.D. 1955). He taught at Vassar College and New York University's Institute of Fine Arts before becoming a Faculty member at the Institute in 1973. His work, which has included a particular interest in the Baroque artist Gianlorenzo Bernini, has been honored on both sides of the Atlantic. Three-time winner of the College Art Association of America's Porter Prize, Professor Lavin has also been awarded the Premio Daria Borghese and the Medal of Honor of the City of Rome. He is a fellow of the American Academy of Arts and Sciences, a Foreign Member of the Accademia Nazionale dei Lincei in Rome and the Accademia Clementina, Bologna, former President of the National Committee for the History of Art, and a member and past President of the International Committee of the History of Art. He has published widely in the history of art, on topics that range from late antiquity to Jackson Pollock.

Jack F. Matlock, Jr. completed a five-year term as the first George F. Kennan Professor in the School of Historical Studies. Prior to his term at the Institute, during which he wrote and spoke frequently on the topics of U.S.-Soviet relations, Soviet and Russian foreign policy, the Soviet government, and Russian literature, Professor Matlock taught at Columbia University. From 1987 to 1991, during his thirty-five year career in the American Foreign Service, Professor Matlock served as the last United States Ambassador to the Soviet Union, through the collapse and dissolution of the Soviet regime. He is the author of an account of the events of that period, *Autopsy on an Empire: The American Ambassador's Account of the Collapse of the Soviet Union*.

The Mellon Visiting Professor Program in the School of Historical Studies allows the School to have in residence, for two-year periods, a senior distinguished visiting professor and a group of Members with research interests in an area that the School wishes to explore. This year, Benjamin A. Elman, Professor of Chinese History at the University of

California, Los Angeles, completed his two-year stay at the Institute as the Mellon Visiting Professor. With the sponsorship of the Mellon Foundation as well as John P. Birkelund and Ladislaus von Hoffmann, Professor Elman organized a series of events under the title "East Asian Studies at the School of Historical Studies, 2000-2001: Seminars and Colloquia on East Asian Culture and History." In November 2000, Professor Elman organized a colloquium entitled "Qing Dynasty History (1600-1900) Through 'Things,'" and in April 2001, he co-organized with the Princeton University East Asian Studies Program a colloquium entitled "East Asian Culture and History." The colloquia included presentations by scholars from Dartmouth College, Princeton and Johns Hopkins Universities, the University of Pittsburgh, the University of British Columbia, the University of Chicago, SUNY Stony Brook, and the University of California, Irvine, as well as participation by the Institute Members in East Asian Studies.

"Creativity: The Sketch in the Arts and Sciences" was the title of a public symposium co-organized by art historian Irving Lavin and Henry A. Millon and held at the Institute for Advanced Study on May 24 and 25, with a related series of lectures held on May 23 in Washington at the National Gallery of Art. The symposium was co-sponsored by the Institute's School of Historical Studies and the Center for Advanced Study in the Visual Arts, National Gallery of Art. The purpose of the event was to explore the history of the creative process by examining the evidence for trial and error-or its absence-in a variety of periods and disciplines. The conference included artists as well as scholars, in the hope of shedding light on the edges of conception. Different sessions focused on architecture, literature, music, dance, natural sciences and mathematics, and visual arts. The symposium was made possible by the Arthur Vining Davis Foundations, the J. Seward Johnson, Sr. Charitable Trusts, and Mrs. F. Merle-Smith.

The School of Mathematics organized a year-long special program on Computational Complexity Theory, funded by the National Science Foundation and led by Faculty member Avi Wigderson together with senior scientists J. Håstad (Sweden), P. Pudlak (Czech Republic), R. Raz (Israel), and A. Razborov (Russia). Fifteen of the School's Members were also participants in this special program, which included lectures, three seminars each week, a regular reading seminar, and two workshops. Another major area of focus in the School during the year was automorphic forms. James Arthur of the University of Toronto gave an advanced course entitled "Representations of Classical Groups." In April, a conference, "Automorphic Forms, Concepts, Techniques, Applications, and Influence," was organized by V. Drinfeld, R. Langlands, P. Sarnak, and A. Wiles, and funded by the National Science Foundation. Fourteen distinguished mathematicians lectured; their talks were videotaped and are now available on the Internet. Other activities in the School included the continuation of a lecture series by V. Voevodsky on Motivic Cohomology; these lectures will soon be published. The School also conducted seminars jointly with Rutgers University and Princeton University on Nonlinear Theory and on Number Theory and Harmonic Analysis.

Together with Rutgers University, the School of Natural Sciences organized the W.M. Keck Workshop "Galaxies and the Dark Matter Problem" from May 31-June 2. Over the past few years, there has been dramatic improvement in astronomical and cosmological data. Some of these data appear to conform remarkably well with the "standard cold dark matter (plus cosmological constant) model." Other data, particularly on galaxy scales, appear to disagree with theoretical predictions. Have astrophysicists converged on the correct cosmological model or are the dark matter/dark energy problems and the low

central densities in galaxy cores symptoms of new physics? The goal of this workshop was to bring together leading researchers in this field for a discussion of this question and related issues.

"Information Technology and Society" was the theme during 2000-01 in the School of Social Science. Visiting Associate Professor Adam Ashforth chaired a seminar that explored the social, political, and economic implications of developments in new media and information technology. Two of the questions seminar participants focused on were "What is at stake for human societies in the changes associated with new technologies?" and "What is at stake for social science?" The School held a conference June 8-10, to reflect upon its year-long examination of this theme. In addition to papers by members of this year's seminar and numerous visiting scholars, there were several special panels. A roundtable discussion on "Information Technologies and the Social Sciences" included an international panel of scholars, and a discussion of "Art in the Age of New Media" included both scholars and artists. Funding for the program on Information Technology and Society was provided by The Ford Foundation, the Gladys Krieble Delmas Foundation, The John D. and Catherine T. MacArthur Foundation, and The Rockefeller Foundation.

This was also the first year of the School's renewed presence in economics, and Eric Maskin, the new Albert O. Hirschman Professor, worked with a group of six mathematically-oriented Member economists on a variety of research topics.

The Program in Theoretical Biology, led by Martin Nowak, completed its third year at the Institute. Five Members and two Visitors worked with Dr. Nowak in areas of research that included evolutionary theory, the dynamics of infectious agents, and mathematical models of tumor progression. The group continued to develop collaborations established with numerous experimental groups both in the United States and abroad. The Biology Lecture Series offered nine public lectures on topics that included "Pathogenesis and Origin of HIV-1," "Origin and Evolution of Genes," and "Unanswered Questions in Ecology."

Robert Taub completed a seven-year term as the Institute's first Artist-in-Residence. Once again the nine performances in the Institute Concert Series attracted full houses to Wolfensohn Hall, and Dr. Taub gave pre-concert lectures to the Institute community as well as a separate series of lectures presented as "Musical Conversations," with invited guests Mary E. Davis (Case Western Reserve University), Lewis Lockwood (Harvard University), and Jonathan Dawe (The Juilliard School). Dr. Taub continued to maintain a very active international concert schedule that included an eight-concert tour in Germany and Italy with the Munich Philharmonic, conducted by James Levine; a continuation of the Beethoven Piano Sonata series with three concerts in New York City; solo concerts in Boston, Cleveland, and San Francisco; and chamber music concerts in Ireland (with the Vanbrugh String Quartet) and California (with the Ives String Quartet).

Our new Artist-in-Residence, composer Jon Magnussen, began his term at the Institute in June 2000. In May 2001, Magnussen's "The Winged," a ballet choreographed by José Limón, was performed in New York City by the Orchestra of St. Luke's and the Limón Dance Company. The ten performances were part of the St. Luke's Arts Education Program for New York school children, which also includes intensive in-school workshops. The new Artist-in-Residence program website, www.admin.ias.edu/air, provides further information about the program and the Institute Concert Series.

From May 15-25, the Institute hosted the IAS/Park City's annual Mentoring Program for Women in Mathematics, organized by Karen Uhlenbeck of the University of Texas at Austin. Over fifty women graduate students, undergraduates, postdoctoral scholars, and senior researchers participated in the lectures, seminars, working problem groups, and mentoring and networking sessions, and benefited from the opportunities to meet and interact with leading mathematicians.

The Summer Session of the IAS/Park City Mathematics Institute (PCMI) was held in Park City, Utah, from July 8 - July 28. The research topic for PCMI's Graduate Summer School and Research Program was "Quantum Field Theory, Supersymmetry, and Enumerative Geometry," organized by Daniel Freed of the University of Texas at Austin, David Morrison of Duke University, and Isadore Singer of the Massachusetts Institute of Technology. Over 275 participants attended six separate but overlapping programs for researchers, high school teachers, undergraduate faculty, mathematics education researchers, and undergraduate and graduate students. New to PCMI this year were changes to the High School Teacher Program, which saw increased focus on active problem-solving sessions as well as the formation of working groups on specific topics, with the goal of producing teacher-created lesson activities for publication. PCMI also formed a new affiliation with the Ross Summer Mathematics Program at Ohio State University and the PROMYS for Teachers program at Boston University. Finally, PCMI convened, for the first time, an International Seminar on the standards and goals of K-12 mathematics education. The panel included educators from Brazil, Egypt, France, India, Japan, Kenya, and Sweden as well as the United States. This panel, which represented several different types of educational systems, initiated an ongoing international conversation on improving mathematics education.

AMIAS (the Association of Members of the Institute for Advanced Study) held its biennial conference at the Institute on March 23 and 24. Featured speakers were Patricia Crone, Professor in the School of Historical Studies; Eric Maskin, Professor in the School of Social Science; Nathan Seiberg, Professor in the School of Natural Sciences; and Martin Nowak, Head, Program in Theoretical Biology. In addition to the conference, several AMIAS talks and receptions took place both nationally and internationally over the past academic year. In January, my wife Marian and I hosted a luncheon at the Taj Mahal Hotel in Mumbai, India. In March, AMIAS member Mina Teicher hosted an evening reception for us in Tel Aviv. In April, AMIAS trustee Jim Stasheff and I cohosted a reception in Durham, North Carolina.

I am pleased to report that the Institute has continued to improve its computing infrastructure and capabilities. Highly sophisticated computing technology is, for many of our scholars, essential to their research work. All of the Schools are concerned with making the research that is done here available to a wider audience, and to this end maintain pages on the Institute website that make this work accessible to scholars all over the world.

Each year, as I reflect upon the activities that have taken place at the Institute over the past twelve months, I am keenly aware of how many individuals contribute to the strength and health of this remarkable institution, and of how vital their contributions are. I would like to express my sincere gratitude to the Faculty, Trustees, Members and former Members, the Friends of the Institute, and our Staff.

Phillip A. Griffiths
Director

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

Academic Year 2000/01

September 13
New Member Reception

October 2
Member Family Barbecue

October 3
Institute Playreading Series
An Experiment with an Air-Pump
by Shelagh Stephenson

October 5
Institute Film Series
Nô

October 13
Institute Concert Series
Musical Conversation: "To Perform or To
Compose: Is That the Question?"
ROBERT TAUB, *Artist-in-Residence, Institute
for Advanced Study* and MARY E. DAVIS,
Case Western Reserve University

Friends of the Institute
Friends Culture & Cuisine Series: "The
Animal That Cooks"
SIDNEY MINTZ, *Professor Emeritus of
Anthropology, The Johns Hopkins University*

October 18
Friends of the Institute
Friends Forum: "The Politics of Monuments
in Jerusalem, or How to Preserve the Past in
the Future"
OLEG GRABAR, *Professor Emeritus, School of
Historical Studies, Institute for Advanced Study*

October 21
Faculty Reception

October 25
Institute Lecture
"Is Majority Rule the Best Election Method?"
ERIC MASKIN, *Professor, School of Social
Science, Institute for Advanced Study*

October 26
Institute Film Series
War of the Worlds

October 31
Children's Halloween Celebration

November 7
Institute Playreading Series
Defying Gravity by Jane Anderson and
Flight by Arthur Giron

November 8
Faculty/Colleague Dinner

November 9
Institute Film Series
King of Masks

November 13
Institute Concert Series
Pre-Concert Talk
ROBERT TAUB, *Artist-in-Residence, Institute
for Advanced Study* and BRUCE BRUBAKER,
pianist

November 14, 17, 18
Institute Concert Series
Schubert: Fantasy in F Minor; Debussy:
En Blanc Et Noir; Brahms: Variations on a
Theme of Haydn; Lutoslawski: Variations on
a Theme of Paganini
ROBERT TAUB, *Artist-in-Residence, Institute
for Advanced Study* and BRUCE BRUBAKER,
pianist

November 19
Institute Trip
Philadelphia Art Museum

November 29
Friends of the Institute
Friends Forum: "Darwin, Viruses and the
Genome: An Introduction to Evolutionary
Genomics"
DAVID KRAKAUER, *Member, Program in
Theoretical Biology, Institute for Advanced
Study*; "Infection Dynamics and
Immunological Memory"
DOMINIK WODARZ, *Member, Program in
Theoretical Biology, Institute for Advanced Study*

December 3
Friends of the Institute
Friends Holiday Party

December 4
Institute Playreading Series
Moving Bodies by Arthur Giron

December 6
Institute Lecture
"The New Cosmology"
DAVID SPERGEL, *W.M. Keck Distinguished Visiting Professor, School of Natural Sciences, Institute for Advanced Study*

December 7
Institute Film Series
Raisin in the Sun

December 10
Institute Trip
Wagner Free Institute of Science,
Pennsylvania Academy of the Fine Arts,
University of Pennsylvania Library, and
University of Pennsylvania Museum

December 12
Institute Playreading Series
Breaking the Code by Hugh Whitemore

December 14
Children's Holiday Celebration

December 20
Institute Film Series
His Girl Friday

January 9
Institute Playreading Series
R.U.R. by Karel Capek

January 10
Institute Film Series
Horseman on the Roof

January 12
Institute Concert Series
Musical Conversation: "The Wider the Brook, the Deeper the Tone"
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study* and
LEWIS LOCKWOOD, *Harvard University*

January 20
Institute Trip
Metropolitan Museum of Art

January 25
Institute Film Series
Signs of Life

January 29
New Member Reception

January 31
Institute Lecture
"Some Infinite Sums, First Investigated by Euler, and Still Mysterious"
PIERRE DELIGNE, *Professor, School of Mathematics, Institute for Advanced Study*

February 6
Institute Playreading Series
Hapgood by Tom Stoppard

February 7
Institute Concert Series
Pre-Concert Talk
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study* and
VANBRUGH STRING QUARTET

February 7, 9, 10
Institute Concert Series
Beethoven: String Quartet in A minor,
Op. 132; Brahms: Piano Quintet in F minor,
Op. 34
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study* and VANBRUGH
STRING QUARTET

February 13
Institute Film Series
Pi

February 24
Institute Trip
Barnes Foundation

Midwinter Party

February 27
Institute Film Series
Cat on a Hot Tin Roof

March 6
Institute Playreading Series
Now Then Again by Penny Penniston

March 7
Institute Lecture
"Classicism, Civil Examinations, and Natural Studies in Late Traditional China, 1600-1900"
BENJAMIN A. ELMAN, *Mellon Visiting Professor, School of Historical Studies, Institute for Advanced Study*

March 8
Institute Concert Series
Musical Conversation: "The Genesis of a
New Work"
ROBERT TAUB, *Artist-in-Residence, Institute
for Advanced Study* and JONATHAN DAWE,
The Juilliard School

March 10
Institute Trip
Philadelphia Flower Show

March 11
Institute Concert Series
Pre-Concert Talk
ROBERT TAUB, *Artist-in-Residence,
Institute for Advanced Study*

March 11, 16, 17
Institute Concert Series
Scarlatti: Two Sonatas; Beethoven: Sonata in
C major, Op. 53 "Waldstein";
Chopin: Twenty-four Preludes, Op. 28
ROBERT TAUB, *Artist-in-Residence, Institute
for Advanced Study*

March 14
Faculty/Colleague Dinner

March 21
Institute Film Series
Fragrance of Wild Flowers

March 22
AMIAS Conference

Einstein Legacy Society Event: "The Impact
on You of Recent Developments Affecting
Retirement and Estate Plans"
DOUGLAS ROTHERMICH, TIAA-CREF

March 24
AMIAS Conference
"Virus Dynamics"
MARTIN NOWAK, *Head, Program in
Theoretical Biology, Institute for Advanced
Study*;
"Should Software be Patented?"
ERIC MASKIN, *Professor, School of Social
Science, Institute for Advanced Study*;
"The Pursuit of Unification: Fulfilling
Einstein's Dream"
NATHAN SEIBERG, *Professor, School of
Natural Sciences, Institute for Advanced Study*;
"Post-Colonialism in Tenth and Eleventh-
Century Islam"
PATRICIA CRONE, *Professor, School of
Historical Studies, Institute for Advanced Study*

April 3
Institute Playreading Series
Galileo by Bertolt Brecht

April 4
Institute Film Series
Contempt

April 2?
Institute Trip
Walters Art Museum, Baltimore Museum of
Art, and Inner Harbor

April 5
Friends of the Institute
Friends Forum: "Privacy and Technologies of
Information"
HELEN NISSENBAUM, *Member, School of
Social Science, Institute for Advanced Study*

May 1
Institute Playreading Series
Space by Tina Landau

May 24, 25
Art History Symposium: "Creativity:
The Sketch in the Arts and Sciences"

May 26
Art History Symposium
Trip to Guggenheim Museum

June
Friends of the Institute
Annual Meeting and Picnic

"All in all, I have never seen my own work exposed to such penetrating criticism from specialists in all the different relevant fields. That by itself would justify the time I spent here. But I also got started on two book projects based on presentations I gave at the Institute . . . Overall, in terms of exposure to constructive criticism, new ideas, and concrete projects, these ten months have been some of the most productive in my life."

— *Member, School of Social Science*

ACKNOWLEDGMENTS

Mr. and Mrs. K. Philip Dresdner
Wells Drorbaugh
Sandi and Charles Ellis
Hanni and Jack Ellis
Liz and Jon Erickson
Elizabeth S. Ettinghausen
Lynne and Robert Fagles
Ruth and Joseph Fath
Elizabeth and Miguel Fernandez
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(Gips Fund of the Princeton Area
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Virginia and Robert Hendrickson
(Virginia Hendrickson deceased March 6, 2001)
Sarah and Lincoln Hollister
Drs. Frances and Simeon Hutner
Janina and Charles Issawi
(Charles Issawi deceased December 8, 2000)
Mr. and Mrs. Thomas C. Jamieson, Jr.
(Thomas Jamieson deceased July 10, 2001)
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The Institute for Advanced Study is deeply appreciative of gifts in fiscal year 2001 designated to provide annual support for Professorships and Memberships.

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"My stay at the Institute this fall enabled me to complete and advance several projects to which I otherwise could have devoted only very limited time . . . what I cherished most was the unfailingly supportive attitude . . . I could focus on my work with nothing standing in the way. There is an established atmosphere of intellectual vitality and exchange. The Institute is a supportive environment in every way and there is no better place for productive scholarship. I am immensely grateful to have been given this opportunity."

— *Member, School of Historical Studies*

Benjamin Elman (center), the Two-Year Mellon Visiting Professor in the School of Historical Studies, and Members Alexander Des Forges (left) and Jonathan Best, examine a scroll painting of prefectural civil examinations being held in the government office of Suzhou in China. The scroll, by Xu Yang, dates to 1759.

THE SCHOOL OF HISTORICAL STUDIES

The School of Historical Studies is concerned principally with the history of Western and Near Eastern civilization. Within this wide area of study, a large range of topics has been explored at one time or another by Faculty and Members, but the emphasis has been particularly strong in the fields of Greek and Roman civilization, medieval, early modern and modern European history, Islamic culture, and the history of art, science, and ideas.

The particular emphases of 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. In Humanistic Studies, the first professor was Benjamin Dean Meritt, a specialist in Greek history and epigraphy, who 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 through the entire gamut of 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 paleographer who worked on the handwriting of pre-ninth century manuscripts; Ernst Herzfeld, a Near Eastern archaeologist and historian, whose scholarly work comprised nearly 200 titles; and Hetty Goldman, one of the pioneering American women archaeologists, whose discoveries at Tarsus in Turkey were

published in six volumes. 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 ancient history and numismatics. Although Alföldi published tirelessly on a wide range of subjects during his years at the Institute, he was mainly preoccupied with the history of early Rome and Julius Caesar, and wrote several books on both subjects. Medieval history came to the Institute Faculty with Ernst Kantorowicz, whose interests ranged in time from the later phases of classical antiquity to the fifteenth and sixteenth centuries, and in space embraced both Western Europe and the Byzantine and Islamic East. The art historical tradition was carried on by Millard Meiss, who was able to complete his great work on late medieval manuscript painting in Burgundy during his years at the Institute.

Additions to the Faculty in modern history came with the appointments of Sir Ernest Llewelyn Woodward in British diplomatic history; George F. Kennan, former Ambassador to the Soviet Union, in Russian history and international relations; Felix Gilbert in Renaissance as well as modern history; Morton White in the history of modern philosophy; and Peter Paret in modern European history. Roman military history and papyrology were represented by James F. Gilliam; medieval history of the Latin East, Venice, and the relations between the Papacy and the Levant by Kenneth M. Setton; medieval science, especially the classical heritage, by Marshall Clagett; Islamic art and culture by Oleg Grabar; and Greek and Roman history, especially the Hellenistic period, by Christian Habicht.

While these traditions have remained strong in the School of Historical Studies, they have not excluded scholars working in other fields who have come here as Members. More than one thousand Members have come to the School since its foundation. The articles and books resulting from their research at the Institute are witness to the quality and productivity of their scholarly activity here.

ACADEMIC ACTIVITIES

FACULTY

In the past academic year PROFESSOR GLEN BOWERSOCK contributed papers to several international symposia. He spoke at Tours on the Syrian Leja in the Hellenistic period, at Capri on current historiography of late antiquity, at Princeton on David Magie's work on Asia Minor, at Toronto on foreigners in Flavian Rome, and at Gubbio on the use of documents in ancient historical writings. He gave the concluding remarks at a three-day conference held at the British Museum on "The World of the Herods and the Nabataeans." He also delivered a lecture at the Louvre on "L'actualisation du passé dans l'antiquité tardive," and a lecture entitled "The People of Antioch" at the Worcester Art Museum in connection with the Antioch exhibition. In the spring of 2001, he delivered an Italian version of his Louvre lecture at La Sapienza in Rome, and he lectured at the German Archaeological Institute in Rome on late antique mosaics from the Near

East. At the invitation of the Grolier Club, he went to Williams College for an exhibition devoted to Edward Gibbon, where he presented a paper on "Gibbon's Library." He also delivered the annual Lax Memorial Lecture at Mount Holyoke College.

In Florence, Professor Bowersock served as a member of the *Consiglio Scientifico* of a newly founded *Istituto di studi umanistici*, composed of several major Italian universities and foundations. In Helsinki, he served together with former Institute Member Alan Bowman (Oxford) to advise the Academy of Finland on the Center of Excellence, which is concerned with the newly discovered Petra papyri. For the American Philosophical Society, Professor Bowersock organized a panel on "The Great Libraries" for the autumn meeting and another panel on "European Culture Between Greek and Maori" for the spring meeting (held jointly with the Royal Society and the British Academy). His *Fiction as History* appeared recently in an Italian translation (*La storia inventata*) with an introduction by Mario Mazza. On the occasion of the recent publication of his *Selected Papers on Late Antiquity*, he participated in a *presentazione* of the book in Rome with former Institute members Aldo Schiavone and Lellia Cracco Ruggini.

Among the papers published by Professor Bowersock in the past academic year were an analysis of the homeland of Strabo the geographer, an examination of late antique Cyprus, and a detailed treatment, originally presented to the Académie des Inscriptions et Belles-Lettres in Paris, of a Greek inscription from Asia Minor in the context of local associations that he calls *confréries joyeuses*. For a larger public, Professor Bowersock published articles on Neapolitan gestures, ancient Petra, and the movie "Gladiator." Two new volumes appeared in the series *Revealing Antiquity*, of which he is the general editor for the Harvard University Press.

In the academic year 2000-01 PROFESSOR GILES CONSTABLE saw the publication, after twenty years of preparation, of *Byzantine Monastic Foundation Documents. A Complete Translation of the Surviving Founders' Typika and Testaments* (Washington, D.C., 2000), in five volumes, edited by John Thomas and Angela Hero, in collaboration with Giles Constable, who also wrote the introduction. Professor Constable also published three articles, three memoirs (two in collaboration with colleagues), and two book reviews. He gave lectures at a conference in Trento (Italy) in October, at the University of Delaware in November, at the Pontifical Institute for Mediaeval Studies (Toronto) in March, and at Tourtour (France) in June. Professor Constable attended professional meetings in Tucson in October (in honor of Heiko A. Oberman), Tempe in March (Medieval Academy of America), Philadelphia in April (American Philosophical Society), and Kalamazoo in May (International Congress on Medieval Studies). He also attended, and spoke briefly at, meetings at Princeton University and the Institute for Advanced Study, where he arranged the meeting of the Delaware Valley Medieval Association held in December.

PROFESSOR PATRICIA CRONE continued to work on medieval Islamic political thought, especially Farabi and the Greek tradition, on which she gave a seminar at the Institute. She also spoke in Chicago on problems to do with the rise of Islam, in Princeton on an early Shiite text, at a conference in Holland on the relationship between non-Arab converts and Shiism, and at a conference at the Institute for Advanced Study in Jerusalem, where she also gave a seminar on aspects of Islamic messianism. Professor Crone taught a graduate seminar on tenth- and eleventh-century views of the right

relationship between religion and socio-political organization at the University of Pennsylvania, using some of the seminar materials as part of a presentation to AMIAS. Again this year, Professor Crone ran two seminars at the Institute: a formal one for all those interested in Islamic history, and an informal and much smaller one for people interested in reading medieval Arabic texts. She continued to serve as editor of *Arabica* and *Studia Islamica*. Her book with Friedrich Zimmermann, *The Epistle of Salim b. Dhakwan*, appeared in 2001, as did some of her articles.

PROFESSOR BENJAMIN ELMAN's edited volume entitled *Rethinking Confucianism: Past and Present in China, Japan, Korea, and Vietnam*, which was co-edited with John Duncan and Herman Ooms of UCLA, has been accepted for publication in the UCLA Asia Pacific Institute Monograph Series, forthcoming in 2002. The volume is based on a series of workshops and a conference held previously at UCLA, sponsored by The University of California Pacific Rim Research Program, The University of California Humanities Research Institute, and organized by the UCLA Center for Chinese Studies. Besides preparing the "Introduction" chapter, Elman also prepared the chapter entitled "Rethinking 'Confucianism' And 'Neo-Confucianism' In Modern Chinese History." Professor Elman's article "The Search for Evidence from China: Qing Learning and *Kôshôgaku* in Tokugawa Japan," a paper presented at the Institute for Advanced Study/School of Historical Studies Symposium on East Asian Culture and History, on April 13, 2001, is forthcoming in the volume entitled *Chinese Views of Japan in the Ming-Qing Period*, edited by Joshua Fogel of the University of California, Santa Barbara (East Bridge Press). His article entitled "Classical Reasoning in Late Imperial Chinese Civil Examination Essays," has been published in the special issue of *Kuo-li Chung-yang ta-hsueh wen-hsueh-yuan jen-wen hsueh-pao*, which includes the articles from the conference, "Chinese Traditions in Classical Hermeneutics," held at National Taiwan University, Taipei, June 1-2, 2000.

Professor Elman presented lectures in China, Germany, Japan, and Taiwan, in addition to several local universities. Based on his two research projects while at the Institute for Advanced Study, he presented the keynote address entitled "'Universal Science' versus 'Chinese Science': The Changing Identity of Natural Studies in China, 1850-1930," for the conference, "Chinese Historiography and Historical Thinking," organized by Susan Weigelin-Schwiedrzik and Axel Schneider, held at Heidelberg University, Germany, May 23-27, 2001. Professor Elman also lectured at the Institute for Chinese Studies at Leiden University on May 21. The paper, "Rethinking Confucianism for the 21st Century: Past and Present in China, Japan, Korea, and Vietnam," was prepared for the International Academic Symposium on "Globalization of the World Economy and the Future of Chinese Civilization," and presented at the first meeting of the "Forum on Chinese Civilization in the 21st Century," Beijing, China, October 25-28, 2000. "The Problem of Modern Science in China: From the Ming Jesuits and Qing Protestants to Qian Mu," was presented at the "Academic Conference Commemorating the Tenth Anniversary of the Passing of Qian Mu," held at the National Taiwan University, Taipei, Taiwan, November 24-26, 2000. All of the above conference presentations will be published in their respective conference volumes in the near future. In addition, Professor Elman presented the following public lectures: "The Scope of the 'Investigation of Things' in Late Imperial China," for the Early Chinese History Seminar, Harvard University, February 5, 2001; "From Jesuits to Protestants: Problems in the Transmission of Modern Science in China, 1600-1900," as part of the Nichols Distinguished Lecture

Series, sponsored by the Asian/Pacific Studies Institute, Duke University, February 15, 2001; "New Perspectives on the Jesuits in China, 1550-1750," for a conference entitled "East/West: Points of Contact," Lycoming College, Williamsport, Pennsylvania, March 16-17, 2001; and "The Cultural Role of Civil Examinations in Late Imperial China," for the History Department, Swarthmore College, March 29, 2001.

In his final year at the School of Historical Studies, Professor Elman again organized a series of events sponsored by The Andrew W. Mellon Foundation, with funds also generously provided by John P. Birkelund and Ladislaus von Hoffmann under the title "East Asian Studies at the School for Historical Studies, 2000-01: Seminars and Colloquia on East Asian Culture and History." In addition to leading one seminar on November 14, 2000, on his own current research project dealing with the influence of late imperial Chinese classical scholarship in Tokugawa Japan (1600-1867) before the Meiji Restoration, Professor Elman organized colloquia in the fall of 2000 and spring of 2001: 1) "Qing Dynasty History (1600-1900) Through 'Things'" (November 3-4, 2000), co-organized with the Princeton University East Asian Studies Program; 2) "East Asian Culture and History" (April 13-14, 2001). The two colloquia included presentations by the Institute Members and Visitors in East Asian Studies as well as non-Institute scholars including Pamela Crossley (Dartmouth College), Susan Naquin (Princeton University), Tobie Meyer-Fong (Johns Hopkins University), Evelyn Rawski (University of Pittsburgh), Alexander Woodside (University of British Columbia), James Ketelaar (University of Chicago), Mark Setton (SUNY, Stony Brook), and R. Bin Wong (University of California, Irvine). Professor Elman also presented an illustrated talk entitled "Classicism, Civil Examinations, and Natural Studies in Late Traditional China, 1600-1800," for the School of Historical Studies Faculty Lecture at the Institute on March 7, 2001.

Since joining the Institute in January, PROFESSOR JONATHAN ISRAEL has continued with his main research project on the impact of Spinoza and Spinozism on the European early Enlightenment as well as with subsidiary projects on the politics of the Dutch Golden Age and early modern Jewish history. His latest book, *Radical Enlightenment, Philosophy and the Making of Modernity, 1650-1750* was published by Oxford University Press, England, in February. At the invitation of the Press, Professor Israel undertook a book tour of several Dutch cities and was interviewed on Dutch radio.

Also in February, Professor Israel met with the history of political ideas research unit of the Folger Library, in Washington, to help plan a future international conference on interaction between England and the Netherlands in early modern political thought. In late March, he delivered a paper on the Dutch role in the European Enlightenment at the Herzog August Bibliothek, Wolfenbuettel, Germany, and, at The Hague, a public lecture on the statecraft of the early eighteenth-century Dutch statesman, Anthony Heinsius. Also at The Hague, he gave a talk to the research staff of the Royal Library on historians' use of the extensive body of source materials which the Royal Library edits and publishes.

In late April, Professor Israel delivered a public lecture at the American Jewish Historical Society in New York to mark the publication of the collective volume to which he was a contributor, *The Jews and the Expansion of Europe to the West, 1450-1800* (New York, 2001) published under the auspices of the John Carter Brown Library. During May, Professor Israel was interviewed for Dutch television in the royal apartments and gardens at Hampton Court Palace, near London, discussing the Stadholder-king, William III, and

the general significance of the so-called 'Glorious Revolution' for the Netherlands and Britain. In late May, he visited Poland, where he has established academic contacts and carried out library research. Professor Israel gave two lectures at the University of Wroclaw (Breslau), one on the early Enlightenment and the other-as part of an international conference on Dutch cultural influence in Central Europe-on the place of Silesia in Dutch anti-Habsburg strategy at the outset of the Thirty Years' War.

PROFESSOR IRVING LAVIN gave a course of lectues at the Institute Italiano per gli Studi Filosofici in Naples, and presented a number of lectures and papers at symposia both here and abroad, including: The J. Paul Getty Museum, The University of Jena in Germany, and the Palazzo delle Esposizioni in Rome. In May, Professor Lavin co-organized a three-day colloquium, sponsored and hosted jointly by the Institute for Advanced Study and the National Gallery of Art in Washington, entitled "Creativity: The Sketch in the Arts and Science."

Professor Lavin continued to serve as a member of the National Committee for the History of Art and as advisor to the architect Michael Graves for the decorative program of a new Federal Court House in Washington, D.C., and for a proposed monument in Richmond, Virginia, to the Virginia Proclamation of Religious Freedom; and on the editorial board of a number of scholarly journals, including "Quaderni d'italianistica," "History of European Ideas," "Art e Dossier," and "Palladio, rivista di storia dell' architettura e restauro."

Publications include a book and several papers in Italian and English: *Caravaggio e La Tour. La luce occulta di Dio* (Rome, 2000); "Georges de La Tour. The Tears of St. Peter and the 'Occult' Light of Penitence," in M. Seidel, ed., *L'Europa e l'arte italiana*, (Venice, 2000), 352-75; "Bernini in San Pietro," in A. Pinelli, ed., *La basilica di San Pietro in Vaticano*, 4 vols., (Modena, 2000), *Saggi*, 177-236; "Storm King: The Genius of the Place," in *Earth, Sky, and Sculpture. Storm King Art Center*, (Mountainville, NY, 2000), 53-63; "Bernini-Bozzetti: One More, One Less. A Berninesque Sculptor in Mid-Eighteenth Century France," in H. Baader et al., eds., *Ars et scriptura. Festschrift für Rudolf Preimesberger zum 65. Geburtstag*, (Berlin, 2001), 143-156.

PROFESSOR JACK F. MATLOCK, Jr. delivered lectures at the National Democratic Institute, the EastWest Institute, Princeton University, the New Jersey Council for History Education, the Society for Historians of American Foreign Relations, the Philadelphia Committee on Foreign Relations, Central Intelligence Agency, the Rand Business Leaders Forum, and the John F. Kennedy School of Government at Harvard University. He also gave a luncheon presentation hosted by the Institute for Advanced Study at the Dow Jones offices in New York.

Professor Matlock participated in conferences and discussions at the Council on Foreign Relations, Princeton University, University of Oklahoma, Global Green USA, and the Harriman Institute, where he received the Alumnus of the Year Award. He also participated in an international conference in Moscow sponsored by the Library of Foreign Literature and the Association of International Cooperation. He gave interviews to Harvard University Press and the BBC regarding Mikhail Gorbachev.

His publications include contributions in various projects and collective volumes: *Challenges and Opportunities in U.S.-Russian Relations*, for the National Defense Universi-

ty; "Russia, Europe, and 'Western Civilization'" for a Festschrift to Martin Malia; "1980-1983: The End of Détente and the Reformulation of American Strategy," for Hoover Institution Press; *U.S. Policy on Human Rights in Relations with the USSR: 1961-1991* for a Human Rights Implementation project sponsored by the U.S. Institute of Peace, and "Mikhail Gorbachev and the End of the Cold War," for a book dedicated to Gorbachev's 70th birthday. He also wrote an essay on Dmitri Likhachev for the American Philosophical Society.

Professor Matlock has completed his research for *Reagan and Gorbachev: How the Cold War Ended*, and continues work on it and other book-length projects.

PROFESSOR HEINRICH von STADEN participated in a workshop in July 2000 at the Needham Research Institute, University of Cambridge, on a recent comparative study (undertaken by Sir Geoffrey Lloyd and Nathan Sivin) of the emergence of ancient Greek and Chinese science. In August, he chaired a panel on "History and philosophy of science: state of the relationship" in St. Louis at the joint meeting of the History of Science Society with its British and Canadian counterparts. In early September 2000, he participated in a three-day conference in Houston on a new history of medical ethics (to be published by Cambridge University Press), to which he also has contributed a chapter. Professor von Staden subsequently gave a lecture on Homeric conceptions of healers and healing at a meeting of the International Society for the History of Medicine in Galveston. In late September 2000, he gave a keynote lecture on the transmission of science in Greco-Roman antiquity at a symposium in Japan (Kyoto University). At the opening plenary session of the annual meeting of the History of Science Society in Vancouver in early November, he gave an invited paper on particularity and the language of exception in Greek science. In mid-November 2000, he gave the Corbett Lecture in the Faculty of Classics at the University of Cambridge on "Reading as Therapy: Literacy and the Practice of Medicine." Throughout the autumn term, he also taught a graduate seminar in the Department of Classics at Princeton University on "Medicine, Language, and Culture." In February 2001, he gave a lecture at the University of Bochum, Germany, on the earliest commentaries on scientific and medical texts in ancient Greece. In late February, he lectured at the University of Cincinnati on literacy and medicine in the Roman empire, and in March 2001 he gave two graduate seminars and a lecture at the University of Texas at Austin. While in Austin, Professor von Staden also presented a commentary on a paper on Aristophanes of Byzantium at an international symposium organized by Project Theophrastus. At a symposium at the Dibner Institute (MIT) in May 2001, he gave an invited paper on 'art' and 'nature' in Greek medicine. At the invitation of the Departments of Philosophy and Classics at Union College in Schenectady, he gave the Harry Guttman Memorial Lecture on Hippocratic Ethics in late May. In June 2001, he gave the keynote address in Cuma, Italy, at the annual Symposium Cumanum sponsored by The Vergilian Society.

His publications in the academic year 2000-01 included "Body, Soul, and Nerves," in *Psyche and Soma. Physicians and Metaphysicians on the Mind-Body Problem from Antiquity to the Enlightenment*, edited by John P. Wright and Paul Potter (Oxford: Clarendon Press, 2000), pp. 79-116; "Metaphor and the Sublime: Longinus," in *Desde los poemas homéricos hasta la prosa griega del siglo IV d.C. Veintiséis estudios filológicos*, edited by Juan Antonio López Férez (Madrid: Ediciones Clásicas, 2000), pp. 359-380; "The Transmission of

Science in Greco-Roman Antiquity. Memory and Loss, Agency and Form," in *Kotengaku no saikôchiku (Towards a Reconstitution of Classical Studies)*, no. 8, edited by Akiyoshi Kida (Kobe: Hideaki Nakatani, Kobegakui University, 2000), pp. 31-41; "The Dangers of Literature and the Need for Literacy: A. Cornelius Celsus on Reading and Writing," in *Les textes médicaux latin comme littérature. Actes du Vie colloque international sur les textes médicaux latins*, edited by Alfrieda and Jackie Pigeaud (Nantes: Institut Universitaire de France, Université de Nantes, 2000), pp. 355-368; seven articles ("Anatomy and Physiology," "Dioscurides," "Galen," "Health," "Herophilus," "Hippocrates," and "Nicander") in *Encyclopedia of Greece and the Hellenic Tradition*, vols. I and II (London and Chicago: Fitzroy Dearborn, 2001), pp. 69-72, 493-94, 637-39, 716-18, 746-47, 755-57, 1153-54; and several book reviews. In February 2001, the Presses Universitaires de France appointed him to the 'Comité scientifique international' of the *Dictionnaire d'histoire et philosophie de la médecine*. He also continued to serve on the editorial boards of the journals *Configurations: Literature, Science and Technology* and *Filologia antica e moderna*, on the 'comité scientifique' of the new journal *Methodos: Savoirs et Textes* (Université de Lille), and as a member of a research unit ('U.P.R.E.S.A.') of the Comité National de Recherche Scientifique at the Sorbonne (Université de Paris-IV).

PROFESSORS EMERITI

PROFESSOR MARSHALL CLAGETT continued preparation of the fourth and last volume of his *Ancient Egyptian Science: A Source Book*. It includes an introductory analysis of some of the chief Egyptian medical papyri, and English translation of these papyri, together with their hieratic texts and hieroglyphic transliterations. The ancient Egyptian techniques of representing nature are also being examined in this volume. Professor Clagett continued to serve on committees of the American Philosophical Society during the past year, as he has done for the last forty years.

PROFESSOR OLEG GRABAR was awarded the eleventh Charles L. Freer Medal from the Smithsonian Institution for contributions to the field of Asian art. He served on the Executive Committee of the Visiting Review Committee for the Humanities at Brown University, was an examiner at a doctoral defense at the University of Paris, spoke at a colloquium on the dimensions of art at the University of California at San Diego, and lectured twice in courses at Princeton University. He also gave the Florovsky Memorial Lecture at Princeton University and the first Norma Jean Calderwood Lecture at the Harvard University Art Museums, as well as a lecture at the Los Angeles County Art Museum. He participated in seminars at New York University and MIT. Professor Grabar's publications included:

"Kunst und Kultur in der Welt der Islam," M. Hattstein and P. Delius, eds., *Islam, Kunst und Architektur* (Koln, 2000), pp. 35-53; "Ritual Objects and Private Devotion," in Larry D. Perkins ed., *Intimate Rituals and Personal Devotions* (Gainesville, Fl, 2000); "Art and Expression," in M.A. Al-Bakhit and others, eds. *History of Humanity: Scientific and Cultural Development, 7th to 16th Centuries* (UNESCO and London, 2000), pp. 143-163; 2001 "About Two Mughal Miniatures," Damaszener Mitteilungen (Festschrift Michael Meinecke), 11 (2000); "Graffiti or Proclamations: Why Write On Buildings," Doris Behrens-Abouseif ed., *The Cairo Heritage* (Cairo, 2000), pp. 69-75; "The Haram al-Sharif: An Essay in Interpretation," *Bulletin of the Royal Institute for Inter-Faith Studies*, 2;2 (2000), pp. 1-14; "The Crusades and the Development of Islamic Art," in A. E. Laiou and R. P. Mottahedeh, eds. *The Crusades from the Perspective of Byzantium and the Muslim World* (Washington, 2000), pp. 235-245.

PROFESSOR CHRISTIAN HABICHT was inducted into the Academy of Athens on October 31, 2000, and delivered a lecture entitled "Athenian Citizens with Foreign Names," forthcoming in the Transactions of the Academy.

From November 2-4, he participated in an international symposium in Athens, organized by Austrian and Greek institutions in memory of the death of Adolph Wilhelm in 1950. Professor Habicht was the first of two keynote speakers and gave a presentation entitled "Adolf Wilhelm und die attischen Inschriften," forthcoming in the proceedings of the symposium. On November 5, he took part in a joint meeting of the Advisory Committee and the Editorial Board responsible for the new edition of the inscriptions of Attica.

On December 9-10, Professor Habicht participated in an international conference held at Princeton University celebrating the fiftieth anniversary of the publication of David Magie's *Roman Rule in Asia Minor*.

On May 18-19, 2001, an international colloquium was held at the Haus of the Aby Warburg-Stiftung of the University of Hamburg on the occasion of Professor Habicht's seventy-fifth birthday. Of the thirteen speakers presenting "Neue Beiträge zur Geschichte der Griechischen Welt," ten had been members of the School of Historical Studies between 1974 and 1996.

Professor Habicht continued to serve on several committees. His publications were: "Delphi und die athenische Epigraphik," in *Delphes Cent Ans Après la Grande Fouille*, 2000, pp. 149-156; "Foreign Names in Athenian Nomenclature," in *Proceedings of the British Academy* 104, 2000, pp. 119-127; "Neues aus Messene," *Zeitschrift für Papyrologie und Epigraphik* 130, 2000, pp. 121-126; "Zur Chronologie der hellenistischen Eponyme von Kos," *Chiron* 30, 2000, pp. 303-332; "Steinepigramme aus dem griechischen Osten," *Tyche* 14, 1999 [2000], pp. 93-99; also reviews of K. W. Arafat, *Pausanias' Greece*, *Gnomon* 72, 2001, pp. 109-111, and of I. Savalli- Lestrade, *Les Philoi Royaux dans l'Asie Hellénistique*, *Topoi* 9, 1999 [2000], pp. 333-338.

PROFESSOR GEORGE KENNAN completed and published, in the year 2000, a small history of the first three generations of his own family. Stimulated by the research that effort involved, he also read extensively, as age permits him to do, and for the edification of none but himself, the history of the founding of the American republic.

PROFESSOR PETER PARET published *German Encounters with Modernism, 1840-1945* (Cambridge University Press, 2001, hardcover and paperback), a sequence of nine connected essays on art, society, and politics, some previously published and expanded, others new. *Makers of Modern Strategy* (Princeton University Press, 1986), a collection of writings by various authors, to which he contributed the introduction and essays on Napoleon and Clausewitz, was published in a Portuguese translation by the Biblioteca do Exercito Editore de Brazil, and in a new English language edition by the World Affairs Press in China. The book has already appeared in Italian, Japanese, Greek, and Spanish editions. During the academic year Professor Paret continued work on a study of the conflict between the sculptor Ernst Barlach and the Third Reich, which he expects to complete before the end of 2001.

PROFESSOR MORTON WHITE delivered a talk entitled "Some Reminiscences of W. V. Quine" at a meeting in memory of the late Professor Quine at Harvard University on March 2, 2001. He also delivered an expanded version of that talk at a similar meeting at Princeton University on April 13, 2001. Professor White has agreed with Questia Media to publish twelve of his books in electronic form, thereby permitting parts of them to be downloaded. He has also agreed to allow Bell and Howell to publish these same works in full in their series "Books on Demand." Professor White was re-elected a Member of Council by the American Philosophical Society and served on its committee to award fellowships in the humanities. He has completed a book tentatively entitled "Experience and Culture," which will be published by Princeton University Press.

WALTER AMELING
Ancient History
University of Jena, Germany

AMI AYALON
Near Eastern Studies
Tel Aviv University · s

CHRISTOPHER BASWELL
Medieval Literature and Classical Tradition
University of California, Los Angeles · n

JANE BAUN
Byzantine History
New York University

PAUL-ALAIN BEAULIEU
Assyriology
Harvard University

ANNETTE BECKER
20th Century History
University Paris X, Nanterre

JONATHAN BEST
Korean Cultural History
Wesleyan University · f

URSZULA BORKOWSKA
Medieval and Early Modern History
Catholic University of Lublin · f

JAN BREMMER
Classics, Comparative Religion
Rijksuniversiteit Groningen · f

SCOTT BRUCE
Medieval History
Institute for Advanced Study · a

ALEXANDER DES FORGES
East Asian Studies
University of Michigan · f

HELMA DIK
Classics
University of Chicago

PATRICIA EMISON
Art History (Renaissance)
University of New Hampshire · s

ROBERT ENGLISH
Political Science, Russian and East European History
Johns Hopkins University · n

KARL GALINSKY
Classics
University of Texas, Austin · vf

THOMAS GALLANIS
History of English Law
The Ohio State University

JONATHAN GLASSMAN
African History
Northwestern University

ALLAN GOTTHELF
Ancient Philosophy and Science
The College of New Jersey · s

KAREN HAGEMANN
Modern German and European History, Women and Gender History
Technical University of Berlin

FERAS HAMZA
Islamic History
Institute for Advanced Study · a

MARTA HANSON
History of Chinese Science
University of California, San Diego · vs

BERNARD HAYKEL
Islamic Studies
New York University

SCOTT HENDRIX
European Reformation History
Princeton Theological Seminary · vs

JOHN HOWE
Medieval History
Texas Tech University · s

DOUGLAS HOWLAND
East Asian History
DePaul University

RICHARD JANKO
Classics
University College, London · f

STEPHEN JONES
Georgian Politics and History
Mount Holyoke College · s

DOROTHY KO
East Asian History
Rutgers University, New Brunswick · n

ETAN KOHLBERG
Islamic History
The Hebrew University of Jerusalem · v

EWA LAJER-BURCHARTH
Art and Cultural History
Harvard University · s

MICHAEL LEWIS
History of Art and Architecture
Williams College

MICHÈLE LOWRIE
Classics
New York University

MICHAEL MAAS
Ancient History/Late Antiquity
Rice University

GREGORY MAERTZ
Art and Cultural History
St. John's University · s

SARAH McHAM
History of Art
Rutgers University, New Brunswick · f · vs

STEPHEN MENN
Ancient Philosophy
McGill University · s

JÖRG MERZ
History of Art
University of Augsburg, Germany

CONSTANT MEWS
Medieval History
Monash University, Australia · vf

VERA MOREEN
Near Eastern Languages and Civilizations
Swarthmore College · f

WILLIAM NEWMAN
History of Science
Indiana University

JOHN PAOLETTI
History of Art
Wesleyan University · s

PIOTR PIOTROWSKI
History of Art
Adam Mickiewicz University, Poland · f

RANDALL POOLE
European and Russian History
Boston University · f

AIMÉE BROWN PRICE
Art History
Independent Scholar · v

CHARLES RADDING
Medieval History
Michigan State University

ERIC REBILLARD
Late Antique History
Centre National de la Recherche Scientifique, Paris

NORMAN SAUL
Russian History
University of Kansas · f

KARIN SCHÜLLER
Iberian and Latin American History
Universität zu Köln, Germany

DUDLEY SHAPERE
Philosophy and History of Science
Wake Forest University · js

D. VANCE SMITH
Middle English Literature
Princeton University · v

DEBORAH STEINER
Classics
Columbia University · s

LIANA VARDI
Early Modern European History
State University of New York, Buffalo

FRIEDRICH ZIMMERMANN
Graeco-Arabic Philosophy and Science, Medieval Arabic Thought
University of Oxford

The following information was mistakenly omitted from the 1999-2000 Annual Report:

RONA GOFFEN
Art History
Rutgers University · v

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f First Term · j Joint Membership with Natural Sciences · 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 2000-01

October 4
The Islamicist Seminar: "What Did al-Farabi
Say about the 'Imamic' Constitution?"
PATRICIA CRONE, *Professor, Institute for
Advanced Study*

October 9
Historical Studies Colloquium: "The Predica-
ment of Ideas in Culture: Translation and
Historiography"
DOUGLAS HOWLAND, *DePaul University;
Member, Institute for Advanced Study*

October 10
East Asian Studies Seminar: "Society Reified:
Herbert Spencer and Political Theory in Early
Meiji Japan"
DOUGLAS HOWLAND, *DePaul University;
Member, Institute for Advanced Study*

October 16
Historical Studies Colloquium: "Science,
Religion and the Origins of Literary Criticism
in Fifth-Century Greece"
RICHARD JANKO, *University College Lon-
don; Member, Institute for Advanced Study*

October 17
Medieval Seminar: "Aeneas in 1381"
CRISTOPHER BASWELL, *University of
California, Los Angeles; Member, Institute for
Advanced Study*

October 23
Historical Studies Colloquium: "The Conver-
sion of Constantine and its Significance"
JAN BREMMER, *Rijksuniversiteit Groningen;
Member, Institute for Advanced Study*

October 29
East Asian Studies Seminar: "Scholarship,
Rebellion, and the Perfect Man: Themes in
Chinese Muslim History"
ZVI BEN-DOR, *Rutgers University,
New Brunswick*

October 30
Historical Studies Colloquium: "Was There a
Physiocratic Aesthetic?"
LIANA VARDI, *State University of New York,
Buffalo; Member, Institute for Advanced Study*

October 31
Medieval Seminar: "The Birth of Christian
Afterlife"
JAN BREMMER, *Reijksuniversiteit Groningen;
Member, Institute for Advanced Study*

November 3-4
East Asian Studies Colloquium: "Qing
History (1600-1900) Through 'Things'"
(co-sponsored by Princeton University and
the Institute for Advanced Study)
"Qing Horse Tools"
PAMELA CROSSLEY, *Dartmouth College*
"What Are 'Things' in Ming-Qing Encyclope-
dias?"
BENJAMIN A. ELMAN, *University of
California, Los Angeles; Mellon Visiting
Professor, Institute for Advanced Study*
"The Order of Things: Shoes as Material
Culture"
DOROTHY KO, *Rutgers University; Member,
Institute for Advanced Study*
"Making Historical Sites in the Early Qing"
TOBIE MEYER-FONG, *The Johns Hopkins
University*
"Local Cultures and the Representations of
Gods"
SUSAN NAQUIN, *Princeton University*
"Tibetan Buddhist Objects at the Qing Court"
EVELYN RAWSKI, *University of Pittsburgh*

November 6
Historical Studies Colloquium: "The Use of
Manuscripts in Medieval History: The Earliest
Manuscripts of Justinian's Code"
CHARLES RADDING, *Michigan State Uni-
versity; Member, Institute for Advanced Study*

November 8
School of Historical Studies Lecture: "The
Insane in Islamic Law"
BABER JOHANSEN, *École des Hautes Études
en Sciences Sociales, Paris*

November 13
Historical Studies Colloquium: "The Role of
Alchemy in the Scientific Revolution"
WILLIAM NEWMAN, *Indiana University;
Member, Institute for Advanced Study*

November 14
East Asian Studies Seminar: "The Impact of
Qing Chinese Classicism in Tokugawa Japan
up to the Kansei Heterodoxy Brouhaha"
BENJAMIN A. ELMAN, *University of
California, Los Angeles; Mellon Visiting
Professor, Institute for Advanced Study*

Medieval Seminar: "Four Brands of Alchemy:
The Corpora of Roger Bacon, Geber, John of
Rupescissa, and Bernard of Trien"
WILLIAM NEWMAN, *Indiana University;
Member, Institute for Advanced Study*

November 17
East Asian Studies Seminar: "The Rectification
of Time: The Systematic Redating of
Anachronisms in the Samguk Sagi's Chronicling
of Early Korean History"
JONATHAN BEST, *Wesleyan University;
Member, Institute for Advanced Study*

November 20
Historical Studies Colloquium: "The Intellectu-
al Milieu of Cracow in the Fifteenth Century"
URSZULA BORKOWSKA, *Catholic University
of Lublin; Member, Institute for Advanced Study*

November 27
Historical Studies Colloquium: "William
Allen White and Russia"
NORMAN SAUL, *University of Kansas;
Member, Institute for Advanced Study*

November 28
Medieval Seminar: "The University of Cracow
in the Fifteenth Century: Sources and Problems"
URSZULA BORKOWSKA, *Catholic Univer-
sity of Lublin; Member, Institute for Advanced
Study*

December 4
Historical Studies Colloquium: "Making an
Exemplum of Yourself: Cicero and Augustus"
MICHÈLE LOWRIE, *New York University;
Member, Institute for Advanced Study*

December 5
East Asian Studies Seminar: "The Closing of
the Archive on Footbinding, China, 1930s"
DOROTHY KO, *Rutgers University; Member,
Institute for Advanced Study*

December 6
The Islamicist Seminar: "A Seventeenth-
Century Jewish Philosopher from Iran on
Jewish Messianism"
VERA MOREEN, *Swarthmore College;
Member, Institute for Advanced Study*

December 11
Historical Studies Colloquium: "Words Afire:
Economies of Censorship and Veneration"
ALEXANDER DES FORGES, *University of
Michigan; Member, Institute for Advanced Study*

December 12
East Asian Studies Seminar: "Opium-Leisure-
Shanghai: Urban Economies of Consumption"
ALEXANDER DES FORGES, *University of
Michigan; Member, Institute for Advanced Study*

Medieval Seminar: "Hugh Metel, Heloise and
Peter Abelard: Reinterpreting Scholastic
Culture of the Twelfth Century"
CONSTANT MEWS, *Monash University;
Member, Institute for Advanced Study*

December 18
Historical Studies Colloquium: "Female
Patriots: Gendering the History of Early
German Nationalism"
KAREN HAGEMANN, *Technical University
of Berlin; Member, Institute for Advanced Study*

January 8
Historical Studies Colloquium: "The Rome of
Alexander VII (1655-1677)"
JÖRG MERZ, *University of Augsburg;
Member, Institute for Advanced Study*

January 16
Medieval Seminar: "The Exegesis of Junillus
Africanus: A Byzantine Contribution to the
Early Medieval Latin Text"
MICHAEL MAAS, *Rice University; Member,
Institute for Advanced Study*

January 22
Historical Studies Colloquium: "Nazi Art:
The Secret Postwar History"
GREGORY MAERTZ, *St. John's University;
Member, Institute for Advanced Study*

January 29
Historical Studies Colloquium: "'Death,
Where Is Thy Victory?' Remembering and
Forgetting the Great War"
ANNETTE BECKER, *University of Paris X,
Nanterre; Member, Institute for Advanced Study*

January 31
The Islamicist Seminar: "Two Yemeni Imposters"
BERNARD HAYKEL, *New York University; Member, Institute for Advanced Study*

February 5
School of Historical Studies Lecture: "Eighteenth-Century Travel Books on Sicily: Between Literature and Hellenic Revival"
GIOVANNI SALMERI, *University of Pisa*

Historical Studies Colloquium: "Medici Patronage Strategies During the Fifteenth Century"
JOHN PAOLETTI, *Wesleyan University; Member, Institute for Advanced Study*

February 6
East Asian Studies Seminar: "Epidemics, Epidemiology, and Cosmological Criticism at the End of the Ming Dynasty"
MARTA HANSON, *University of California, San Diego; Visitor, Institute for Advanced Study*

February 12
Historical Studies Colloquium: "Aristotle as Scientist: A Proper Verdict (With Emphasis on His Biological Works)"
ALLAN GOTTHELF, *The College of New Jersey; Member, Institute for Advanced Study*

February 13
Medieval Seminar: "The Mixed Economy of Health Care in the Early Middle Ages"
PEREGRINE HORDEN, *University of Oxford*

February 26
Historical Studies Colloquium: "'Music of the Spheres?': Did the Line Staff System of Musical Notation Develop Out of Astronomical Figures?"
JOHN HOWE, *Texas Tech University; Member, Institute for Advanced Study*

February 27
Medieval Seminar: "Inside the Scholar's Workshop: Legal Manuscripts of Eleventh-Century Italy"
CHARLES RADDING, *Michigan State University; Member, Institute for Advanced Study*

February 28
The Islamicist Seminar: "The Adab al-kabir of Ibn al-Muqaffa"
ANDRAS HAMORI, *Princeton University*

March 5
Historical Studies Colloquium: "'Divino': The Renaissance Artist as Undisguised Symbol"
PATRICIA EMISON, *University of New Hampshire; Member, Institute for Advanced Study*

March 13
East Asian Studies Seminar: "Protest from the Floating World: Fashion, State, and Category Formation in Early Modern Japan"
EIKO IKEGAMI, *New School for Social Research* and *Director, Center for Studies of Social Change*

Medieval Seminar: "The Millenial Reform of the Medieval Church"
JOHN HOWE, *Texas Tech University; Member, Institute for Advanced Study*

March 14
School of Historical Studies Lecture: "Books of Medieval Islam: From the History of the Book to the History of Collections"
LAHOUARI TOUATI, *École des Hautes Études en Sciences Sociales, Paris*

March 19
Historical Studies Colloquium: "Georgian Menshevism"
STEPHEN JONES, *Mount Holyoke College; Member, Institute for Advanced Study*

March 26
Historical Studies Colloquium: "'An Everlasting Possession': The History of Thucydides"
WALTER AMELING, *University of Jena; Member, Institute for Advanced Study*

March 27
Medieval Seminar: "The Living and the Dead in Middle Byzantine Apocalypses: Commemoration, Patronage, and Purgation"
JANE BAUN, *New York University; Member, Institute for Advanced Study*

March 28
The Islamicist Seminar: "Jewish Charity as Reflected in the Cairo Geniza"
MARK COHEN, *Princeton University*

April 2
Historical Studies Colloquium: "Ethnography Between Antiquity and the Middle Ages"
MICHAEL MAAS, *Rice University; Member, Institute for Advanced Study*

April 13-14

East Asian Studies Colloquium: "East Asian Culture and History"
"Evidential Studies in Qing China and Tokugawa Japan"
BENJAMIN A. ELMAN, University of California, Los Angeles; Mellon Visiting Professor, Institute for Advanced Study
"Chinese Medicine in the Manchu Court of the Early Qing"
MARTA HANSON, University of California, San Diego; Visitor, Institute for Advanced Study
"The Barbarian in Japanese History"
JAMES KETELAAR, University of Chicago
"The Closing of the Archives on Footbinding, China, 1934-1941"
DOROTHY KO, Rutgers University; Member, Institute for Advanced Study
"Practical Studies and Ancient Learning in Choson Korea and Tokugawa Japan"
MARK SETTON, State University of New York, Stony Brook
"East Asia as a Confucian World"
R. BIN WONG, University of California, Irvine
"The Developmental Ambiguities of East Asian Classical Politics"
ALEXANDER WOODSIDE, University of British Columbia

April 24

East Asian Studies Seminar: "Liberating and Killing Outcastes in Early Meiji Japan"
DAVID L. HOWELL, Princeton University

May 8

East Asian Studies Seminar: "Military Culture in Qing China Before 1800"
JOANNA WALEY-COHEN, New York University

May 24-25

Creativity Symposium: "The Sketch in the Arts and Sciences"
(This symposium was co-sponsored by the National Gallery of Art and the Institute for Advanced Study. The list of talks which follows includes only those which took place at the Institute. The Symposium also included talks at the National Gallery of Art in Washington, D.C. on May 23.)
"Writing Music, Sketching Music"
LEO TREITLER, City University of New York (emeritus)
"Beethoven's Sketches: From Conceptual Image to Realization"
LEWIS LOCKWOOD, Harvard University
"Experience, Discipline, Fantasy: Improvisation in Classical Music and Jazz"
ROBERT LEVIN, Harvard University
"Sketching and Choreography"
TWYLA THARP, New York, NY
"Creation in Mathematics: The Question of the Sketch of a Proof"
JEAN DHOMBRES, École des Hautes Études en Sciences Sociales
"Sketching Science in the Seventeenth Century"
MICHAEL S. MAHONEY, Princeton University
"Sketching as Re-reptesentation: Edison and the Development of the Telephone, 1875-1879"
W. BERNARD CARLSON, University of Virginia
"Uses of Sketches by Chinese Painters"
JAMES CAHILL, University of California, Berkeley (emeritus)
"Bozzetti and Modelli. Notes on Sculptural Procedure from the Early Renaissance through Bernini.
IRVING LAVIN, Institute for Advanced Study
"The Sketch in the History of the Visual Arts"
HORST BREDEKAMP, Humboldt-Universität zu Berlin
"A Modernity of Obsessive Calculations and Heedless Haste"
KIRK VARNEDOE, Museum of Modern Art

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, who met to discuss ongoing projects and specific problems encountered in their research, and Islamic historians who met periodically for an informal seminar to study specific Islamic texts. Individual Faculty members also occasionally arranged informal talks by invited speakers. Although these do not appear on the above list, which reflects only formal activities of the School, these informal gatherings also played an important role in the intellectual life of the School.

" I enjoyed the beauty of the Institute and really appreciated being here.
The staff seems to know what the role of the Institute is, and they
even seem to like mathematicians . . . In fact I am sorry to leave
now. The opportunity to work in so stimulating, comfortable,
and beautiful a place is a privilege."

— *Member, School of Mathematics*

THE SCHOOL OF MATHEMATICS

Faculty

ENRICO BOMBIERI, *IBM von Neumann Professor*
JEAN BOURGAIN
PIERRE DELIGNE
ROBERT P. LANGLANDS, *Hermann Weyl Professor*
ROBERT D. MacPHERSON
THOMAS SPENCER
AVI WIGDERSON

Professors Emeriti

ARMAND BOREL
ATLE SELBERG

ACADEMIC ACTIVITIES

During the academic year 2000-01, the School of Mathematics organized a special program entitled "Computational Complexity Theory." With funds from the National Science Foundation, this program was led by School Faculty member Avi Wigderson together with four senior scientists: J. Håstad (Sweden), P. Pudlak (Czech Republic), R. Raz (Israel), and A. Razborov (Russia). In addition to these senior scientists, there were fifteen participants (mostly junior) in residence for the year. The program attracted many scientists from Princeton and Rutgers Universities as well as from NEC and AT&T research laboratories.

The year began with a series of introductory lectures by each of the senior researchers. There were three seminars each week. The topics were extremely varied and touched almost every aspect of complexity theory, from quantum computation to the complexity of testing knots to probalistically checkable proofs and optimization. However, most talks and mini-courses centered around two main themes in which there was special strength and interest among the residents. One was "Proof Complexity," a study centered on quantifying the difficulty of proving theorems in a variety of algebraic, combinatorial and geometric proof systems. The other was "Derandomization and Pseudo-randomness," a study of the power and limitations of randomness in computation (including the construction of random-like objects as expanders and extractors). The breadth and depth of the seminars made them a great educational experience even to experts, and certainly to the more junior participants as well as the many outsiders, mainly mathematicians, who attended these seminars.

In addition, there was a regular reading seminar conducted by the participants. Some of the highlights from the reading seminar included polynomial time algorithms for the approximation of permanants, and learnability and applications of Fourier analysis to complexity.

Research was quite intensive, with diverse contributions to a variety of topics in complexity theory made by the special-year program participants. Some of these were central to intrinsic studies within computational complexity, e.g. major advances towards understanding the power of the resolution proof system, and near-optimal constructions of extractors. Others were on the meeting grounds of computational complexity with various mathematical disciplines, such as the new algorithms that provide an understanding of the topology of knots, and the impacts of new combinatorial methods of constructing expander graphs on problems in group theory.

There were also two workshops: "Complexity of Proofs and Computations" in the fall, and "Asymptotic and Computational Aspects of Coding" in the spring. These were attended by the world's leading experts as well as by graduate students. The two workshops were very different due to the nature of research in these two areas. The first was very focused and coherent, as essentially all participants had the same background. The second involved researchers from the four or five different communities interested in codes from different perspectives. The effects of the cross-fertilization should be lasting.

Alexander Razborov has accepted a three-year appointment in the School. His presence will further strengthen research in complexity theory at the Institute over the next few years.

During 2001-02, the main activity in the School will be in symplectic geometry and holomorphic curves. This program is being organized by Robert MacPherson and Yakov Eliashberg (Stanford University) who will be Distinguished Visiting Professor. Other senior participants include H. Hofer (Courant Institute) and D. MacDuff (SUNY at Stony Brook).

Another major focus of activity during the year was automorphic forms. The senior participants included J. Arthur, G. Henniart, R. Kottwitz, D. Shelstad, P. Sarnak, and M-F. Vigneras.

James Arthur gave an advanced course, "Representations of Classical Groups." The object of the course was to describe how to classify automorphic representations of matrix groups by means of the trace formula. Classical matrix groups are the setting for a major part of the Langlands program. Their representations are thought to carry fundamental arithmetic information. The course met for one hour per week from October to April. Many members of the Institute took part, as did a number of graduate students from Princeton University.

In April, there was a conference on "Automorphic Forms, Concepts, Techniques, Applications and Influence." The conference, organized by V. Drinfeld, R. Langlands, P. Sarnak, and A. Wiles, was funded by the National Science Foundation. The lectures, presented by fourteen prominent mathematicians, were video-taped and are now on the Internet.

Vladimir Voevodsky continued his lecture series on "Motivic Cohomology," giving a systematic exposition of motivic homotopy theory and focusing especially on generalizations of Steenrod operations. These are important ingredients for his proof of the Milnor conjecture and should also be useful in approaching the Bloch-Kato conjectures. These lectures will soon appear in written form.

Other regular seminars in the School included one on nonlinear theory and another on number theory and harmonic analysis. These seminars were conducted jointly with Rutgers University and Princeton University. The seminar on nonlinearity covered many equations arising in differential geometry and mathematical physics such as the Chern-Simons equation, wave maps, and Einstein equations. The number theory seminar focused on automorphic forms, including random matrices as well as classical aspects of of primes.

In the spring term, Don Richards and Peter Sarnak organized a seminar on random matrices. There were expository lectures by J. Baik, D. Richards, S. Sahi, and T. Spencer which explained connections of random matrices with orthogonal polynomials, statistics, representation theory, and mathematical physics.

There were several noteworthy seminar series. In March, the Marston Morse Memorial Lectures were delivered by David Gabai (Caltech) on "Geometric and Topological Rigidity of Hyperbolic 3-Manifolds" and "The Smale Conjecture for Hyperbolic 3-Manifolds." In these lectures, Gabai outlined the geometry behind the computer-assisted proof that hyperbolicity is a homotopy invariant. This is joint work with G. Mayerhoff and N. Thurston.

In February, Joseph Bernstein (Tel Aviv University) gave three lectures entitled "Analytic Continuation of Eisenstein Series." In March, Dennis Gaitsgory (Harvard University) presented lectures on an "Introduction to the Geometric Langlands Correspondence." Gaitsgory showed that classical arithmetic questions can be naturally reformulated and proved in a geometric setting.

Pierre Deligne gave several lectures on his recent research on rational relations of multi-zeta values. These values can be expressed in terms of integrals over cycles on certain algebraic varieties. The main idea of his proof is to use the relations between various cohomology theories.

In the area of applied mathematics, there were two one-day workshops on turbulence organized by Victor Yakhot. These informal workshops presented some new experimental and theoretical results, and succeeded in bringing about lively interdisciplinary discussions involving mathematicians, engineers, and physicists. Among the participants were U. Frisch (France), M. Jensen (Bohr Institute), A. Polykov (Princeton University), Y. Sinai (Princeton University), and K. Sreenivasan (Yale University).

Enrico Bombieri received an honorary doctorate from the University of Pisa in the fall of 2000, and L'Academie des Sciences de Paris awarded Robert Langlands the Grand Medaille d'Or.

MIKHAIL ALEKHNOVITCH
Complexity Theory
Moscow State University, Russia

JAMES ARTHUR
Automorphic Forms and Trace Formulas
University of Toronto

JINHO BAIK
Integrable Systems and Random Permutations
Institute for Advanced Study · i

VLADIMIR BARANOVSKY
Moduli of Sheaves and Bundles on Curves and Surfaces
University of Chicago · f

MARGHERITA DISERTORI
Constructive Renormalization
École Polytechnique, France

HAROLD DONNELLY
Analysis on Manifolds, Partial Differential Equations
Purdue University

NICOLA GALESI
Complexity of Propositional Proof Systems
Universitat Politecnica de Catalunya, Spain

WEE TECK GAN
Representation Theory, Automorphic Forms
Institute for Advanced Study · i

MICHAEL GOLDSTEIN
Nonlinear Equations, Spectral Theory
Institute for Advanced Study · f

DIOGO GOMES
Viscosity Solutions of Hamilton-Jacobi Equations
University of California, Berkeley

MARK GORESKY
Geometry, Automorphic Forms
Institute for Advanced Study

ULRICH GÖRTZ
Algebraic Geometry: Bad Reduction of Shimura Varieties
Universität zu Köln, Germany

ANTONELLA GRASSI
Algebraic Geometry, Physics of String Theory
University of Pennsylvania

JESPER GRODAL
Algebraic Topology
Massachusetts Institute of Technology

CEMALETTIN GÜNTÜRK
Harmonic Analysis Methods in Signal Quantization and Compression
Princeton University

NADYA GUREVICH
Automorphic Forms, Trace Formula, L-Functions
The Weizmann Institute of Science, Israel · i

THOMAS HAINES
Automorphic Forms and Shimura Varieties
University of Toronto

ZHENG-CHAO HAN
Partial Differential Equations
Rutgers University, New Brunswick · vf

JOEL HASS
Topology, Differential Geometry
University of California, Davis

JOHAN HÅSTAD
Complexity Theory
Royal Institute of Technology, Sweden

GUY HENNIART
Automorphic Forms and Representations of P-Adic Groups
Université de Paris-Sud · s

RICHARD HORJA
Complex Algebraic Geometry, Mirror Symmetry
Duke University · s

PO HU
Homotopy Theory of Algebraic Varieties, Stable Homotopy Theory
University of Chicago

TAMOTSU IKEDA
Automorphic Forms
Kyoto University, Japan

DIHUA JIANG
Automorphic Representations and L-Functions
University of Minnesota · *f*

VALENTINE KABANETS
Computational Complexity
University of Toronto

GIL KALAI
Combinatorics
The Hebrew University of Jerusalem · *f*

KALLE KARU
Algebraic Geometry, Toric Geometry, Moduli Spaces,
Combinatorics
Harvard University

ROWAN KILLIP
Differential Operators, especially Schrödinger Operators
California Institute of Technology

ANTHONY KNAPP
Lie Groups and Representation Theory
State University of New York, Stony Brook · *v*

JOSEPH KOHN
Several Complex Variables and Partial Differential
Equations
Princeton University

ROBERT KOTTWITZ
Automorphic Forms, Shimura Varieties
University of Chicago · *s*

OLEG KOVRIJKINE
Estimates of Fourier Transforms
California Institute of Technology

EMMANUEL KOWALSKI
Automorphic Forms and L-Functions
Institute for Advanced Study · *fi*

EREZ LAPID
Automorphic Forms, Trace Formula
The Ohio State University · *s*

ELON LINDENSTRAUSS
Ergodic Theory, Topological Dynamics
Institute for Advanced Study

SATYANARAYANA LOKAM
Computational Complexity in Combinatorial and
Algebraic Models
Loyola University

DIANE MACLAGAN
Algebraic Combinatorics
University of California, Berkeley

GEORGIY MEDVEDEV
Applications of Partial Differential Equations
Institute for Advanced Study · *i*

ROY MESHULAM
Combinatorics
Technion-Israel Institute of Technology

PHILIPPE MICHEL
Analytic Number Theory, Modular Forms
Institute for Advanced Study · *f*

IRINA MITREA
Harmonic Analysis and Partial Differential Equations
University of Minnesota

AMBRUS PAL
Arithmetic Algebraic Geometry
Columbia University

PAVEL PUDLÁK
Computational Complexity
Academy of Sciences of the Czech Republic · *f*

STEPHEN RALLIS
L-Functions and Automorphic Forms
The Ohio State University · *s*

RAN RAZ
Complexity Theory
The Weizmann Institute of Science, Israel

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

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

CHARLES REZK
Homotopy Theory
Institute for Advanced Study · *s*

f First Term · *i* Veblen Research Instructorship · *s* Second Term · *v* Visitor

DONALD RICHARDS
Representation Theory and Special Functions
University of Virginia

DANIEL SAGE
Representation Theory
Louisiana State University · vs

YVAN SAINT-AUBIN
Statistical Physics, Conformal Field Theory
Université de Montréal

ALEX SAMORODNITSKY
Coding Theory, Complexity, Extremal Set Theory
Institute for Advanced Study

PETER SARNAK
Analytic Number Theory, Automorphic Forms
Princeton University · f

ALEXANDER SCORICHENKO
General Linear Homology, Homological Algebra
Northwestern University

DIANA SHELSTAD
Automorphic Representation Theory
Rutgers University · s

KANNAN SOUNDARARAJAN
Number Theory, Modular Forms
Institute for Advanced Study

VENKATESH SRINIVASAN
Randomness and Computation, Combinatorial Methods in Complexity Theory
Tata Institute of Fundamental Research, India

BENJAMIN SUDAKOV
Combinatorics
Institute for Advanced Study · i

DINESH THAKUR
Arithmetic of Function Fields, Drinfeld Modules
University of Arizona

ABIGAIL THOMPSON
3-Manifolds and Knot Theory, Algorithms
University of California, Davis

LISA TRAYNOR
Symplectic Topology
Bryn Mawr College · s

SALIL VADHAN
Computational Complexity Theory
Massachusetts Institute of Technology · v

DIETER VAN MELKEBEEK
Computational Complexity
University of Chicago

MARIE-FRANCE VIGNÉRAS
Lie Groups, Representation Theory
Université Paris 7 · s

VLADIMIR VOEVODSKY
K-Theory and Arithmetical Algebraic Geometry
Institute for Advanced Study

ANDREW WILES
Algebraic Number Theory
Institute for Advanced Study and
Princeton University · s

VICTOR YAKHOT
Turbulence Theory, Hydrodynamics, Combustion Theory, Dynamic Critical Phenomena
Boston University

CATHERINE YAN
Algebraic Combinatorics, Lattice Theory
Texas A & M University

PAUL YANG
Extremal Metrics on 3- and 4-Manifolds
Princeton University

YIFAN YANG
Analytic, Combinatorial and Probabilistic Methods in Number Theory
University of Illinois, Urbana-Champaign

EDUARD ZEHNDER
Symplectic Geometry
Eidgenössische Technische Hochschule Zurich · f

ILIA ZHARKOV
Algebraic Geometry and String Dualities
University of Pennsylvania

f First Term · i Veblen Research Instructorship · s Second Term · v Visitor

RECORD OF EVENTS

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

Academic Year 2000-01

September 28
Princeton/IAS/Rutgers Nonlinear Theory Seminar:
"Perturbation and Scalar Curvature"
ANTONIO AMBROSETTI, *Scuola Internazionale
Superiore di Studi Avanzati, Italy*

September 29
Automorphic Forms Seminar: "The Principle of
Functoriality: An Elementary Introduction"
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

October 2
Combinatorics and Complexity Theory Seminar:
"Graph Coloring in Expected Polynomial Time"
MICHAEL KRIVELEVICH, *Tel Aviv University*

October 3
Complexity Year Seminar I: "Introduction to Proof
Complexity"
ALEXANDER RAZBOROV, *Institute for Advanced
Study*

October 5
Complexity Year Seminar II: "Expander Graphs -
Motivations and Constructions"
AVI WIGDERSON, *Institute for Advanced Study*

Princeton University/IAS/Rutgers Number Theory
and Harmonic Analysis Seminar: "A New Example
of Theta Power"
NADYA GUREVICH, *Institute for Advanced Study*

October 6
Automorphic Forms Seminar: "Parameters for
Classical Groups"
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

Complexity and Combinatorics Reading Seminar:
"Integer Division Using Logarithmic Workspace"
DIETER VAN MELKEBEEK, *University of Chicago*

October 10
Complexity Year Seminar I: "Introduction to Proof
Complexity" (continued)
ALEXANDER RAZBOROV, *Institute for Advanced
Study* and PAVEL PUDLÁK, *Institute for Advanced
Study*

October 11
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

October 12
Complexity Year Seminar II: "Expander Graphs -
Explicit Constructions"
AVI WIGDERSON, *Institute for Advanced Study*

Princeton University/IAS/Rutgers Number Theory
and Harmonic Analysis Seminar: "The Local Con-
verse Theorem for SO(2n+1) and Applications"
DIHUA JIANG, *Institute for Advanced Study*

October 13
Complexity Year Reading Seminar

October 16
Combinatorics and Complexity Theory Seminar:
"Entropy, Hypergraphs and Inequalities"
EHUD FRIEDGUT, *The Hebrew University of
Jerusalem*

Automorphic Forms Seminar: "Parameters for
Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

October 17
Complexity Year Seminar I: "Topics in Proof Com-
plexity"
JAN KRAIJCEK, *Mathematics Institute, Prague*

October 18
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

October 19
Complexity Year Seminar II: "Extractors - Motivations and Explicit Constructions"
OMER REINGOLD, *Institute for Advanced Study* and RONEN SHALTIEL, *Institute for Advanced Study*

October 20
Complexity Year Reading Seminar: "'A Polynomial-Time Approximation Algorithm for the Permanent of a Matrix with Non-Negative Entries,' by J. Jerrum, A. Sinclair and E. Vigoda"
ALEX SAMORODNITSKY, *Institute for Advanced Study*

October 23
Automorphic Forms Seminar: "Parameters for Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Complexity and Combinatorics Seminar: "Do Quantum Drunks Walk Faster?"
DORIT AHARONOV, *University of California, Berkeley* and *The Hebrew University of Jerusalem*

October 24
Complexity Year Seminar I: "More on Feasible Interpolation in Proof Complexity"
PAVEL PUDLÁK, *Institute for Advanced Study*

Special Seminar: "Term Rewriting and Computational Complexity"
HARVEY FRIEDMAN, *The Ohio State University*

October 25
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

October 26
Complexity Year Seminar II: "Extractors - Applications and Explicit Constructions"
RONEN SHALTIEL, *Institute for Advanced Study*

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "Diophantine Approximation in Finite Characteristic"
DINESH THAKUR, *Institute for Advanced Study*

October 27
Complexity Year Reading Seminar: "A Polynomial-Time Approximation Algorithm for the Permanent of a Matrix with Non-Negative Entries" (continued)
ALEX SAMORODNITSKY, *Institute for Advanced Study*

October 30
Automorphic Forms Seminar: "Parameters for Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Complexity and Combinatorics Seminar: "Estimating the Distance Distribution of Codes"
ALEXANDER BARG, *Bell Labs*

October 31
Complexity Year Seminar I: "Techniques for Proving Lower Bounds in Resolution"
ELI BEN-SASSON, *Institute for Advanced Study*

November 1
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

November 2
Complexity Year Seminar II: "Construction of Extractors (continued) and Hardness vs. Randomness"
RONEN SHALTIEL, *Institute for Advanced Study* and DIETER VAN MELKEBEEK, *University of Chicago*

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "Bounds for the Riemann Zeta Function, and New Results for the Prime Race Problem"
KEVIN FORD, *University of South Carolina*

November 3
Complexity Year Reading Seminar

November 6
Automorphic Forms Seminar: "Parameters for Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Complexity and Combinatorics Seminar: "On the Strength of Comparisons in Property Testing"
ELDAR FISCHER, *NEC Research Institute*

Members Seminar: "Finiteness in Conformal Geometry"
PAUL YANG, *Institute for Advanced Study*

November 7
Complexity Year Seminar I: "Monotone Proof
Complexity and Resolution Refinements"
NICOLA GALESI, *Institute for Advanced Study*

November 8
Complexity Year Reading Seminar: "'Constant-Depth
Circuits, Fourier Transform and Learnability,' by N.
Linial, Y. Mansour and N. Nisan"
SATYA LOKAM, *Institute for Advanced Study*

Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

November 9
Complexity Year Seminar II: "Hardness Amplifica-
tion Using Error-Correcting Codes" and "Extraction
of Randomness from 'Efficient' Sources"
SALIL VADHAN, *Institute for Advanced Study* and
Harvard University

November 13
Automorphic Forms Seminar: "Parameters for
Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

Complexity and Combinatorics Seminar: "Scaling
Limits of Random Processes and the Outer Boundary
of Planar Brownian Motion"
ODED SCHRAMM, *Microsoft Corporation* and
The Weizmann Institute of Science, Israel

Members Seminar: "Harmonic Functions on
Manifolds of Non-Negative Ricci Curvature"
HAROLD DONNELLY, *Institute for Advanced Study*

November 15
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

November 16
Complexity Year Seminar II: "Derandomization
Under Uniform Assumptions"
VALENTINE KABANETS, *Institute for Advanced
Study*

Princeton University/IAS/Rutgers Number Theory
and Harmonic Analysis Seminar: "Rational Points
Close to an Arc of a Curve"
MARTIN HUXLEY, *University of Wales*

November 17
Complexity Year Reading Seminar

November 20
Automorphic Forms Seminar: "Parameters for
Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

Complexity and Combinatorics Seminar: "The
Number of Different Instances of k-SAT"
BELA BOLLOBAS, *Trinity College Cambridge* and
University of Memphis

Members Seminar: "Isoperimetry, Noise, and First-
Passage Percolation"
GIL KALAI, *Institute for Advanced Study*

November 22
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

November 27
Automorphic Forms Seminar: "Parameters for
Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

Complexity and Combinatorics Seminar: "Construc-
tive Lower Bounds for Off-Diagonal Ramsey
Numbers" (joint work with Noga Alon)
PAVEL PUDLÁK, *Institute for Advanced Study*

Members Seminar: "Pseudoholomorphic Curves and
Dynamics in Three Dimensions"
EDUARD ZEHNDER, *Institute for Advanced Study*

November 28
Complexity Year Seminar I: "Regular Resolution
Lower Bounds for the Weak Pigeonhole Principle"
RAN RAZ, *Institute for Advanced Study*

November 29
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

November 30

Complexity Year Seminar II: "Extracting Randomness from Samplable Distributions"
SALIL VADHAN, *Institute for Advanced Study* and *Harvard University*

Complexity Year Seminar II: "The Bitprobe Complexity of Set Membership"
VENKATESH SRINIVASAN, *Institute for Advanced Study*

December 1

Complexity Year Reading Seminar: "'The Influence of Variables on Boolean Functions,' by J. Kahn, G. Kalai and N. Linial"
GIL KALAI, *Institute for Advanced Study*

December 4

Automorphic Forms Seminar: "Parameters for Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Complexity and Combinatorics Seminar: "A Combinatorial Problem in Abelian Groups"
GYULA KAROLYI, *Eötvös Loránd University, Hungary*

Complexity and Combinatorics Seminar: "Random Walks on Truncated Cubes and Sampling Knapsack Solutions"
ALISTAIR SINCLAIR, *University of California, Berkeley*

Members Seminar: "Combinatorics Relating to Local Models of Shimura Varieties"
THOMAS HAINES, *Institute for Advanced Study*

December 5

Complexity Year Seminar I: "Exponential Lower Bounds for the Weak Pigeonhole Principle in Regular Resolution" (continued)
RAN RAZ, *Institute for Advanced Study*

Special Seminar: "Approximating Permanents"
ALISTAIR SINCLAIR, *University of California, Berkeley*

December 6

Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

December 7

Complexity Year Seminar II: "Robustness Functions of Matrix Rank with Applications in Complexity Theory"
SATYA LOKAM, *Institute for Advanced Study*

December 8

Complexity Year Reading Seminar: "Some Very Easy Uses of the Fourier Transform"
JOHAN HÅSTAD, *Institute for Advanced Study* and *Royal Institute of Technology, Sweden*

December 10, 11, 12, 13, 14, 15

Workshop on Complexities of Proofs and Computations

December 11

Automorphic Forms Seminar: "Parameters for Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

December 13

Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

December 14

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "Derivatives of Siegel Modular Forms and Fields of Periods of Abelian Varieties"
DANIEL BERTRAND, *Université Pierre of Marie Curie*

December 18

Complexity and Combinatorics Seminar: "Mixed Volumes of Hypersimplices"
ERIC BABSON, *University of Washington*

Complexity and Combinatorics Seminar: "A New Connectivity Theory for Simplicial Complexes"
HELENE BARCELO, *Arizona State University*

December 19

Complexity Year Seminar I: "Resolution Is Not Automatizable Unless MMSA Can Be Efficiently Approximated for Small Weights"
MIKHAIL ALEKHNOVITCH, *Institute for Advanced Study*

December 20

Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

January 15
Automorphic Forms Seminar: "Representations of Classical Groups"
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

January 17
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

January 18
Complexity Year Seminar: "Some Optimal Inapproximability Results, Part I"
JOHAN HÅSTAD, *Institute for Advanced Study* and *Royal Institute of Technology, Sweden*

January 19
Seminar on Random Matrices and Eigenvalues:
Organizational Meeting

January 22
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Theoretical Computer Science/Discrete Math Seminar: "Equilateral Sets"
CLIFF SMYTH, *Rutgers University*

January 23
Complexity Year Reading Seminar

January 24
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

January 25
Complexity Year Seminar: "Some Optimal Inapproximability Results, Part II"
JOHAN HÅSTAD, *Institute for Advanced Study* and *Royal Institute of Technology, Sweden*

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "On Some Constructions of Siegel Cusp Forms"
TAMOTSU IKEDA, *Institute for Advanced Study*

January 26
Seminar on Random Matrices and Eigenvalues: "The Wishart Distributions"
DONALD RICHARDS, *Institute for Advanced Study*

January 29
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Members Seminar: "Representations of $Gl(n, Q_p)$ Modulo Ell and Quantum Groups"
MARIE-FRANCE VIGNÉRAS, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math Seminar: "Testing of Function That Have Small Width Branching Programs"
ILAN NEWMAN, *NEC Research Institute* and *Haifa University*

January 30
Complexity Year Reading Seminar

Seminar on Random Matrices and Eigenvalues: "The Wishart Distributions" (continued)
DONALD RICHARDS, *Institute for Advanced Study*

January 31
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

February 1
Complexity Year Seminar: "Some Optimal Inapproximability Results, Part III"
JOHAN HÅSTAD, *Institute for Advanced Study* and *Royal Institute of Technology, Sweden*

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "Lattice Point Problems and Distribution of Values of Quadratic Forms"
FRIEDRICH GÖTZE, *University of Bielefeld*

February 5
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Members Seminar: "On Parabolic Induction and Restriction Functors: The Example of $Gl_2(q_p)$"
GUY HENNIART, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math
Seminar: "Matching and Covering via Homology"
ROY MESHULAM, *Institute for Advanced Study* and
Technion-Israel Institute of Technology

February 6
Complexity Year Reading Seminar: "L_1 Embeddings
of Graphs"
YURI RABINOVICH, *Haifa University*

Seminar on Random Matrices and Eigenvalues:
"The Complex Wishart Distributions"
DONALD RICHARDS, *Institute for Advanced Study*

February 7
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

February 8
Complexity Year Seminar: "Lower Bounds for
Polynomial Calculus"
ALEXANDER RAZBOROV, *Institute for Advanced
Study*

February 9
Special Seminar: "Analytic Continuation of
Eisenstein Series"
JOSEPH BERNSTEIN, *Tel Aviv University*

February 12
Automorphic Forms Seminar: "Representations of
Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and
University of Toronto

Members Seminar: "Generic Automorphic Forms on
SO(2n+1): Descent from GL(2n)"
STEPHEN RALLIS, *Institute for Advanced Study*

Special Seminar: "Analytic Continuation of
Eisenstein Series"
JOSEPH BERNSTEIN, *Tel Aviv University*

Theoretical Computer Science/Discrete Math Semi-
nar: "Quasi-Worst Case Analysis: Why the Simplex
Algorithm Usually Takes Polynomial Time"
DAN SPIELMAN, *Massachusetts Institute of Technology*

February 13
Complexity Year Reading Seminar: "'Noise-Tolerant
Learning, the Parity Problem, and the Statistical Query
Model,' by A. Blum, A. Kalai and H. Wasserman"
OMER REINGOLD, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues:
"Universality Classes and Orthogonal Polynomials"
EDUARDO DUENEZ, *Princeton University*

February 14
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced
Study*

Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

Special Seminar: "Analytic Continuation of
Eisenstein Series" (continued)
JOSEPH BERNSTEIN, *Tel Aviv University*

February 15
Complexity Year Seminar: "Lower Bounds for
Polynomial Calculus" (continued)
ALEXANDER RAZBOROV, *Institute for Advanced
Study*

Princeton University/IAS/Rutgers Number Theory
and Harmonic Analysis Seminar: "Linear Indepen-
dence Over q of Infinitely Many Values of Zeta at
Odd Integers"
TANGUY RIVOAL, *Centre National de la Recherche
Scientifique*

February 16
Special Seminar: "Analytic Continuation of
Eisenstein Series" (continued)
JOSEPH BERNSTEIN, *Tel Aviv University*

February 20
Complexity Year Reading Seminar: "'Extractor
Codes,' by A. Ta-shma and D. Zuckerman"
VENKATESH SRINIVASAN, *Institute for Advanced
Study*

Seminar on Random Matrices and Eigenvalues:
"Compact Symmetric Space and Their Matrix
Ensembles"
EDUARDO DUENEZ, *Princeton University*

February 21
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

February 22
Complexity Year Seminar: "Extracting Randomness from Samplable Distributions"
SALIL VADHAN, *Institute for Advanced Study* and *Harvard University*

February 26
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Members Seminar: "The Distribution of Values of $L(1,\chi)$"
KANNAN SOUNDARARAJAN, *Institute for Advanced Study*

Special Seminar: "Descent from GL(2n): Endoscopy, Base Change and A-Packets"
STEPHEN RALLIS, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math Seminar: "Groups and Expanders"
ALEX LUBOTZKY, *The Hebrew University of Jerusalem*

February 27
Complexity Year Reading Seminar: "Switching Lemmas and (Simple) Lower Bounds for Bounded-Depth Frege"
ELI BEN-SASSON, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues: "The Variational Principle for the Eigenvalue Density Random Matrices"
MICHAEL KIESSLING, *Rutgers University*

February 28
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

Special Seminar: "Some Functorial Properties of the Unitary Dual"
DAN BARBASCH, *Cornell University*

March 1
Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "High Derivates for L-Functions"
JEFF VANDERKAM, *IDA/CCR*

Special Analysis Seminar: "On Rigidity of Invariant Measures for Smooth Actions of Higher-Rank Abelian Groups"
ANATOLE KATOK, *The Pennsylvania State University*

March 5
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Marston Morse Memorial Lecture: "Geometric and Topological Rigidity of Hyperbolic 3-Manifolds, Part I"
DAVID GABAI, *California Institute of Technology*

Theoretical Computer Science/Discrete Math Seminar: "Approximating Coloring and Maximum Independent Sets in 3-Uniform Hypergraphs"
BENJAMIN SUDAKOV, *Institute for Advanced Study* and *Princeton University*

March 6
Complexity Year Reading Seminar: "'Unbalanced Expanders and Improved Extractors and Dispersers,' by A. Ta-shma, C. Umans and D. Zuckerman"
RONEN SHALTIEL, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues: "Riemann-Hilbert Problems and Universality"
JINHO BAIK, *Institute for Advanced Study* and *Princeton University*

March 7
Marston Morse Memorial Lecture: "Geometric and Topological Rigidity of Hyperbolic 3-Manifolds, Part II"
DAVID GABAI, *California Institute of Technology*

Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

March 8
Complexity Year Seminar: "Discrete Uncertainty Inequalities"
ROY MESHULAM, *Institute for Advanced Study* and *Technion-Israel Institute of Technology*

Marston Morse Memorial Lecture: "The Smale Conjecture for Hyperbolic 3-Manifolds"
DAVID GABAI, *California Institute of Technology*

March 9
Members Seminar: "Geometry, Topology and Computational Complexity"
JOEL HASS, *Institute for Advanced Study*

March 12
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Complexity Year Seminar: "Introduction to Coding Theory"
ALEXANDER BARG, *Lucent Technology*

Members Seminar: "Geometry, Topology and Computational Complexity"
JOEL HASS, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math Seminar: "Learning Mixtures of Arbitrary Gaussians"
SANJEEV ARORA, *Princeton University*

March 13
Complexity Year Reading Seminar: "'Parallel Strategies,' by Pavel Pudlák"
PAVEL PUDLÁK, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues: "Permanents of Random Matrices"
GÁBOR SZÉKELY, *Bowling Green State University* and *Eötvös Loránd University, Hungary*

March 14
Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

March 15
Complexity Year Seminar: "Introduction to Coding Theory"
ALEXANDER BARG, *Lucent Technology*

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "Uniform Distribution of Some Sequences from Cryptography"
JOHN FRIEDLANDER, *University of Toronto*

March 19
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Members Seminar: "Boundary Behavior of the Critical Two-Dimensional Ising Model"
YVAN SAINT-AUBIN, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math Seminar: "A Sieve Algorithm for the Shortest Lattice Vector Problem"
RAVI KUMAR, *IBM Almaden Research Center*

March 20
Complexity Year Reading Seminar: "'Unbalanced Expanders and Improved Extractors and Dispensers,' by A. Ta-shma, C. Umans and D. Zuckerman"
RONEN SHALTIEL, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues: "Selberg's Beta Integral and Determinants of Correlation Functions"
DONALD RICHARDS, *Institute for Advanced Study*

March 21, 22, 25, 26, 27, 28, 29, 30
Workshop on Asymptotic and Computational Aspects of Coding Theory

March 21
Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

March 22
Complexity Year Seminar: "Some New Results on the Complexity of Computing Genus"
JOEL HASS, *Institute for Advanced Study*

March 23
Introduction to the Geometric Langlands Correspondence: "Sheaves-Functions Correspondence and the Moduli Stack of Bundles"
DENNIS GAITSGORY, *Harvard University*

March 26
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

March 27
Introduction to the Geometric Langlands Correspondence: "Definition of Hecke Eigen-Sheaves"
DENNIS GAITSGORY, *Harvard University*

Seminar on Random Matrices and Eigenvalues: "An Introduction to Jack Polynomials"
SIDDHARTHA SAHI, *Rutgers University*

March 28
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

March 30
Introduction to the Geometric Langlands Correspondence: "The Drinfeld-Laumon Construction of Hecke Eigen-Sheaves"
DENNIS GAITSGORY, *Harvard University*

April 2
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Theoretical Computer Science/Discrete Math Seminar: "Approximating Coloring and Maximum Independent Sets in 3-Uniform Hypergraphs"
BENJAMIN SUDAKOV, *Institute for Advanced Study* and *Princeton University*

Theoretical Computer Science/Discrete Math Seminar: "On Phase Transition in the Hard-Core Model on Z^d"
JEFF KAHN, *Rutgers University*

April 3
Complexity Year Reading Seminar: "'Resolution Lower Bounds for the Weak Pigeonhole Principle,' by Ran Raz"
RAN RAZ, *Institute for Advanced Study*

Introduction to the Geometric Langlands Correspondence: "Drinfeld's Compactifications of Parabolic G-Bundles"
DENNIS GAITSGORY, *Harvard University*

Seminar on Random Matrices and Eigenvalues: "An Introduction to Jack Polynomials" (continued)
SIDDHARTHA SAHI, *Rutgers University*

April 4, 5, 6, 7
Automorphic Forms Conference: Concepts, Techniques, Applications and Influence

April 4
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

April 5
Complexity Year Seminar: "Resolution Lower Bounds for the Weak Pigeonhole Principle"
RAN RAZ, *Institute for Advanced Study*

April 9
Automorphic Forms Seminar: "Representations of Classical Groups" (continued)
JAMES ARTHUR, *Institute for Advanced Study* and *University of Toronto*

Members Seminar: "On the Spectra of Elliptic Layer Potentials on Lipschitz Domains"
IRINA MITREA, *Institute for Advanced Study*

Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math Seminar: "Dimension Reduction in the Hamming Cube and Its Applications"
RAFAIL OSTROVSKY, *Telcordia Technologies*

April 10
Seminar on Random Matrices and Eigenvalues: "Multiple Integrals, Jack Polynomials, and Generalized Hypergeometric Equations"
PETER FORRESTER, *University of Melbourne*

Special Seminar: "New Null Sets and Frechet Differentiability of Lipschitz Functions"
JORAM LINDENSTRAUSS, *The Hebrew University of Jerusalem*

April 11
Motivic Cohomology Lecture
VLADIMIR VOEVODSKY, *Institute for Advanced Study*

Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

April 12
Complexity Year Seminar: "Semi-Direct Product in Groups and Zig-Zag Product in Graphs – Connections and Applications"
AVI WIGDERSON, *Institute for Advanced Study*

April 13
Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "A General Divisor Problem"
ROBERT VAUGHAN, *The Pennsylvania State University*

April 16
Members Seminar: "Derived Category Automorphisms from Mirror Symmetry"
RICHARD HORJA, *Institute for Advanced Study*

Theoretical Computer Science/Discrete Math Seminar: "Improved Bounds on the Mixing Time of Markov Chains"
RAVI KANNAN, *Yale University*

April 17
Complexity Year Reading Seminar: "'A Linear Lower Bound on the Unbounded Error Probabilistic Communication Complexity,' by J. Forster"
SATYA LOKAM, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues: "An Introduction to Jack Polynomials" (continued)
SIDDHARTHA SAHI, *Rutgers University*

April 18
Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

Special Seminar: "Algebraic Loop Groups"
GERD FALTINGS, *Max Planck Institute, Germany*

April 19
Complexity Year Seminar: "Black-Box Concurrent Zero-Knowledge Requires ~ Omega (Log N) Rounds"
RAN CANETTI, *IBM Research*

Princeton University/IAS/Rutgers Number Theory and Harmonic Analysis Seminar: "Finding Arithmetic Progressions"
BEN GREEN, *Cambridge University and Princeton University*

April 23
Members Seminar: "Generalizations of the FKG Inequality, and Connections with Harmonic Analysis and Combinatorics"
DONALD RICHARDS, *Institute for Advanced Study*

April 24
Complexity Year Reading Seminar: "'Optimization and Approximate Counting,' by A. Barvinok and A. Samorodnitsky"
ALEX SAMORODNITSKY, *Institute for Advanced Study*

Seminar on Random Matrices and Eigenvalues: "Supersymmetry and Spectral Theory of Random Schroedinger Operators"
WEI-MIN WANG, *Université de Paris-Sud*

April 25
Multi Zeta Values Lecture
PIERRE DELIGNE, *Institute for Advanced Study*

April 26
Special Seminar: "Domino Tilings and the Gaussian Free Field"
RICHARD KENYON, *Université de Paris-Sud*

April 30
Theoretical Computer Science/Discrete Math Seminar: "A Trace Bound for the Discrepancy"
BERNARD CHAZELLE, *Princeton University and NEC Research Institute*

May 1
Complexity Year Reading Seminar

Seminar on Random Matrices and Eigenvalues: "An Introduction to Supersymmetric Methods for Random Matrices, Part I"
THOMAS SPENCER, *Institute for Advanced Study*

May 8
Seminar on Random Matrices and Eigenvalues: "An Introduction to Supersymmetric Methods for Random Matrices, Part II"
THOMAS SPENCER, *Institute for Advanced Study*

"Because of the diversity of my interests, the research freedom I have at the Institute is particularly valuable. I very much appreciate the opportunity to advance my research and work with a variety of collaborators."

— *Member, School of Natural Sciences*

David N. Spergel (left), the 2000-2001 W.M. Keck Distinguished Visiting Professor in the School of Natural Sciences, with (left to right) Members Anthony Aguirre, Sara Seager, and Joop Schaye

THE SCHOOL OF NATURAL SCIENCES

ACADEMIC ACTIVITIES

Part of PROFESSOR STEPHEN ADLER's work this year dealt with supergravity-induced effective actions, motivated by their possible application to dynamical symmetry breaking. He also continued his research on modified forms of quantum mechanics, in particular his work on stochastic phenomenological modifications of the Schrödinger equation, and on trace dynamics as a possible pre-quantum mechanics.

In supergravity, Adler wrote an article giving a simple method, based on the idea of completing the square, to calculate the supersymmetric matter field effective action induced by leading-order graviton and gravitino exchange, expressed as a quadratic form in the components of the current supermultiplet. The supersymmetry invariance of the final expression for the effective action was then directly checked using the supersymmetry transformation properties of the current multiplet components. The calculation gives a nice illustration of the importance of the supergravity auxiliary fields, since supersymmetry invariance of the effective action involves cancellations between the nonlocal graviton and gravitino and the local auxiliary field contributions. Adler plans to return later on to possible applications of this effective action to dynamical symmetry breaking in supersymmetric theories. In a second supergravity-related paper, Adler classified various possibilities for spontaneous symmetry breaking in theories with supersymmetric matter

coupled to supergravity, in terms of the possible vacuum expectation values of components of the current supermultiplet. When the vacuum expectation of the energy momentum tensor is zero, but the scalar current or pseudoscalar current gets an expectation, evaluation of the gravitino self energy using the supersymmetry-current algebra shows that there is an induced gravitino mass term. The structure of this term generalizes the supergravity action with the cosmological constant to theories with CP violation. When the vacuum expectation of the energy momentum tensor is nonzero, supersymmetry is broken; requiring cancellation of the cosmological constant gives the corresponding gravitino mass formula generalized to the case in which CP violation is present.

In the area of quantum mechanics, Adler and T. Brun discussed two directions for generalization of the stochastic Schrödinger equations proposed by a number of authors, which were studied in detail in last year's paper by Adler and Horwitz. First of all, they considered a general class of norm preserving stochastic Schrödinger equations, and showed that even after making several specializations, there is an infinity of possible equations for which state vector collapse is provable. This is relevant for attempts to derive a stochastic Schrödinger equation from a new pre-quantum dynamics, to which the usual Schrödinger equation is a leading approximation. Secondly, they explored the problem of formulating a relativistic stochastic Schrödinger equation, using a manifestly covariant equation for a quantum field system based on the interaction picture of Tomonaga and Schwinger. The stochastic noise term in this equation can couple to any local scalar density that commutes with the interaction energy density, and leads to collapse onto spatially localized eigenstates. However, as found in a similar model by Pearle, the equation predicts an infinite rate of energy nonconservation, arising from the local double commutator in the "drift term." So the local generalization of the stochastic models does not give a satisfactory answer to the problem of achieving relativistic covariance.

Adler is currently returning to his earlier work on global unitary invariant matrix models ("trace dynamics"), to try to further advance the proposal that these models can serve as a pre-quantum mechanics, with quantum mechanics arising in the limit where statistical thermodyamics applies. One aim of the current investigation is to try to get the leading fluctuation corrections to the Schrödinger equation, and to see if these corrections can be related to the stochastic Schrödinger equations for which state vector reduction is provable.

Finally, Adler wrote a memorial article about the life and work of his thesis advisor Sam Bard Treiman, to be published in the National Academy of Sciences' *Biographical Memoirs*.

For PROFESSOR JOHN BAHCALL, this was a good year. An international collaboration of scientists working at the Sudbury Neutrino Observatory (SNO) in Sudbury, Ontario, Canada, used a detector containing one thousand tons of heavy water in a deep mine to measure the number of electron-type neutrinos that reach the earth from the center of the sun. This number is less than the total number measured by Japanese and American scientists, the Super-Kamiokande collaboration, using twenty-two thousand tons of pure, light water in a mine in the Japanese Alps. The Japanese-American experiment is sensitive to neutrinos of all types; the SNO experiment is sensitive to neutrinos of only the electron type.

Comparing the results of the two experiments, the SNO scientists conclude that neutrinos have split personalities, i.e., they oscillate from one type (the electron type produced

in the center of the sun) to other types that are more difficult to detect. This may provide an important clue for developing the next generation of particle theories.

The SNO results also permitted the first direct determination of the total number of (higher-energy) neutrinos produced by the sun. The result is in excellent agreement with the number calculated by Bahcall and his collaborators in 1968 and refined by him, together with many different collaborators, over the past three-and-a-half decades.

The SNO measurement caused rejoicing in the ranks of astronomers. The predicted neutrino flux depends upon the twenty-fifth power of the central temperature of the sun. The prediction and the measurement agree to better than ten percent, less than the estimated uncertainty in the experimental value. The agreement between calculation and experiment is a triumph for the theory of stellar evolution.

Bahcall worked with a series of collaborators on using the results of SNO to help determine the masses and other fundamental properties of neutrinos. In a very different professional activity, Bahcall chaired a committee of nuclear and particle physicists that selected and proposed establishing a national underground laboratory in the Homestake Gold Mine in South Dakota.

PROFESSOR PIET HUT has led the Starlab team, a group of astrophysicists and computer scientists, into a new phase of exploration of dense stellar systems such as globular clusters and galactic nuclei. Given the increase of a factor of 100 in computer speed, delivered by the GRAPE-6 computers specially designed for stellar dynamics, data handling and analysis has now become the bottleneck in Starlab's large-scale simulations. Hut and his colleagues are currently exploring three avenues to manage this data flood: 1) the design of a publicly accessible archive, allowing guest observers to view and analyze the results of the largest simulations 2) the development of visualization tools, in collaboration with the Hayden Planetarium of the American Museum of Natural History in New York City 3) the exploration of connections with the National Virtual Observatory, a new initiative aimed at creating a seamless digital sky in all wavelengths based on data sets available from various telescopes and surveys. The Starlab work has been supported by a grant to Hut from the Alfred P. Sloan Foundation.

Hut organized a summer school, "Ways of Knowing," which took place in August 2000, together with cognitive psychologist Roger Shepard from Stanford, philosopher of science Bas van Fraassen from Princeton University, physicist Arthur Zajonc from Amherst College, and writer Steven Tainer from Berkeley. This was the third public offering of the Kira Institute. Together with David De Young from the National Optical Astronomy Observatories in Tucson, Hut organized two two-day workshops to study theoretical aspects of virtual observatories, one in March in Tucson and one in June in Aspen. Together with David Waltz, president of the NEC Research Institute in Princeton, Hut organized a series of lunch meetings at the Institute, leading up to a one-day workshop in March with Brian Smith, from the University of Indiana at Bloomington, and Robert Sokolowski, from the Catholic University in Washington, D.C., to discuss their respective books *On the Origin of Objects* and *Introduction to Phenomenology*. In February, Hut was elected Member of the Husserl Circle.

PROFESSOR PAWAN KUMAR worked primarily on gamma-ray bursts (GRBs). These explosions, which radiate much of their energy in gamma-ray photons, are seen on the

average of once a day and are typically at a distance of several billion light years from us. Although the duration of these bursts is a few seconds, we continue to receive emission from these events for days to months, and the frequency of the peak of the spectrum shifts to smaller values with time. By modeling the observed broad-band emission, Kumar and Panaitescu, of Princeton University, found that the energy release in the form of highly relativistic ejecta in these explosions varies by less than a factor of four from one burst to another. This result is based on detailed analysis of eight bursts which have data in the x-ray, optical, and radio bands with good temporal coverage of at least a week. The narrow distribution of energy in the explosions is surprising for the currently popular collapsar model for GRBs; according to this model, a massive star at the end of its nuclear burning phase undergoes collapse and releases a small fraction of its binding energy to drive a relativistic explosion. This result is also obtained by a completely different technique used by Kumar and collaborators, which exploits the observed distribution for x-ray afterglow flux at a fixed elapsed time since the explosion. The work of Panaitescu and Kumar shows that the density of the medium in the vicinity of these explosions varies by three to four orders of magnitude, and the beaming angle of the explosion varies by about an order of magnitude from one burst to another. These results should provide important clues to the nature of these enigmatic explosions.

PROFESSOR NATHAN SEIBERG, with L. Susskind and N. Toumbas, explored field theories based on noncommutative spacetime. Such theories exhibit very distinctive nonlocal effects, which mix the ultraviolet with the infrared in bizarre ways. In particular, if the time coordinate is involved in the noncommutativity, the theory seems to be seriously acausal and inconsistent with conventional Hamiltonian evolution. To illustrate these effects, they studied the scattering of wave packets in a field theory with space/time noncommutativity. In this theory, they found effects which seem to precede their causes, and rigid rods which grow instead of Lorentz contract as they are boosted. These field theories are evidently inconsistent and violate causality and unitarity.

On the other hand, open string theory in a background electric field is expected to exhibit space/time noncommutativity. This raises the question of whether this also leads to acausal behavior. They showed that this is not the case. Stringy effects conspire to cancel the acausal effects that are present in the noncommutative field theory.

Searching for space/time noncommutativity, the same authors reconsidered open strings in a constant background electric field. The main difference between this situation and its magnetic counterpart is that here there is a critical electric field beyond which the theory does not make sense. They showed that this critical field prevents a limit in which the theory becomes a field theory on a noncommutative spacetime. However, an appropriate limit toward the critical field leads to a novel noncritical string theory on a noncommutative space/time, which decouples from gravity. Similar work was done independently by R. Gopakumar, J. Maldacena, S. Minwalla, and A. Strominger, who called such theories NCOS (Non-Commutative Open String).

In continuation of this line of research, Seiberg, with R. Gopakumar, S. Minwalla, and A. Strominger, extended the newly discovered NCOS theories. They proposed dual descriptions for the strong coupling limit of these theories in six or fewer spacetime dimensions. In particular, they conjectured that the five-dimensional NCOS theory at strong coupling is a theory of light Open Membranes (OM), decoupled from gravity, on

an M5-brane with a near-critical three-form field strength. The relation of OM theory to NCOS theories resembles that of M-theory to Type II closed string theories. In two dimensions, they conjectured that supersymmetric $U(n)$ gauge theory with a unit of electric flux is dual to the NCOS theory with string coupling $1/n$. A construction based on NS5-branes led to new theories in six dimensions generalizing the little string theory. A web of dualities relates all the above theories when they are compactified on tori.

Using the construction of D-branes with nonzero B field in the matrix model, Seiberg gave a physical interpretation of the known background independence in gauge theories on a noncommutative space. The background independent variables were identified as the degrees of freedom of the underlying matrix model. This clarified and extended some recent results about the end point of tachyon condensation in D-branes with a B field. This work also explained the freedom in the description which is parametrized by a two-form - from the points of view of the noncommutative geometry on the world volume of the branes, and of the first quantized string theory.

Finally, Seiberg, in collaboration with J. Maldacena and G. Moore, showed that one can construct D-branes in parafermionic and WZW theories (and their orbifolds), which have very natural geometrical interpretations, and yet are not automatically included in the standard Cardy construction of D-branes in rational conformal field theory. The relation between these theories and their T-dual description has led to an analogy between these D-branes and the familiar A-branes and B-branes of N=2 theories.

PROFESSOR EDWARD WITTEN's most significant new direction in 2000-01 was to explore the behavior of M-theory compactification on manifolds of G_2 holonomy, mostly in collaboration with Michael Atiyah. This is of interest as a natural way to generate a supersymmetric model of particle physics in four dimensions. Witten and Atiyah explored the behavior of M-theory near a conical singularity of a G_2-manifold, and obtained convincing arguments about the dynamics for all of the known examples of such singularities. Toward the end of the year, Witten began to examine how chiral fermions can arise from manifolds of G_2 holonomy.

PROFESSOR EMERITUS FREEMAN DYSON spent most of the year giving lectures and attending meetings away from Princeton. The most interesting of the meetings was the World Economic Forum at Davos, Switzerland, in January 2001. There he was a speaker in three public debates on scientific issues of concern to the world business community. When not engaged in public activities, he worked on a problem of atomic physics in collaboration with the experimenter William Happer at Princeton University. Happer discovered experimentally an unexplained degeneracy of states in the spectrum of a rubidium atom in a magnetic field. Dyson and Happer succeeded in proving by analytical calculation that the degeneracy is exact. Happer found a simple theoretical model of three coupled spins in which the degeneracy is still exact. Until now, Dyson and Happer's efforts to explain the degeneracy in terms of an underlying physical symmetry have been unsuccessful. They shall continue to hunt for the hidden symmetry.

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Particle Physics
University of South Carolina · *v*

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Astrophysics
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Mathematical and Particle Physics
Institute for Advanced Study · *f*

LEONARD SUSSKIND
Particle Physics
Stanford University · *v*

OLEG TCHERNYSHYOV
Condensed Matter
Institute for Advanced Study

CLAUDIO TEITELBOIM
Particle Physics
Centro de Estudios Científicos, Chile · *dm*

ACHIM WEISS
Astrophysics
Max Planck Institute, Germany · *v*

EDWARD WRIGHT
Astrophysics
University of California, Los Angeles

ZHENG YIN
Particle Physics
Institute for Advanced Study

MATIAS ZALDARRIAGA
Astrophysics
Institute for Advanced Study · *mf*

REN-JIE ZHANG
Particle Physics
University of Wisconsin

d Director's Visitor · *f* First Term · *j* Joint Membership with Historical Studies · *s* Second Term
v Visitor · *m* Long Term Member

THE SCHOOL OF NATURAL SCIENCES

RECORD OF EVENTS

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

Academic Year 2000-01

November 7
Astrophysics Talk: "Early Results from the FUSE Mission"
WARREN MOOS, *Johns Hopkins University*

November 9
Astrophysics Talk: "The Cult of Microlensing"
SCOTT GAUDI, *Institute for Advanced Study*

November 15
Astrophysics Talk: "Metal-rich Stars in Metal-poor Globular Clusters: A New Perspective on the Blue Horizontal Branch"
BRADFORD BEHR, *University of Texas*

High Energy Theory Lunchtime Seminar:
"Solitons in Non-Commutative Gauge Theories"
DAVID GROSS, *Institute for Theoretical Physics*

November 21
Astrophysics Talk: "X-Ray Observations of Jets in Galactic Microquasars"
RON REMILLARD, *Center for Space Research, Massachusetts Institute of Technology*

November 22
Astrophysics Talk: "A New Model for Black Hole Accretion"
ANDREI BELOBORODOV, *Stockholm Observatory*

November 27
Astrophysics Talk: "New Results on Brown Dwarfs"
JOHN GIZIS, *California Institute of Technology*

High Energy Theory Seminar: "BPS Spectra of Calabi-Yau Compactifications from a Low Energy Perspective"
FREDERIK DENEF, *Columbia University*

November 28
Astrophysics Talk: "Full-Sky Astrometric Mapping Explorer (FAME)"
KEN SEIDELMANN, *U.S. Naval Observatory*

December 1
Astrophysics Talk: "The Dwarf Satellite Problem and the Galaxy's Stellar Halo"
JAMES S. BULLOCK, *Ohio State University*

High Energy Theory Lunchtime Seminar:
"Applications of the Multiplet of Currents: Supersymmetric Matter Effective Action Induced by Linearized Supergravity, and Supersymmetry Breaking from the Viewpoint of the Current Multiplet"
STEPHEN L. ADLER, *Institute for Advanced Study*

December 5
Astrophysics Talk: "Why Are Nearby Galactic Nuclei So Dim?"
ELIOT QUATAERT, *Institute for Advanced Study*

December 7
Astrophysics Talk: "Gamma-Ray Bursts for Trans-Relativistic Blast Waves in Supernovae"
JONATHAN TAN, *University of California, Berkeley*

December 8
Astrophysics Talk: "Cosmology with a Local Bubble"
KENJI TOMITA, *Kyoto University*

December 15
Astrophysics Talk: "Photon-Electron Interactions in Strong Gravitational Fields"
DIMITRIOS PSALTIS, *Massachusetts Institute of Technology*

High Energy Theory Lunchtime Seminar:
"Non-Abelian Geometry"
ZHENG YIN, *Institute for Advanced Study*

January 16
Astrophysics Talk: "The Role of Heating and Enrichment in Galaxy Formation"
EVAN SCANNAPIECO, *University of California, Berkeley*

January 18
Astrophysics Talk: "Strange Stars and Heavy Neutron Stars: Mind Games or Real Objects?"
DIMITRIOS PSALTIS, *Massachusetts Institute of Technology*

January 19
High Energy Theory Lunchtime Seminar:
"Quantifying Quantum Entanglement"
TODD BRUN, *Institute for Advanced Study*

January 29

High Energy Theory Seminar: "R⁴ Couplings, the
Fundamental BPS Membrane, and Exceptional
Theta Correspondences"
BORIS PIOLINE, *Harvard University*

January 30

Astrophysics Talk: "Dynamics of Eccentric
Planetary Rings and Planets"
EUGENE CHIANG, *Institute for Advanced Study*

February 2

High Energy Theory Lunchtime Seminar:
"Critical Behavior of Simple Statistical Models"
YVAN SAINT-AUBIN, *School of Mathematics,
Institute for Advanced Study*

February 6

Astrophysics Talk: "The Cosmic Infrared Back-
ground"
EDWARD WRIGHT, *Institute for Advanced Study*
and *University of California, Los Angeles*

February 12

High Energy Theory Seminar: "Recent Results
from the LEP Combined Higgs Searches"
CHRIS TULLY, *Princeton University*

February 13

Astrophysics Talk: "Chandra Observations of
Groups and Clusters of Galaxies"
LARRY DAVID, *Harvard-Smithsonian Center for
Astrophysics*

February 16

Astrophysics Talk: "Star and Planet Formation
with SIRTF"
DAVID KOERNER, *University of Pennsylvania*

High Energy Theory Lunchtime Seminar: "Strong
CP Problem and Supersymmetry"
MARTIN SCHMALTZ, *Fermilab*

February 20

Astrophysics Talk: "Problems with Dark Matter"
JERRY SELLWOOD, *Rutgers University*

February 21

Astrophysics Talk: "Hipparcos and Extra-Solar
Planets: End of a Controversy?"
DIMITRI POURBAIX, *Princeton University*

February 26

High Energy Theory Seminar: "Boundary Mirror
Symmetry"
HENTARO HORI, *Harvard University*

February 27

Astrophysics Talk: "Waking with Shock in a
Protoplanetary Disk"
JEREMY GOODMAN, *Princeton University*

February 28

Astrophysics Talk: "The Physics of Reionization
and Limits on Warm Dark Matter"
RENNAN BARKANA, *Canadian Institute for
Theoretical Astrophysics*

March 2

Astrophysics Talk: "What SDSS Can Do For You
– An Introduction to the SDSS Database"
XIAO HUI FAN, *Institute for Advanced Study*

High Energy Theory Lunchtime Seminar:
"Aspects of Short Distance Physics and Cosmology"
GARY SHIU, *University of Pennsylvania*

March 6

Astrophysics Talk: "Early Results from the FUSE
Mission"
WARREN MOOS, *Johns Hopkins University*

March 9

Astrophysics Talk: "Full-Orbit Spectra, Doppler
Tomograms, and Hydrodynamic Simulations of
Accretion Structures in Algol-type Interacting
Binaries"
MERCEDES RICHARDS, *Institute for Advanced
Study* and *University of Virginia*

March 12

High Energy Theory Seminar: "Supersymmetry
and Composite Extra Dimensions"
MARKUS LUTY, *University of Maryland*

March 13

Astrophysics Talk: "Detection of Supersymmetric
Dark Matter"
LARS BERGSTRÖM, *Stockholm University*

March 16

Astrophysics Talk: "The Stability of Minor Bodies
in the Inner Solar System"
SERGE TABACHNIK, *Princeton University*

March 20
Astrophysics Talk: "Evidence for Neutrino Mass"
ELIGIO LISI, *Universita di Bari, Italy*

March 23
High Energy Theory Lunchtime Seminar: "Nonperturbative Superpotentials in Heterotic M-Theory"
JAEMO PARK, *University of Pennsylvania*

March 26
High Energy Theory Seminar: "Fluxbranes in String Theory"
ANDREW STROMINGER, *Harvard University*

March 27
Astrophysics Talk: "Anomalous X-Ray Pulsars"
SHRI KULKARNI, *California Institute of Technology*

March 30
Astrophysics Talk: "Distant Supernovae: The (Other) Wonderful Things You Can Do with Them"
DANI MAOZ, *Columbia University*

High Energy Theory Lunchtime Seminar: "More About D-Branes on Calabi-Yau Manifolds"
MICHAEL DOUGLAS, *Rutgers University*

April 3
Astrophysics Talk: "Distance Determination Using Binary Stars"
BOHDAN PACZYNSKI, *Princeton University*

April 9
High Energy Theory Seminar: "Supersymmetric Conical Defects"
VIJAY BALASUBRAMANIAN, *University of Pennsylvania*

April 10
Astrophysics Talk: "Exploring the Kuiper Belt"
CHARLES ALCOCK, *University of Pennsylvania*

April 11
Astrophysics Talk: "Cosmological Parameters, Boojums, and Epicycles"
MAX TEGMARK, *University of Pennsylvania*

April 13
High Energy Theory Lunchtime Seminar: Basic Notions of Deformation Theory for Physicists"
PIERRE DELIGNE, *School of Mathematics, Institute for Advanced Study*

April 17
Astrophysics Talk: "Things Invisible to See: Black Holes in Galaxy Centers"
DOUG RICHSTONE, *University of Michigan*

April 19
Astrophysics Talk: "Planetesimal Formation by Gravitational Instability"
ANDREW YOUDIN, *University of California, Berkeley*

April 23
High Energy Theory Seminar: "Deconstructing Dimensions"
NIMA ARKANI-HAMED, *University of California, Berkeley*

April 24
Astrophysics Talk: "Manned Space Missions in the Next Twenty Years"
ED LU, *NASA Shuttle Astronaut*

April 25
Astrophysics Talk: "Space-Based Gravitational Microlensing: The 'Easy Way' to Find Terrestrial Extra-solar Planets"
DAVID BENNETT, *University of Notre Dame*

April 27
High Energy Theory Lunchtime Seminar: "Supersymmetric Cigar/Liouville Duality as Mirror Symmetry"
ANTON KAPUSTIN, *Institute for Advanced Study*

May 9
Astrophysics Talk: "Magnetars in Nature: What Would They Look Like, How Would They Pulse, and Have We Observed Them?"
FERYAL OZEL, *Harvard-Smithsonian Center for Astrophysics*

Astrophysics Talk: "The Edge of the Solar System"
MICHAEL BROWN, *California Institute of Technology*

May 11
High Energy Theory Lunchtime Seminar: "Orientifolds, RR Torsion, and K-Theory"
ERIC GIMON, *Institute for Advanced Study*

May 16
Astrophysics Talk: "Towards the Progenitors of
Gamma-Ray Bursts"
JOSH BLOOM, *California Institute of Technology*

May 17
Astrophysics Talk: "Extremely Cool White Dwarfs
and Galactic Structure"
BEN OPPENHEIMER, *University of California,
Berkeley*

May 22
Astrophysics Talk: "Simulations of the Formation
and Evolution of the Galaxy Population"
SIMON WHITE, *Max Planck Institute, Germany*

May 25
Astrophysics Talk: "Unified Models for the Evolu-
tion of Quasars and Their Host Galaxies"
GUINEVERE KAUFFMAN, *Max Planck Institute,
Germany*

High Energy Theory Lunchtime Seminar:
"Extremal Two-Dimensional Black Holes
Revisited"
SERGEI GUKOV, *Princeton University*

May 30
Astrophysics Talk: "Astrophysical Dynamos:
Basics, Controversies, Progress, and a Related
Speculation about Planet Formation"
ERIC BLACKMAN, *University of Rochester*

May 31- June 2
W.M. Keck Workshop: "Galaxies and the Dark
Matter Problem"
Organizers: DAVID N. SPERGEL, *Institute for
Advanced Study* and *Princeton University*;
JERRY SELLWOOD, *Rutgers University*

June 1
High Energy Theory Lunchtime Seminar: "A 3-D
Gauge Theory with Dynamical SUSY Breaking
and its Supergravity Dual"
HORATIU NASTASE, *Institute for Advanced
Study*

June 15
Astrophysics Talk: "Origins of the First Planetary
Materials: Chondrules and Their Cousins"
HAROLD CONNOLLY, *California Institute of
Technology*

"As a young academic scholar, I was most impressed by the devotion, seriousness, and genuine passion for the highest level possible of intellectual pursuit which I found in the daily, undivided attention to scholarship manifested by the permanent Faculty members. This has been a lesson for life, one for which I am truly grateful. I entered academia with the expectation that creative thinking and writing should be the task of a scholar, and I am happy to have found this substantiated by life at the Institute."

— *Member, School of Social Science*

The Institute Dining Hall, foreground, with West Building in the background. West Building is home to both the School of Historical Studies and the School of Social Science.

THE SCHOOL OF SOCIAL SCIENCE

Faculty

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

Professor Emeriti

CLIFFORD GEERTZ
ALBERT O. HIRSCHMAN

Visiting Associate Professor

ADAM ASHFORTH

ACADEMIC ACTIVITIES

Nineteen scholars from the United States and abroad were invited to be part of the School's scholarly community as Members and Visitors for the 2000-01 academic year-from a pool of 195 individuals who applied for membership. Three research assistants also participated in the year's activities. The National Endowment for the Humanities partially or fully funded three fellows, The Ford Foundation funded one fellow, The John D. and Catherine T. MacArthur Foundation partially or fully funded three fellows, and the Gladys Krieble Delmas Foundation funded two fellows. Fields of inquiry of the School's Members and Visitors included anthropology, three; art history, one; digital media, one; economics, five; history, one; law, two; philosophy, two; political science, two; and sociology, two.

The theme during 2000-01 was Information Technology and Society. Faculty and Visiting Members explored the following sorts of questions: How far-reaching are the changes associated with new technologies? What challenges do they pose to established modes of thinking and acting? Are metaphors drawn from the worlds of computers and the logics of networks gaining explanatory weight in the social sciences and becoming models guiding practice? In general, what is at stake for human societies in the changes associated with new technologies? And what is at stake for social science? The School was especially interested in research that focused on specific instances of technological change and its impact.

In May of last year, the Albert O. Hirschman Chair in Economics in the School of Social Science was inaugurated at the Institute for Advanced Study. Eric Maskin, formerly of Harvard University, was appointed the first holder of the Hirschman Chair, and began his tenure in the fall of 2000.

VISITING ASSOCIATE PROFESSOR ADAM ASHFORTH began a new research project on the political impact of the AIDS epidemic in South Africa. He presented

papers relating to this work at an Advanced Seminar at the School of American Research, Santa Fe; the International Conference on AIDS in Social and Historical Context, Johannesburg; the Centre d'Etudes et de Recherches Internationales (Paris), sponsored by the journal *Critique Internationale* (Fondation Nationale des Sciences Politiques, Paris); and the Center for International Development at Harvard University. Professor Ashforth also lectured at the State University of New York's Stony Brook and Albany campuses, and made a presentation relating to his research to the Board of Trustees of the Harry Frank Guggenheim Foundation in New York.

PROFESSOR EMERITUS CLIFFORD GEERTZ gave the Sabbagh Lecture on Arabic Culture at the University of Arizona, Tucson, in February; lectured on ritual at the Princeton Theological Seminary in December; and lectured on Indonesia to the Institute trustees in May. His most recent book, *Available Light*, was the subject of a special symposium at the American Philosophical Association meetings in San Francisco in March. He was a commentator at a symposium on model systems at Princeton's History of Science Program in December. He also published a number of articles and reviews, and tried to learn how to retire.

At the end of September 2000, PROFESSOR EMERITUS ALBERT O. HIRSCHMAN participated in a conference on economic doctrines in Latin America. Organized by Professor Rosemarie Thorp of Saint Antony's College, Oxford University, the conference explored economic doctrines in Latin America, their revolution, transmission, and power. After this conference, Professor Hirschman spent some time in London, Cambridge, and Paris.

At the end of April 2001, Professor Hirschman participated in a conference on the continuing influence of Karl Polanyi, author of *The Great Transformation* (Beacon Press, 1994). This conference was organized by Anthony Marx of Columbia University, who had been a student of Professor Hirschman's at Princeton and is now an associate professor of political science at Columbia University.

In May 2001, Professor Hirschman traveled to Madrid, Spain, to receive a doctorate honoris causa from the Universidad Compulutense de Madrid together with Professor Robert A. Dahl of Yale University and Professor Giovanni Sartori of Columbia University and the University of Florence. In his speech, Professor Hirschman talked about his various contacts with Spanish intellectuals, and in particular expressed his regrets about the recent death, resulting from terrorist action by the Basque separatist group ETA, of Professor Ernest Lluch. Professor Lluch had spent a year at the Institute for Advanced Study in 1989-90, invited at that time by Professor John Elliott. Professor Hirschman and his wife spent another four days in Madrid, and three days each in Granada and Seville.

Upon returning to Princeton, Professor Hirschman learned that his book *Crossing Boundaries - Selected Writings, 1998*, was to be published by Zone Books as a paperback in the fall of 2001. In addition, one of his earlier books, *Exit, Voice, and Loyalty*, will be published in Chinese and in Greek in 2002.

Last August, PROFESSOR ERIC MASKIN gave the Seattle Lecture entitled "Auctions and Efficiency" at the Eighth World Congress of the Econometric Society, held in Seattle. Auctions were also the subject of his Lionel McKenzie Lecture at the University of

Rochester in April, and of lectures in Heidelberg, Bilbao, Toulouse, and Baltimore. He gave graduate courses on auction theory at Princeton University and the University of Pennsylvania. In October and November, Professor Maskin made presentations to the European and Belgian Parliaments on the question of whether software should be patented. He also gave lectures on this topic at the Universities of Paris and Frankfurt and at the biennial AMIAS conference in March. In his faculty lecture in November at the Institute, Professor Maskin compared the theoretical properties of different electoral methods. He also gave talks on this issue at Princeton and Columbia Universities and the University of Pennsylvania. This year, he served as consultant to the British government on how to create incentives for firms to participate in the market for pollution permits that is being set up in the U.K. That government issued a report incorporating his recommendations in May. Professor Maskin continues to serve on the executive committee of the Econometric Society. He was elected second vice-president of the Society last December and will serve as its president in 2003.

PROFESSOR JOAN SCOTT published an article, "Fantasy Echo: History and the Construction of Identity," in *Critical Inquiry*, Winter 2001. She gave a keynote address at the Fourth International Feminist Research Conference in Bologna, Italy, and organized a conference on Feminism and the Changing Boundaries of Public and Private, held at the Rockefeller Foundation's Bellagio Study and Conference Center in Italy. She gave papers at Brown University, the University of Frankfurt (Germany), and the Berlin Technical Institute. She taught a graduate course in the Rutgers University History Department in the fall of 2000, and she continued to serve as the chair of the Committee on Academic Freedom and Tenure of the AAUP.

PROFESSOR MICHAEL WALZER delivered the G. Theodore Mitau Lecture at Macalaster College in St. Paul, Minnesota, and the Morgenthau Memorial Lecture on Ethics and Foreign Policy for the Carnegie Council on Ethics and International Affairs in New York. He also lectured at Princeton University, the Harvard Divinity School, the Graduate Faculty of Political and Social Science of New School University, Cardozo Law School of Yeshiva University, Mount Holyoke College, Wesleyan University, and the Einstein Forum in Berlin. The major focus of his work this year was volume two of *The Jewish Political Tradition* (volume one was published by Yale University Press last year). His Horkheimer Lectures, published in German in 1999, appeared in Italian and Korean translations. *On Toleration* came out in Chinese and Polish. His Lucas Price Lecture at the University of Tubingen (1998) was published in Germany under the title *Exilpolitik in der Hebraischen Bibel*.

SANDEEP BALIGA
Economics
Kellogg Graduate School of Management

YITZHAK BENBAJI
Philosophy
Shalom Hartman Institute · *a*

MANUEL DELANDA
Philosophy
Columbia University · *FF*

JAMES DER DERIAN
Political Science
Brown University and University of
Massachusetts, Amherst · *MF*

KIM FORTUN
Anthropology
Rensselaer Polytechnic Institute · *vs*

MICHAEL FORTUN
Anthropology
Rensselaer Polytechnic Institute

JOAN FUJIMURA
Sociology
Stanford University · *v*

MAITREESH GHATAK
Economics
University of Chicago

VICTORIA HATTAM
Political Science
New School for Social Research · *n*

MARK HUDDLE
History
Bradford College · *a*

PHILIPPE JEHIEL
Economics
University College London

JOHN MacDOUGALL
Anthropology
Princeton University · *a*

MARGARET MORSE
Digital Media
University of California, Santa Cruz · *DF*

HELEN NISSENBAUM
Philosophy
Princeton University · *DF*

MONROE PRICE
Law
Benjamin N. Cardozo School of Law · *MF*

SYLVIA SCHAFER
History
University of Wisconsin, Milwaukee · *n*

AYELET SHACHAR
Law
University of Toronto

RAN SPIEGLER
Economics
University of Oxford

THOMAS STREETER
Sociology
The University of Vermont · *RF*

MICHELE WHITE
Art History
University of California, Santa Cruz · *nMF*

MENAHEM YAARI
Economics
The Hebrew University of Jerusalem

MAYFAIR YANG
Anthropology
University of California, Santa Barbara

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

Academic Year 2000-01

September 28
Social Science Thursday Luncheon Seminar:
"Admitting the Stranger: The Rule of Law, the
Ethics of Medical Hospitality, and the Borders of
Governmental Imagination in Nineteenth-
Century France"
SYLVIA SCHAFER, *University of Wisconsin,
Milwaukee; Member, School of Social Science*

October 4
Information Technology and Society:
Organizational Meeting
ADAM ASHFORTH, *Visiting Associate Professor,
School of Social Science*

October 5
Social Science Thursday Luncheon Seminar:
"Gene Pools, Stock Markets, Democracy, and
Other Promises: Volatilities of Genomics in and
around Iceland"
MICHAEL FORTUN, *Rensselaer Polytechnic
Institute; Member, School of Social Science*

October 12
Social Science Thursday Luncheon Seminar:
"Justice and the Market"
MENAHEM YAARI, *The Hebrew University of
Jerusalem; Member, School of Social Science*

October 18
Information Technology and Society: Discussion
of Bill Joy, "Science and Safety in the Information
Age"
MANUEL DELANDA, *Columbia University;*
MICHAEL FORTUN, *Rensselaer Polytechnic
Institute;* and MARGARET MORSE, *University of
California, Santa Cruz; Members, School of Social
Science*

October 19
Social Science Thursday Luncheon Seminar:
"Virtuous War/Virtual Theory/Army Goes to
Hollywood"
JAMES DER DERIAN, *Brown University* and
*University of Massachusetts, Amherst; Member,
School of Social Science*

October 26
Social Science Thursday Luncheon Seminar:
"Fictitious Unities: 'Gender,' 'East,' and 'West'"
JOAN W. SCOTT, *Professor, School of Social
Science*

November 1
Information Technology and Society: Discussion
of Monroe Price, "The Internet and the Newness
of New Technology"
MONROE PRICE, *Benjamin N. Cardozo School of
Law; Member, School of Social Science*

November 2
Social Science Thursday Luncheon Seminar:
"Limited Foresight and Analogy-Based Reasoning
in Multi-Stage Games"
PHILIPPE JEHIEL, *University College London;
Member, School of Social Science*

November 9
Social Science Thursday Luncheon Seminar:
"Towards a Foreign Policy of Media Structures"
MONROE PRICE, *Benjamin N. Cardozo School of
Law; Member, School of Social Science*

November 16
Social Science Thursday Luncheon Seminar:
"What Can the Philosophy of Science Do for
Social Science?"
MANUEL DELANDA, *Columbia University;
Member, School of Social Science*

November 29
Information Technology and Society: Discussion of Helen Nissenbaum, "Securing Trust On-Line: Wisdom or Oxymoron"
HELEN NISSENBAUM, *Princeton University; Member, School of Social Science*

November 30
Social Science Thursday Luncheon Seminar: "The Argument About Humanitarian Intervention"
MICHAEL WALZER, *Professor, School of Social Science*

December 7
Social Science Thursday Luncheon Seminar: "Ethics and Information Technology: Philosophical Perspectives"
JAMES MOOR, *Dartmouth College*

December 13
Information Technology and Society: Discussion of Joan Fujimura, "Future Imaginaries: Genomic Practices and Discourses in Japan"
JOAN FUJIMURA, *Stanford University; Visitor, School of Social Science*

December 14
Social Science Thursday Luncheon Seminar: "From Local Cult to Transnational Pilgrimage: Media, Popular Religion, and State Discourse across the Taiwan Straits"
MAYFAIR YANG, *University of California, Santa Barbara; Member, School of Social Science*

January 25
Social Science Thursday Luncheon Seminar: "Personhood, Law, and Communication Technology: Making Sense of (and with) Internet Commercialization"
THOMAS STREETER, *The University of Vermont; Member, School of Social Science*

January 31
Information Technology and Society: Discussion of Michele White, "Too Close to See: Men, Women and Webcams"
MICHELE WHITE, *University of California, Santa Cruz; Member, School of Social Science*

February 1
Social Science Thursday Luncheon Seminar: "The Role of Argumentation in Economic Interactions"
RAN SPIEGLER, *University of Oxford; Member, School of Social Science*

February 8
Social Science Thursday Luncheon Seminar: "Law and Diversity: A New Approach to Multicultural Accommodation"
AYELET SHACHAR, *University of Toronto; Member, School of Social Science*

February 14
Information Technology and Society: Discussion of James Der Derian, "Between War and Theory: A Virtual Trip"
JAMES DER DERIAN, *Brown University* and *University of Massachusetts, Amherst; Member, School of Social Science*

February 15
Social Science Thursday Luncheon Seminar: "A Game-Theoretic Model of Arms Races and Negotiations"
SANDEEP BALIGA, *Kellogg Graduate School of Management; Member, School of Social Science*

February 22
Social Science Thursday Luncheon Seminar: "The Laboratory for a Great Race-Welding: The Harlem Renaissance and Mixed-Race America"
MARK HUDDLE, *Bradford College; Research Assistant, School of Social Science*

February 28
Information Technology and Society: Discussion of Margaret Morse, "Differing Multitudes: On Collective and Collaborative Interactivity and Connectivity"
MARGARET MORSE, *University of California, Santa Cruz; Member, School of Social Science*

March 1
Social Science Thursday Luncheon Seminar: "Information Technology: Shaping Values, Shaped by Values"
HELEN NISSENBAUM, *Princeton University; Member, School of Social Science*

March 8
Social Science Thursday Luncheon Seminar: "Burnt Offerings: Virtual Smell and Community"
MARGARET MORSE, *University of California, Santa Cruz; Member, School of Social Science*

March 15
Social Science Thursday Luncheon Seminar:
"Religious Modernity and Regional Rivalries:
Post-Suharto Politics and the Rites of Organized
Violence in Lombok, Indonesia"
JOHN MacDOUGALL, *Princeton University;
Research Assistant, School of Social Science*

March 21
Information Technology and Society: Discussion
of Michael Fortun, "Volatilities – OrganisimsX-
GenomicsXEconomics"
MICHAEL FORTUN, *Rensselaer Polytechnic
Institute; Member, School of Social Science*

March 22
Social Science Thursday Luncheon Seminar:
"Ethnicity: The Pernicious Politics of American
Pluralism?"
VICTORIA HATTAM, *New School of Social
Research; Member, School of Social Science*

March 29
Social Science Thursday Luncheon Seminar:
"The Good, the Bad, and the Virtual: Ethics in
the Age of Information"
MARK POSTER, *University of California, Irvine*

April 11
Information Technology and Society: Discussion
of Manuel DeLanda, "Markets, Anti-Markets and
Network Economics"
MANUEL DeLANDA, *Columbia University;
Member, School of Social Science*

April 12
Social Science Thursday Luncheon Seminar:
"Credit Market Imperfections and Economic
Development: Theory, Evidence, and Policy
Implications"
MAITREESH GHATAK, *University of Chicago;
Member, School of Social Science*

April 18
Information Technology and Society: Discussion
of Thomas Streeter, "Digital Discourse Networks:
The Internet and the New White Collar Style"
THOMAS STREETER, *The University of Ver-
mont; Member, School of Social Science*

May 2
Information Technology and Society: Discussion
of Adam Ashforth, "AIDS, Witchcraft, and the
Problem of Public Power in Post-Apartheid South
Africa"
ADAM ASHFORTH; *Visiting Associate Professor,
School of Social Science*

"**M**y stay at the Institute was a perfect opportunity to widen the fields of interest of my research. It gave me time to learn new techniques, to finish several works, and more importantly, to start a new set of projects. I fully realize how unique the conditions of work (both intellectual and material) at the Institute are . . . I simply don't think I have ever met such a level of excellence."

— *Member, School of Mathematics*

The current areas of research in the Program in Theoretical Biology are evolutionary theory, the dynamics of infectious agents, and mathematical models of tumor progression. The program is led by Martin Nowak and includes five Members: Natalia Komarova, David Krakauer, Alun Lloyd, Karen Page, and Dominik Wodarz. David Tilman, Professor in the Department of Ecology, Evolution and Behavior at the University of Minnesota, was a Visitor for the fall term. Anirvan Sengupta, a Senior Scientist from Bell Labs, is a Visitor who started in the spring term. Nowak also works with two Ph.D. students from Princeton University, Garrett Mitchener and Joshua Plotkin.

Collaborations have been established with numerous experimental groups, including: Robert Darnell (The Rockefeller University) on immune response to cancer cells; Arnold Levine (The Rockefeller University) on apoptosis; Jeffrey Lifson (National Cancer Institute) on SIV/HIV dynamics; George Shaw (University of Alabama at Birmingham) on HIV infection; Allan Thomsen (University of Copenhagen) on LCMV infection; Peter Doherty (St. Jude's Children's Research Hospital) on murine respiratory infections; Lynn Enquist (Princeton University) on CNS infection; Stuart Sealfon (Mount Sinai School of Medicine) on signal transduction; and Shirley Tilghman (Princeton University) on genomic imprinting.

Research Projects

Martin Nowak has worked on mathematical models of tumor initiation and progression. He has formulated a theory that describes how mutational events affect intracellular signaling pathways that normally prevent cells from turning into tumor cells. Most tumor cells display a loss of apoptotic functions, increased proliferation rates and an enormous amount of mutations. A fundamental question is how somatic selection gives rise to genetic instability in cancer cells and to what extent genetic instability is responsible for tumor progression.

Nowak has a long-standing research interest in the dynamics of viral and other infectious diseases and, with Robert May, he recently completed a book, *Virus Dynamics*, published by Oxford University Press.

Nowak has also developed a mathematical theory for the population dynamics of language acquisition. The main goal is to understand the conditions that the genetically encoded language acquisition device (Universal Grammar) has to fulfill in order to induce linguistic coherence in a population. This approach can be used for analyzing (1) the evolution of animal communication and human language, (2) language change in the context of historical linguistics, and (3) empirical observations of language acquisition in children (parameter setting). In May 2001, Nowak hosted a workshop at the Institute for Advanced Study that brought together scientists in the field of linguistics, animal communication, and learning theory.

In October 2000, Nowak gave the Akira Okubo Lecture at Shizuoka University in Japan. In February 2001, he gave the Benjamin and Anne A. Pinkel Lecture at the Institute for Research in Cognitive Science at the University of Pennsylvania. Nowak was recently elected a corresponding member of the Austrian Academy of Sciences.

Natalia Komarova has focused on problems of mathematical modeling of the evolution of language. A system of ordinary differential equations can be used to describe a population dynamics of language learning. It includes the possibility of learning mistakes and innovation as well as some selection mechanism. In the framework of this model, language is a self-organizing system where high-coherence states manifest themselves as stable equilibria of the dynamical system. One of the advantages of the model is that it is possible to get some analytical insights into the dynamics of linguistic coherence.

Komarova, along with P. Niyogi, M. Nowak, and I. Rivin, used this framework to describe different aspects of language, such as the lexical matrix and grammar. One of the questions asked is how accurately children have to learn the language of their parents in order for the population to be able to maintain a coherent communication system. Another question asked is what are the evolutionary forces that shape the Universal Grammar. It has also been possible to model natural selection of the critical period of language acquisition and address the issue of convergence rate for different language learning mechanisms.

David Krakauer's work has focused on (1) molecular quality control as a mechanism of genomic robustness, (2) a detailed study of the dynamics of positive strand RNA viruses, (3) a consideration of the importance of genetic instability in cancer progression, and (4) a new perspective on the dynamics of neurodegenerative disease.

Molecular quality control can be thought of as all of those cellular processes that have evolved to minimize the impact of genetic or environmental damage on the phenotype. Krakauer has sought to classify these mechanisms according to a small number of parameters. Two have emerged: the effective population size and the mutation rate. Using a stochastic quasispecies framework, he describes continuous variation in the degree of redundancy genomes that should encode to serve as quality control and as a function of these parameters.

RNA viruses have evolved as a large number of ingenious means of subverting and exploiting the protein synthesis pathways of their host cells. Krakauer models, using reaction kinetics, the replication and translation mechanics of the virus life cycle. A number of paradoxical results emerge, namely that increasing the decay rate of the virus genome increases the abundance of viral proteins and that there is a critical tradeoff between genome replication and virion export.

Alun Lloyd's research has been on the spread of infectious diseases and how this spread depends on the way in which human populations are structured. For instance, rates of disease transmission will be higher in cities than in rural areas, as each person tends to encounter many more people each day. Lloyd's research tries to address such issues, using a combination of mathematical modeling and statistical analysis of historical records of disease incidence. One particular approach Lloyd has been exploring during the last year is so-called network modeling, which explicitly considers each individual in a population and his or her connections (e.g. social encounters) with others. Using this technique, he has been able to draw interesting parallels between the spread of computer viruses on the internet and the spread of sexually transmitted diseases, such as HIV.

Another project examines the incidence records of childhood diseases (such as measles, mumps, and rubella) in the United States. These records, which Lloyd has computerized,

begin in 1952 and continue to the present day. This period includes the introduction of mass vaccination programs. Study of these records has revealed interesting spatial patterns and changes which occur with the onset of vaccination. These studies are helping to illuminate the relative importance of local and global transmission events in the spread of childhood diseases, as well as aiding in the development of more reliable models for disease transmission.

Karen Page has been working on mathematical models of cancer. Vaccinations of antigens present on the surface of cancer cells can induce immune responses which limit tumor growth, such that tumors remain at a small, fixed size. Within these tumors, some cells are nonetheless dividing. Page has developed models to describe how the cell division can be exactly matched by cell death, and to estimate the parameters necessary for this dormant state, as well as the dependence of the tumor size and proportion of cycling cells on these parameters. A further aim of this research is to suggest methods of preventing escape from dormancy, perhaps using combined immuno- and chemo-therapy. Page has also developed a unified framework for evolutionary dynamics, which helps to clarify the concept of selection. She is working on developing a "selection theory" akin to information theory.

Joshua Plotkin has continued to research both ecological and evolutionary theory. Based upon data from forests across the globe, he has developed predictive methods to assess large-scale tropical forest biodiversity from small-scale censuses. Plotkin is applying these mathematical models to design a new forestry protocol for the Government of Malaysia, under a grant from the United Nations' Development Fund. He has also been researching the evolution, in multicellular organisms and especially mammals, of natural defense mechanisms against genomic instability, i.e. against cancer. Plotkin has developed stochastic models which predict the timing of tumorigenesis in terms of the mutational and genetic profile of a cell. These models have both evolutionary and medical implications in the study of carcinogenesis.

Dominik Wodarz has continued his work on immunity to HIV infection and on therapy regimes aimed at inducing immune-mediated, long-term control of the infection. He has applied his models of hepatitis C virus, with special focus on anti-viral therapy. Wodarz has continued his work on virus infections in mice deficient in various components of the immune system, as well as work on CD4 cell help. In relation to cancer, Wodarz has examined mathematical models looking at the use of viruses as anti-tumor weapons, the role of the immune system in relation to progression and therapy, the role of angiogenesis in cancer progression, models of chemotherapy, and the relevance of genetic instability in cancers. All of his projects are done in close collaboration with experimental groups in the United States and Europe.

The Program in Theoretical Biology Lecture Series
Each year, distinguished scientists in diverse areas of biology are invited to lecture at the Institute for Advanced Study. The lecture series is coordinated with a similar series at Princeton University. The following lectures were presented during the 2000-01 academic year:

September 13	"The World's Smallest Rotary Motor: The Mechanochemistry of ATP Synthase" George Oster, *University of California, Berkeley*
September 27	"From Genome to Organism: A Virus-World View" John Yin, *University of Wisconsin, Madison*
October 4	"The Tree of Life: The Origin of Universal Scaling Laws in Biology from Molecules and Cells to Whales" Geoffrey B. West, *Santa Fe Institute*
October 18	"Causes, Consequence, and Conservation of Biodiversity: Theoretical Musings" David Tilman, *University of Minnesota*
November 8	"The Evolution of Evolvability: Fact or Mirage?" Günter P. Wagner, *Yale University*
November 15	"Genes as Physiological Prisoners, Illustrated with Mathematical Modeling of the Heart" Denis Noble, *University of Oxford*
March 21	"Pathogenesis and Origin of HIV-1" George Shaw, *University of Alabama, Birmingham*
April 18	"Origin and Evolution of Genes" Walter Gilbert, *Harvard University*
May 2	"Unanswered Questions in Ecology" Robert May, *University of Oxford*

Language Learning and Evolution
The aim of this meeting was to discuss to what extent evolutionary biology and learning theory can shed light on the nature of human language.

May 17	"Possible Stages in the Evolution of the Language Capacity" Ray Jackendoff, *Department of Psychology, Brandeis University*
	"Language Learning from Multisensory Input" Deb Roy, *Media Laboratory, Massachusetts Institute of Technology*
	"Mathematical Models for Language Learning and Evolution" Martin Nowak, *Program in Theoretical Biology, Institute for Advanced Study*

"Variation, Acquisition, and Change"
Charles D. Yang, *Department of Linguistics and Computer Science,*
Yale University

"Why Animals Don't Have Language"
Dorothy Cheney, *Department of Biology, University of Pennsylvania*

"Do You Speak Chimpanzee? A Neglected Moment in the History of
Theorizing About Language Origins"
Stephen R. Anderson, *Department of Linguistics, Yale University*

"The Evolution of Language: What are the Uniquely Human
Computational Mechanisms?"
Marc Hauser, *Department of Psychology, Harvard University*

May 18   "The Course of Syntactic Development and the Current State of
Learning Theory"
Kenneth Wexler, *Department of Linguistics, Massachusetts Institute of*
Technology

"Reflections on the Specificity of the Language Acquisition Device"
Daniel Osherson, *Department of Psychology, Rice University*

"Evolutionary Dynamics of Linguistic Coherence"
Natalia Komarova, *Program in Theoretical Biology,*
Institute for Advanced Study

"Language Evolution: A Population Genetics Perspective"
Salikoko Mufwene, *Department of Linguistics, University of Chicago*

"The Evolution of the Language Faculty"
Scott Weinstein, *Department of Philosophy, University of Pennsylvania*

"Neural Computation and Language"
Leslie Valiant, *Division of Engineering and Applied Sciences, Harvard*
University

"Punctuated Equilibrium and Language Change"
David Lightfoot, *Department of Linguistics, University of Maryland*

May 19   "The Computational Interaction of Learning and Change in
Linguistic Systems"
Partha Niyogi, *Department of Computer Science, University of Chicago*

"The Emergence of Gestural Structures in the Development of
Phonology"
Louis Goldstein, *Departments of Linguistics and Psychology,*
Yale University

"Language Evolution and Leaky Grammars"
William Shi-yuan Wang, Chair of Language Engineering, *Department of Electronic Engineering, City University of Hong Kong*

"Learnability, Optimization, and Grammar"
Bruce Tesar and Alan Prince, *Linguistics, Rutgers University*

"Innate Grammatical Knowledge? Explorations of Universal Grammar in Optimality Theory through Infant Behavioral Experiments and Abstract Genomic Encoding"
Paul Smolensky, *Department of Cognitive Science, The Johns Hopkins University*

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 1930's. 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 Albert Einstein, 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 extensive 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) plus subscriptions to nearly 180 journals. Its collection of older periodicals is housed in compact shelving on the lower level of the Historical Studies-Social Science Library. 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. 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 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 articles from former and current Members of the Institute.

"This was a highly fruitful year for me. My most remarkable experience, however, has been the high level of intellectual exchange with the other colleagues at the Institute, and, above all, with the permanent Faculty . . . whom I can only praise for the truly unique environment they create every year for the Members and visitors at the Institute. My conversations with all these scholars have resulted in the elaboration of a number of ideas and projects for future research."

— *Member, School of Historical Studies*

The biennial AMIAS (Association of Members of the Institute for Advanced Study) conference, held March 23-24 at the Institute, featured four lectures given by (left to right) Patricia Crone, School of Historical Studies Faculty; Eric Maskin, who holds the Albert O. Hirschman Professorship in the School of Social Science; Martin Nowak, Head of the Program in Theoretical Biology; and Nathan Seiberg, School of Natural Sciences Faculty.

INSTITUTE FOR ADVANCED STUDY/PARK CITY
MATHEMATICS INSTITUTE

The IAS/Park City Mathematics Institute (PCMI) is an integrated mathematics program that has been sponsored by the Institute for Advanced Study since 1994. Participants in PCMI include research mathematicians, graduate students, undergraduate students, mathematics education researchers, undergraduate faculty, and high school teachers. The interaction among these groups fosters a stronger sense of the mathematical enterprise as a whole. In addition, it raises awareness of the roles of professionals with diverse responsibilities in the mathematics-based professions.

A Summer Session is the flagship activity of PCMI. Additional programs take place throughout the year and include the year-long High School Teacher Program, the Mentoring Program for Women in Mathematics, and the Lecture Publication Series.

Summer Session
The 11th annual Summer Session of the IAS/Park City Mathematics Institute (PCMI) was held July 8-28, 2001 in Park City, Utah. As is the case each year, a specific area of mathematics is chosen to provide the focus for the overall programming. The 2001 emphasis centered on topics in mathematical physics. The research and graduate summer school topic for this summer was *Quantum Field Theory, Supersymmetry, and Enumerative Geometry*, organized by Daniel Freed of the University of Texas at Austin, David Morrison of Duke University, and Isadore Singer of the Massachusetts Institute of Technology. Professors Freed and Morrison were important participants in the related *Special Year in Quantum Field Theory*, a joint program of the Institute for Advanced Study Schools of Mathematics and Natural Sciences during the 1996-97 academic year. Related topics in the Undergraduate Faculty Program and High School Teachers Program were *Differential Equations* and *Physics in the Math Curriculum* respectively.

This year's PCMI Summer Session, with a total of 290 participants, included the following programs:
    Research Program in mathematics and physics
    Graduate Summer School
    Undergraduate Summer Program
    High School Teacher Program
    Undergraduate Faculty Program
    Mathematics Education Research Program
    International Seminar on Mathematics Education

In addition, PCMI hosted the summer meeting of the Standards Impact Resource Group of the National Council of Teachers of Mathematics.

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 four days per week. A complete listing of courses, seminars, and activities follows.

Graduate Summer School
The Graduate Summer School met for three formal lectures each day and two problem sessions. There were courses in physics as well as in mathematics this year, culminating

in a lecture series on *Mirror Symmetry* that synthesized results from both fields. The courses were:

Enumerative Geometry I, William Fulton (University of Michigan)
Enumerative Geometry II, Barbara Fantechi (University of Udine, Italy)
Enumerative Geometry III, Aaron Bertram (University of Utah)
Classical Field Theory and Supersymmetry, Daniel Freed (University of Texas at Austin)
General Relativity, Clifford Johnson (University of Durham, England)
Introduction to Quantum Field Theory, Orlando Alvarez (University of Miami)
Introduction to String Theory, David Morrison (Duke University)
Mirror Symmetry, Ronen Plesser (Duke University)

One of the lectures from the research program (*Introduction to supermanifolds*, by John Morgan of Columbia University) was aimed at graduate students as well as researchers, and formed a part of the Graduate Summer School. In addition, PCMI ran very popular 'translation sessions' between the language of physics and the language of mathematics.

Research Program
This year's research program had two separate themes, with some participants involved with only one, and others involved with both. One or two meetings per day were held in the research program.

In the first theme, a series of seminars that extended through the entire summer session was organized around recent advances in *Enumerative Geometry* and their relationship to theoretical physics. There were twelve lectures in this part of the program:

Michael Thaddeus (Columbia University), *Mirror symmetry and Langlands duality*
Jim Bryan (Tulane University), *The Gopakumar-Vafa conjecture*
Melissa Liu (Harvard University), *Disk instantons*
Ravi Vakil (Massachusetts Institute of Technology), *Vanishing conjectures on the moduli space of curves*
Robert Bryant (Duke University), *Three remarks on special Lagrangian cycles*
Prakash Belkale (University of Utah), *Small quantum cohomology of Grassmannians*
Ionut Ciocan-Fontanine (University of Minnesota), *Derived moduli spaces*
Y. P. Lee (University of California, Los Angeles), *Quantum K-theory*
Alistair Craw (University of Warwick), *The McKay correspondence and moduli of G-constellations*
Rahul Pandharipande (Caltech), *Gromov-Witten theory and the moduli space of curves*
Holger Kley (Colorado State University), *New recursions for genus 0 Gromov-Witten invariants*
Yongbin Ruan (University of Wisconsin), *Cohomology ring of crepant resolutions of orbifolds*.

The second theme was a workshop on *Supergravity and its Mathematical Ramifications*, held during the second and third weeks of the summer session. In addition to a number of discussion sessions devoted to open problems in the field, this workshop featured thirteen formal lectures:

John Morgan (Columbia University), *Introduction to supermanifolds*

Savdeep Sethi (University of Chicago), *Survey of supergravity in high dimensions*
Martin Rocek (SUNY Stony Brook), *Introduction to supergravity in low dimensions* (two lectures)
John Morgan (Columbia University), *Supermanifolds and superspace*
Robbert Dijkgraaf (University of Amsterdam), *BPS equations and solutions in supergravity*
S. J. Gates, Jr. (University of Maryland), *Introduction to local supergeometry* (two lectures)
Robbert Dijkgraaf (University of Amsterdam), *The 3-Form in M-Theory*
John Lott (University of Michigan), *Geometry of torsion constraints*
Albion Lawrence (Stanford University), *Black holes and attractors on moduli space*
Sergei Gukov (Princeton University), *M-theory on G2 manifolds*
Martin Rocek (SUNY Stony Brook), *Harmonic superspace*

The High School Teacher Program
The High School Teacher Program underwent a substantial review and revision prior to the 2001 summer session, and by every indication, the new program was a great success.

A strong group of teachers came to Park City from across the United States (and one teacher from Canada), and they rose to the challenge of the new program with a high degree of competence, engagement and enthusiasm.

Each morning was devoted to two courses, one on number theory and one on geometry. The number theory course was notable in that it was brought to PCMI from the PROMYS program of Boston University, which has become affiliated with PCMI. The course was a two-hour problem-based session taught solely by high school teachers. It engaged the participating teachers for the entire two hours every day and attracted at least a dozen visitors from other PCMI programs as well. The geometry course was an hour of investigative work that focused especially on problems concerning three-dimensional polyhedra and the packing of space. While the first course comprised the 'continued learning of mathematics' component of the teachers' program and the second comprised the 'analysis of practice' component, in fact, both courses offered models for the teaching and learning of mathematics.

For two hours each afternoon, the teachers were divided into six small working groups, each devoted to focused in-depth study over a 12-24 month period of a single topic in mathematics and teaching. The purpose of these groups is to train the participants to become resources for the mathematics teaching community on the particular topic, and to eventually produce a publication that can be shared with that broader community. All six groups were very focused and spirited, and met their twin goals of teacher involvement and resource preparation. Draft documents to be shared within the PCMI group have been posted on a special web site hosted by the MathForum, and the work will be continued throughout the coming academic year. The topics covered were: *Algebra and Number Theory, Japanese Lesson Study, Geometry Models, Making Mathematics Meaningful, Physics in the Math Curriculum,* and *Analysis of Data*.

The remaining time in the High School Teacher Program's daily schedule was devoted to Cross-Program activities, to teacher presentations, to an extended session with Professor Isadore Singer of the Research Program, and to various hands-on activities.

A notable feature of the 2001 High School Teacher Program was the increased role of the Internet in communicating and disseminating information. This was facilitated by the

participation during the Summer Session of staff from the MathForum. The Forum web site contains a discussion board, journals of the HSTP working groups and drafts of materials. The site will play a pivotal role in keeping the teachers in touch as they work on their projects.

A second feature of the 2001 High School Teacher Program was the substantial informal interaction with the International Seminar of education policy makers and teachers that was convened July 19-24. The work of the International Seminar was closed to casual visitors, but the teachers of the HSTP were asked to take on hosting duties for the visitors from abroad, with the result that strong bonds were forged with the visiting Seminar members. This informal and ad hoc relationship was remarkably robust and dynamic. Not only were these contacts interesting and valuable for the HSTP teachers, but their friendly interest was clearly reciprocated by the International Seminar members.

Undergraduate Program
The Undergraduate PCMI program for 2001 was organized by Roger Howe of Yale University and William Barker of Bowdoin College. The undergraduate courses offered were focused on topics complementary to the research program in mathematical physics. As has been the practice, there were two undergraduate courses, one at a fairly advanced level and one more introductory.

The advanced course was given by Sheldon Katz of Oklahoma State University, on the topic of mathematical physics and enumerative geometry. Although the course was advanced, nearly all of the undergraduate students attended. In addition, a sizable contingent of graduate students attended, and the lectures had to be moved to the main lecture theater to accommodate the audience. As well as giving the daily lectures, Professor Katz prepared extensive lecture notes and ran problem sessions.

An introduction to differential geometry was given by Ruth Gornet of Texas Technical University. Although introductory in nature, this course was also at a high level, and in the last week treated the fundamental theorem of Riemannian geometry using differential forms and the Gauss-Bonnet Theorem using complex line bundles. (Professor Gornet chose this particular formulation after consultation with her students as the course progressed.) Professor Gornet maintained an informal atmosphere of give-and-take, asking many questions of her audience and also welcoming questions. Her course was attended by approximately two-thirds of the undergraduates and by a large group of the undergraduate faculty program participants.

Undergraduate Faculty Program
The Undergraduate Faculty program was directed by John Polking of Rice University and Paul Blanchard of Boston University, with assistance from David Arnold of The College of the Redwoods. There were ten participants from a wide variety of institutions across the nation, including four-year and two-year colleges. The topic was *The Teaching of Ordinary Differential Equations (ODEs)*. The group met three times every day, twice for seminars and once for a session in the computer lab.

The participants were informed by e-mail a month before the meeting that they were expected to complete a project of their own choice by the end of the three weeks. As a

result, two web pages were developed during the Summer Session, and several write-ups of student projects were prepared. All of these will eventually be made available on the PCMI web site.

In the computer lab, the participants were introduced to a wide variety of computer programs aimed at instruction in ordinary differential equations. They were then encouraged to experiment with those programs they found to be most effective.

In the two daily seminars a variety of topics were discussed. Included were the contents of the ODE course; the effective use of computation; the interaction between linear algebra and ODEs; the use of qualitative analysis; modeling and applications; dealing with client disciplines; the efficacy of teaching systems before higher order equations; and the use of student projects. Some sessions were devoted to homework exercises. In addition, there were meetings with participants from the Undergraduate Program, the High School Teacher Program, and the Math Education Research Program. Finally, there was a very well-received session with participants from the Graduate and Research Programs.

Mathematics Education Research Program

The Mathematics Education Research Program for 2001 focused for the second year on the work of the Probability and Statistics Research Group. It was organized by Timothy Kelly of Hamilton College and Richard Lehrer of the University of Wisconsin. The week-long summer meeting at PCMI was the third working meeting of the group. The first was the Summer 2000 Mathematics Education Research Program of PCMI, and the second took place prior to the Joint Mathematical Meetings in New Orleans in January, 2001.

Some examples of the twice-daily seminars:

Richard Lehrer presented current work with fourth grade students (and teachers) as they developed an understanding of distributional markers such as center, spread, and symmetry, through a series of tasks using Fast Plant growth as the context of inquiry.

Kathleen Metz reported on work that focused on the nature of first and second graders' generalizations from sample to population following investigations in the area of animal behavior and botany.

Timothy Kelly presented results of a study of college students' misconceptions regarding the distributional basis for the construction of confidence intervals, and the use of a dynamic programming technique intended to enhance conceptual understanding of the topic.

Patrick Thompson discussed work on the conceptualizations of high-school students set on the task of creating their own measures of association for bivariate data.

The group also continued work on an edited volume documenting their innovative cross-disciplinary collaboration and its outcomes, and began drafting proposals for funding to support future collaborative initiatives.

Finally, the group presented, in an all-institute activity, two pieces of research on statistical reasoning, and met formally with participants in both the Undergraduate Faculty and High School Teacher Programs.

Standards Impact Research Group (SIRG)
As part of the 2001 PCMI Mathematics Education Research Program, PCMI hosted the summer working meeting of the national Standards Impact Research Group, commissioned by the National Council of Teachers of Mathematics (NCTM) to monitor the impact and implementation of the NCTM's recently revised *Principles and Standards for School Mathematics*. SIRG members:

Deborah Ball, University of Michigan
Joan Ferrini-Mundy, Michigan State University (chair)
Bob Floden, Michigan State University
Ken Krehbiel, National Council of Teachers of Mathematics
Frank Lester, Indiana State University
Gary Martin, Auburn University
Mary Kay Stein, University of Pittsburgh

Mathematics Education Around the World: Bridging Policy and Practice
In a major innovation this year, as part of its Mathematics Education Research Program, PCMI hosted a week-long international workshop whose participants compared systems of mathematics education from a diverse selection of countries and cultures. The seminar was coordinated by Joan Ferrini-Mundy, Director of the PCMI Mathematics Education Research Program, and Gail Burrill, Director of the PCMI High School Teachers Program. Teams consisting of one mathematics education policy-maker and one currently practicing secondary school mathematics teacher representing each of eight countries (Brazil, Egypt, France, India, Japan, Kenya, Sweden, USA) participated. Each international team led the examination of one major aspect of secondary mathematics education:

Issues Session One (Antoine Bodin and Catherine Sackur, France): What is the relationship of national standards and national curriculum to teaching practice in classrooms in your country?

Issues Session Two (Fayez Mina and Khaled Etman, Egypt): What is the system of teacher education in your country and how does it relate to teaching practice?

Issues Session Three (George Eshiwani and Beatrice Shikuku, Kenya): Describe the role of algebra in the middle and secondary mathematics curriculum in your country. Similarly, how are ideas from probability and statistics currently configured in your system?

Issues Session Four (Yoshihiko Hashimoto and Miho Ueno, Japan): How does your country handle the balance between tradition and reform in mathematics education? What do tradition and reform mean within your mathematics education system?

Issues Session Five (Sudhakar Agarkar and Shailesh Shirali, India): How does your educational system decide the balance between depth and breadth, that is, between insistence on in-depth knowledge of relatively fewer core topics vs. a broad inclusion of topics, with less emphasis on each? How is this decision effected in practice?

Issues Session Six (Gerd Brandell and Susanne Gennow, Sweden): How do your country and culture deal with the challenges of excellence and accessibility in mathematics education? What is the balance of power and input into the system among the various educational constituencies?

Issues Session Seven (Romulo Lins and Carlos Francisco, Brazil): What is the role of mathematics education as a profession and of mathematics education research in your country?

The U.S. team, which did not make a formal presentation, was composed of Gail Burrill, Director of the PCMI High School Teacher Program, and high school mathematics teachers Susan Eddins and Carol Hattan.

Discussion was followed by reflections from observer-participants Deborah Ball of the NCTM Standards Impact Research Group, and Hyman Bass and Hiroshi Fujita, both of the International Council on Mathematics Instruction (ICMI).

Proceedings are being prepared for eventual publication, and a continuation of the dialogue was organized and will be facilitated through a joint PCMI/MathForum website.

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 constituents of the mathematical enterprise. To that end, a formal Cross-Program Activity was held four afternoons each week, and there were various evening activities and participant-coordinated weekend trips.

Titles of the formal 2001 Cross Program Activities were as follows:
The Role of Mathematics in Science, Dr. Irving Adler, with an introduction by Professor Stephen Adler of the Institute for Advanced Study, Princeton, New Jersey.
Million Dollar Math I: Yang-Mills Existence and Mass Gap, Lorenzo Sadun, University of Texas at Austin.
Research as a probe of student reasoning and as a guide for effective instruction; examples from physics, the University of Washington Physics Education Group.
Million Dollar Math II: The Hodge Conjecture, Daniel Freed, University of Texas at Austin.
Pre-concert lecture, Robert Taub, Artist-in-Residence at the Institute for Advanced Study.
Geometry and Cosmology, Isadore Singer of the Massachusetts Institute of Technology and Orlando Alvarez of the University of Miami.
Stats, kids, and other conundrums: a collaboration between mathematicians and mathematics education researchers, participants of the Mathematics Education Research Program.
Geometry of Area vs. Geometry of Length, Roger Howe, Yale University.
Mathematics Education around the World: Bridging Policy and Practice, participants of the International Seminar on Mathematics Education.
Elkonin-Davydov Primary Curriculum from Russia: A Model for Early Mathematics Education in the U.S., Gail Richardson, Best Practices in Education; Zaur Berkaliev, Indiana University; Barbara Dougherty, Curriculum Research & Development Group, University of Hawaii.

Evening activities included barbecue dinners and pizza parties for participants and their families, a piano concert by Robert Taub, Artist-in-Residence at the Institute for Advanced Study, and a special screening of *Fermat's Last Tango* sponsored by the Clay Mathematics Institute followed by a discussion with Karl Rubin, Stanford University, and Arthur Jaffe, Clay Mathematics Institute.

PCMI participants organized various sports activities that took place daily: biking, soccer, basketball, volleyball, running, hiking, etc. Weekend trips for everything from horseback riding to rock climbing were also arranged by PCMI participants.

Publication Series
PCMI is very pleased to make the proceedings of its Summer Session available to the public. Volume 9 of the Graduate Summer School lectures is currently in press, and Volume 10 should be published in 2002. The full series, which includes 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*

All titles are available from the American Mathematical Society or through popular bookstores such as Barnes and Noble.

A *Park City Mathematics Institute Subseries* was established within the AMS *Student Mathematics Series* last year. 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 will begin dissemination of its teacher-created materials and other resources sometime in the next two years, either via a special web site or in printed form.

Funding
The 2001 Summer Session was made possible by generous support from the following major funders: The National Science Foundation; the State of New Jersey; The Starr Foundation; and Datek Online Holdings Corporation. PCMI is grateful for additional support received from Bristol-Myers Squibb Foundation; Chautauqua Programs; the Geraldine R. Dodge Foundation; Toyota USA Foundation; and the Wolfensohn Family Foundation.

Oversight Board
The IAS/Park City Mathematics Institute is governed by an Oversight Board:

Chairperson:
Phillip A. Griffiths, Director, Institute for Advanced Study

Board Members:
Hyman Bass, Professor, University of Michigan
C. Herbert Clemens, Professor, University of Utah
Ronald L. Graham, Professor, University of California at San Diego
Shirley A. Hill, Professor Emeritus, University of Missouri-Kansas City
Robert D. MacPherson, Professor, School of Mathematics, Institute for
Advanced Study
Elaine B. Wolfensohn, New York, New York

Steering Committee
Members of the Steering Committee plan and manage the activities of PCMI

Chair:
C. Herbert Clemens, Professor, University of Utah
Member at large:
John C. Polking, Professor, Rice University
2001 Graduate Summer School/Research Program Organizers:
Daniel S. Freed, Professor, University of Texas at Austin
David R. Morrison, Professor, Duke University
Isadore Singer, Professor, Massachusetts Institute of Technology
Editor, Lecture Series:
David R. Morrison, Professor, Duke University
High School Teachers Program:
Gail Burrill, Director, Mathematical Sciences Education Board
James R. King, Professor, University of Washington
Carol Hattan, Teacher, Skyview High School
Susan Addington, Professor, California State University at San Bernardino
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
Recruitment:
Nathaniel Whitaker, Professor, University of Massachusetts at Amherst
Research Program:
Karl Rubin, Professor, Stanford University
Undergraduate Faculty Program:
Daniel Goroff, Harvard University
Undergraduate Program:
William Barker, Bowdoin College
Roger Howe, Yale University

The organizers of the 2002 Graduate Summer School/Research Program, whose topic will
be *Automorphic Forms*, will be Peter Sarnak of Princeton University and Freydoon Shahi-
di.

The eighth annual mentoring program for women in mathematics was held at the Institute for Advanced Study from May 15 to May 25, 2001. The topic of the PCMI summer school for the year 2001, *Quantum Field Theory, Supersymmetry, and Enumerative Geometry*, was the scientific topic of the Women's Program as well.

Janet Talvacchia, Swarthmore College, and Karen Uhlenbeck, University of Texas at Austin, taught the undergraduate course on the topic *Mechanics from the Point of View of a Geometer*. Antonella Grassi, University of Pennsylvania, organized the graduate sessions. The first set of graduate lectures was given by Ranee Brylinski, Pennsylvania State University, on *Geometric Quantization of the Kepler Manifold*. Xenia de la Ossa, University of Oxford, gave a second course on *Calabi-Yau Manifolds over Finite Fields*. In between the two lecture series, Antonella Grassi gave one lecture on *Tied up with Strings? (A literary approach to Calabi-Yau)*. Linda Chen and Agnes Szilard, both of Columbia University, organized the research seminar, and Lisa Traynor, Bryn Mawr College, led the Women-in-Science seminar.

The undergraduate course on mechanics was designed to be different from standard undergraduate course material, and the students also were encouraged to work on their own projects and present them to their colleagues. Ten undergraduates gave presentations of their own during the last two days of the program.

Both of the graduate courses were on subjects that were somewhat unusual, and the combination was good preparation for the upcoming Graduate Summer School of the IAS/Park City Mathematics Institute. Many undergraduate students (including two physics majors) attended the graduate course on *Geometric Quantization of the Kepler Manifold* given by Ranee Brylynski. The lectures of Xenia de la Ossa also were very well attended. While both courses had a number of outside visitors from Princeton University and other institutions, there were more in the second course. Between the two courses, Antonella Grassi gave an overview of the interaction between mathematics and physics.

Linda Chen and Agnes Szilard organized this year's Research Seminar. The seminars presented were as follows:
ERM, SRM, RN, SVM, and other topics in statistical learning theory, Cynthia Rudin, Princeton University
Seiberg-Witten integrable systems and how I got involved with mathematical physics, Amy Ksir, SUNY Stony Brook
Parametric Gromov-Witten invariants and symplectomorphism groups, Olguta Buse, SUNY Stony Brook
D-branes and K-theory: a pedagogical approach, Greg Moore, Rutgers University
Harmonic maps T^2-S^3: an algebro-geometric perspective, Emma Carberry, Princeton University
Analytic rigidity of contractions of smooth threefolds, Csilla Tamas, Purdue University

Lisa Traynor organized the Women-in-Science Seminar for the first time, assisted by one of the graduate students. While these seminars are designed to appeal to undergraduate students, many graduate students were involved as well. Topics were:
The Graduate School Phase of a Science Career

The Postdoctoral Phase of a Science Career
Interview with Joan Feigenbaum, Yale University (formerly of AT&T Research)
Interview with Nurit Krausz, New York Stock Exchange
The Chilly Classroom Environment
Mentoring and Networking

Andrew Wiles and Peter Sarnak, both of Princeton University, had lunch with the undergraduate students as a group, an activity that was much enjoyed by the students.

Planning Committee
The Women's Program Committee assists the organizers in planning and promoting the program and recruiting lecturers and participants. Members include: Alice Chang, Professor, Princeton University; Ingrid Daubechies, Professor, Princeton University; Joan Feigenbaum, Professor, Yale University; Antonella Grassi, Professor, University of Pennsylvania; Nancy Hingston, Professor, The College of New Jersey; Rhonda Hughes, Professor, Bryn Mawr College; Robert MacPherson, Professor, Institute for Advanced Study; Janet Talvacchia, Professor, Swarthmore College; and Lisa Traynor, Professor, Bryn Mawr College.

" I would like to express my gratitude to the Faculty and staff of the Institute, and to my fellow Members, for this 'golden' year."

— *Member, School of Historical Studies*

Artist-in-Residence Jon Magnussen, composer, at work

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, 2001
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 responsi-
bility 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, 2000 financial statements, and in our report dated September 20, 2000, 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 support-
ing the amounts and disclosures in the financial statements. An audit also includes
assessing the accounting principles used and significant estimates made by manage-
ment, 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, 2001 and the changes in its net assets and
its cash flows for the year then ended in conformity with accounting principles general-
ly accepted in the United States of America.

Deloitte & Touche LLP

November 21, 2001

BALANCE SHEET
JUNE 30, 2001 (WITH COMPARATIVE TOTALS FOR 2000)

ASSETS	2001	2000
CASH	$ 2,882,443	$ 746,898
SHORT-TERM INVESTMENTS - Held by Trustees (Note B)	13,146,755	6,368,517
ACCOUNTS RECEIVABLE	289,450	249,764
GOVERNMENT GRANTS AND CONTRACTS RECEIVABLE	1,332,804	1,017,761
ACCRUED INCOME ON INVESTMENTS	1,555,940	1,479,613
PREPAID AND OTHER ASSETS	311,517	422,840
CONTRIBUTIONS RECEIVABLE - NET (Note M)	794,755	1,283,664
UNAMORTIZED DEBT ISSUANCE EXPENSE	789,446	680,447
LAND, BUILDINGS AND IMPROVEMENTS, EQUIPMENT AND RARE BOOK COLLECTION - NET (Note C)	45,290,995	40,527,807
INVESTMENTS (Note B)	363,342,832	372,634,749
TOTAL ASSETS	$429,736,937	$425,412,060

See notes to financial statements.

LIABILITIES AND FUND BALANCES	2001	2000
ACCOUNTS PAYABLE AND ACCRUED EXPENSES	$ 8,475,595	$ 8,537,727
REFUNDABLE ADVANCES (Note F)	6,958,257	4,787,827
TRUST FUND OBLIGATIONS	2,769,922	2,769,922
NOTE PAYABLE (Note C)	1,033,365	1,087,671
ACCRUED INVESTMENT MANAGEMENT FEES	1,860,588	1,017,270
LONG-TERM DEBT (Note D)	51,195,043	41,466,859
Total liabilities	72,292,770	59,667,276
NET ASSETS:		
Unrestricted	236,026,790	244,176,515
Temporarily restricted (Note A, J)	79,021,668	28,563,649
Permanently restricted (Note A, J)	42,395,709	93,004,620
Total net assets	357,444,167	365,744,784
TOTAL LIABILITIES AND NET ASSETS	$ 429,736,937	$ 425,412,060

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2001 (WITH COMPARATIVE TOTALS FOR 2000)

	UNRESTRICTED	TEMPORARILY RESTRICTED
REVENUES, GAINS AND OTHER SUPPORT:		
Private contributions and grants	$ 2,129,120	$ 3,378,205
Government grants	-	4,711,549
Income on long-term investments	4,221,428	1,943,270
Net realized and unrealized gains and (losses) on long-term investments (includes $2,369,158 and $3,911,854 in unrealized losses in 2001 and 2000, respectively)	1,646,504	1,208,416
(Loss) gain on sale of capital assets	(140,761)	-
Net assets released from restrictions - satisfaction of program restrictions	14,542,035	(14,542,035)
Reclassification of true endowment (Note A)	-	53,758,614
Total revenues, gains and other support	22,398,326	50,458,019
EXPENSES AND LOSSES:		
School of Mathematics	6,307,384	-
School of Natural Sciences	5,175,080	-
School of Historical Studies	4,465,924	-
School of Social Science	2,858,415	-
Libraries and other academic expenses	5,230,092	-
Administration and general	6,096,539	-
Auxiliary activity - tenants' housing expenses, net of unrestricted revenue $200,757	414,617	-
Total expenses and losses	30,548,051	-
CHANGES IN NET ASSETS	(8,149,725)	50,458,019
NET ASSETS, BEGINNING OF YEAR	244,176,515	28,563,649
NET ASSETS, END OF YEAR	$236,026,790	$79,021,668

See notes to financial statements.

2001		
PERMANENTLY RESTRICTED	TOTAL 2001	TOTAL 2000
$ 3,374,147	$ 8,881,472	$ 11,211,026
-	4,711,549	3,790,775
-	6,164,698	13,316,479
(224,444)	2,630,476	22,798,857
-	(140,761)	162,037
-	-	-
(53,758,614)	-	-
(50,608,911)	22,247,434	51,279,174
-	6,307,384	5,998,078
-	5,175,080	5,316,261
-	4,465,924	4,205,045
-	2,858,415	2,238,971
-	5,230,092	4,748,689
-	6,096,539	5,525,697
-	414,617	246,128
-	30,548,051	28,278,869
(50,608,911)	(8,300,617)	23,000,305
93,004,620	365,744,784	342,744,479
$42,395,709	$357,444,167	$365,744,784

STATEMENT OF CASH FLOWS
YEAR ENDED JUNE 30, 2001 (WITH COMPARATIVE TOTALS FOR 2000)

	2001	2000
CASH FLOWS FROM OPERATING ACTIVITIES:		
Change in net assets	$ (8,300,617)	$ 23,000,305
Adjustments to reconcile change in net assets to		
net cash used in operating activities:		
Depreciation	2,506,901	2,479,525
(Increase) decrease in accrued income	(76,327)	49,303
(Increase) decrease in accounts and grants receivable	(354,729)	304,337
Decrease in contributions receivable	488,909	149,996
Decrease in accounts payable	(62,132)	(99,212)
Decrease in prepaid and other assets	111,323	61,928
Increase in refundable advances	2,170,430	368,413
Increase (decrease) in accrued management fees	843,318	(2,024,258)
Contributions restricted for long-term investments	(3,440,410)	(7,753,013)
Net realized and unrealized gains on		
long-term investments	(2,630,476)	(22,798,857)
Gain on sale of capital assets	-	(162,037)
Net cash used in operating activities	(8,743,810)	(6,423,570)
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of capital assets	156,842	2,389,680
Purchase of capital assets	(7,426,931)	(8,628,309)
Proceeds from sale of investments	97,527,319	181,766,108
Purchase of investments	(85,604,926)	(188,032,433)
Net cash provided by (used in)		
investing activities	4,652,304	(12,504,954)
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from contributions restricted for:		
Investment in endowment	3,374,147	6,123,952
Investment in plant	66,263	387,806
Investment subject to annuity agreements	-	1,241,255
	3,440,410	7,753,013
Other financing activities:		
Increase in trust fund obligations	-	771,204
(Increase) decrease in unamortized		
debt issuance expense	(108,999)	48,790
Increase (decrease) in long-term debt	9,728,184	(922,508)
Decrease in notes payable	(54,306)	(53,236)
(Increase) decrease in investments		
held by trustee	(6,778,238)	9,400,139
	2,786,641	9,244,389
Net cash provided by financing activities	6,227,051	16,997,402
NET INCREASE (DECREASE) IN CASH	2,135,545	(1,931,122)
CASH, BEGINNING OF YEAR	746,898	2,678,020
CASH, END OF YEAR	$ 2,882,443	$ 746,898
SUPPLEMENTAL DATA:		
Interest paid	$ 2,473,357	$ 2,439,783

See notes to financial statements.

A. 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 180 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. Certain prior year amounts presented for comparative purposes have been reclassified to conform to the current year presentation.

Use of Estimates - The preparation of financial statements in conformity with generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements. Estimates also affect the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Fund Accounting - The accounts of the Institute are maintained in accordance with the principles of "fund accounting." This is the procedure by which resources for various purposes are classified for accounting and reporting purposes into funds that are in accordance with activities or objectives specified. Separate accounts are maintained for each fund; however, in the accompanying financial statements, funds that have similar characteristics have been combined into net asset classifications.

Fund balances restricted by outside sources are so indicated and are distinguished from unrestricted funds allocated or designated to specific purposes by action of the governing board. Externally restricted funds may only be utilized in accordance with the purpose established by the grantor of such funds. In contrast, the governing board retains full control over unrestricted funds to be used in achieving any of the Institute's objectives.

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.

During the fiscal year ended June 30, 2001, the Institute completed its study of true endowments and determined that a portion, $53.8 million, should have been classified as temporarily restricted.

The Institute reports gifts of cash and other assets as restricted support if they are received with donor stipulations that limit the use of the donated assets. 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.

The Institute reports gifts of buildings and equipment as unrestricted support unless explicit donor stipulations specify how the donated assets must be used. Gifts of long-lived assets with explicit restrictions that specify how the assets are to be used and gifts of cash or other assets that must be used to acquire long-lived assets are reported as restricted support. Absent explicit donor stipulations about how long those long-lived assets must be maintained, the Institute reports expirations of donor restrictions when the donated or acquired long-lived assets are placed in service.

All gains and losses arising from the sale, collection, or other disposition of investments and other noncash assets are accounted for in the fund which 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.

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). Interest expense, net of related interest income, is capitalized on construction in progress of qualifying assets.

B. INVESTMENTS

Effective July 1, 1996, the Institute adopted the provisions of Statement of Financial Accounting Standards No. 124, *Accounting for Certain Investments Held by Not-for-Profit Organizations* ("SFAS No. 124"). SFAS No. 124 requires that investments in equity securities with readily determinable fair values and all investments in debt securities be reported at fair value with gains and losses included in the statement of activities. Previously, investments purchased by the Institute were recorded at cost; investments received by gift were recorded at the fair market value at the date of donation.

Endowment and similar funds investments at June 30, 2001 are comprised of the following:

	REPORTED VALUE	FAIR VALUE
Pooled investments:		
Equity securities	$ 152,189,505	$ 205,085,444
Debt securities	204,172,633	208,050,652
Mortgages from faculty and staff	2,313,192	2,313,192
Total pooled investments	358,675,330	415,449,288
Funds invested separately:		
Equity securities	4,667,502	4,905,687
Total	$ 363,342,832	$ 420,354,975

Marketable debt and equity securities are carried at market value. Realized gains and losses are computed based on the average cost of the investment. Fair values are determined utilizing fair market prices.

Equity securities include the Institute's interests in certain limited partnerships with a reported value of approximately $92,279,390 and a fair value of approximately $108,939,701 at June 30, 2001. The Institute accounts for these investments under the equity method and, accordingly, recognizes its proportionate share of ordinary income/expenses and net realized gains/losses attributable to the investments of the partnerships. The Institute's proportionate share of ordinary expense and net realized loss was $1,570,856 and $5,735,517, respectively, for the year ended June 30, 2001.

In addition, equity securities include the Institute's interests in three open-ended investment funds (the "Funds") incorporated in the Cayman Islands with carrying values of $59,910,113 and fair values of $96,145,743 at June 30, 2001. The Institute accounts for these investments at the lower of cost or market value. Fair value is determined as the number of shares held by the Institute multiplied by the net asset value for such shares. Net asset value, as determined by the Funds, reflects the underlying assets held by the Funds and any investment gain or loss. Realized gains and losses are computed based on the actual cost of the investment.

The Institute's interests in limited partnerships and Funds represent 26% and 17%, respectively, 43% collectively of total investments held by the Institute at June 30, 2001. These instruments may contain elements of both credit and market risk. Such risks include, but are not limited to, limited liquidity, absence of regulatory oversight, dependence upon key individuals, emphasis on speculative investments (both derivatives and nonmarketable investments) and nondisclosure of portfolio composition.

Substantially all of the 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, 2001:

	UNRESTRICTED	TEMPORARILY RESTRICTED	PERMANENTLY RESTRICTED	TOTAL
Dividends and interest	$ 4,221,428	$ 1,943,270	$ -	$ 6,164,698
Realized gain on investments reported at fair value	762,586	476,586	(53,239)	1,185,933
Realized gain (loss) on investments reported at other than fair value	2,452,309	1,532,598	(171,206)	3,813,701
Total realized gain/(loss)	3,214,895	2,009,184	(224,445)	4,999,634
Unrealized loss	(1,568,390)	(800,768)	-	(2,369,158)
Total realized and unrealized gain	$ 1,646,505	$ 1,208,416	$ (224,445)	$ 2,630,476

Investments, beginning of year	$ 372,634,749
Investment purchases	85,604,926
Investment sales	(97,527,319)

Investment returns:	
Realized gains	$ 4,999,634
Unrealized losses	(2,369,158)

Total realized and unrealized gain	2,630,476
Investments, end of year	$ 363,342,832
Investments, beginning of year	$ 372,634,749

Gifts available for investment:	
Gifts creating a permanent endowment fund	3,774,454
Gifts creating a temporary endowment fund	1,034,050
Gifts for trust funds	1,095,070

Investment returns:	
Dividends and interest	$ 6,164,898
Realized gains	4,999,634
Unrealized losses	(2,369,158)

Total return on investments	8,795,374
Amounts appropriated for current operations	(23,616,126)
Annuity trust income payment	(374,739)
Investments, end of year	$ 363,342,832

The participation in the pool and ownership of the other investments at June 30, 2001 is shown in the table below:

Permanently restricted net assets		$ 41,446,747
Temporarily restricted net assets		
Accumlated earnings on permanently restricted net assets	53,758,614	
Other temporarily restricted net assets	27,595,301	
Total Temporarily restricted net assets		81,353,915
Unrestricted net assets		240,542,170
		$ 363,342,832

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, 2001, the market value of such securities approximates their carrying value.

C. 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, 2001 follows:

Land and improvements	$ 1,114,898
Buildings and improvements	61,253,952
Equipment	15,779,120
Rare book collection	203,508
Joint ownership property	921,717
Total	79,273,195
Less accumulated depreciation	(33,982,200)
Net book value	$45,290,995

During 1997, the Institute entered into a Deed of Pathway and Conservation Easement (the "Easement") whereby the Institute has 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 $1,033,365 has been recorded as a note payable

in the accompanying statement of financial position at June 30, 2001. 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, 2001:

2002	$	55,397
2003		56,511
2004		57,647
2005		58,805
2006		59,987
Through 2017		745,018
Total	$	1,033,365

D. LONG-TERM DEBT

A summary of long-term debt at June 30, 2001 follows:

Series F & G 1997 - NJEFA	$40,780,000
Series A 2001 - NJEFA	11,000,000
Less unamortized bond discount	(584,957)
Total long-term debt	$51,195,043

Interest expense on long-term debt for the year ended June 30, 2001 was $2,069,930.

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 is to be used for renovations of members housing, construction of a new academic building, and additional capital projects. 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 are to be used for the construction of Bloomberg Hall.

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, 2001:

2002	$ 1,195,000
2003	1,445,000
2004	1,515,000
2005	1,585,000
2006	1,665,000
Through 2031	44,375,000
Total	$ 51,780,000

E. PENSION PLANS AND OTHER POST RETIREMENT 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, 2001 totaled approximately $1,192,500.

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 2001 are as follows:

Postretirement Benefit Costs:	
Service Cost - benefits attributable to service during the year	$ 113,408
Interest Cost on Accumulated Postretirement Benefit Obligation	330,743
Total	$ 444,151

The actuarial and recorded liabilities for these benefits, none of which have been funded, are as follows at June 30, 2001:

Accumulated Postretirement Benefit Obligation

Retirees	$2,556,513
Fully Eligible Active Plan Participants	853,989
Other Active Plan Participants	1,340,123
Total	$4,750,625

For measurement purposes, an 11.0% trend rate was used for 2001 health care costs, with the rate decreasing ratably until the year 2009, 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 $655,732 at June 30, 2001 and the net periodic cost by $85,014 for the year. The weighted average discount rate used in determining the accumulated postretirement benefit obligation was 7.5%.

F. CHANGES IN DEFERRED RESTRICTED REVENUE (REFUNDABLE ADVANCES)

Restricted receipts, which are recorded initially as deferred restricted revenue, are reported as revenues when expended in accordance with the terms of the restriction or transferred to quasi-endowment funds. Changes in deferred restricted revenue amounts are as follows:

	Total Deferred Restricted Revenue
Balance at June 30, 2000	$ 4,787,827
Additions:	
Contributions, grants, etc.	10,673,674
Restricted endowment income	809,019
Total additions	11,482,693
Deductions:	
Funds expended from contributions, grants, etc.	8,503,244
Funds expended from restricted endowment	2,117,683
Quasi-endowment funds utilized	(1,308,664)
Total deductions	9,312,263
Balance at June 30, 2001	$ 6,958,257

G. 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 $3,634,642 as of June 30, 2001, and is not included in the accompanying financial statements.

H. 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 ($252,779 net of $865,614 in revenues) and members' housing ($1,694,282, net of $1,384,695 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 program is $1,283,000 worth of depreciation expenses. 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 $3,876,525 for the year ended June 30, 2001.

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 $2,137,781 and allocated interest income totaled $240,086 for the year ended June 30, 2001.

I. 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.

J. TEMPORARILY AND PERMANENTLY RESTRICTED ASSETS

Temporarily restricted net assets are available for the following purposes:

	2001
Academic Services:	
Educational Programs	$79,021,668

Permanently restricted net assets are restricted to:	
Investments to be held in perpetuity, the income from which is	
expendable to support academic services	$42,395,709

Net assets were released from donor restrictions by incurring expenses satisfying the restricted purposes or by occurrence of other events specified by donors.

Purpose restrictions accomplished:

	2001
Program expenses:	
School of Mathematics	$ 4,125,596
School of Natural Sciences	2,312,493
School of Historical Studies	1,690,356
School of Social Science	2,545,030
Academic support costs:	
Libraries and other academic	3,147,390
Computing	79,800
Administration and general:	
Fund raising	20,568
Tenants' housing	175,359
Equipment acquired and placed in service	66,263
Trust fund disbursements	379,180
Total restrictions released	$14,542,035

K. FUNCTIONAL EXPENSES

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:

	2001
Expenses incurred were for:	
Salaries, wages, and benefits	$16,538,401
Stipends	5,446,977
Honoraria	121,284
Grants to other organizations	306,724
Supplies and travel	2,590,307
Services and professional fees	2,891,061
Depreciation	1,545,390
Interest	1,107,907
Total expenses	$30,548,051

L. 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.
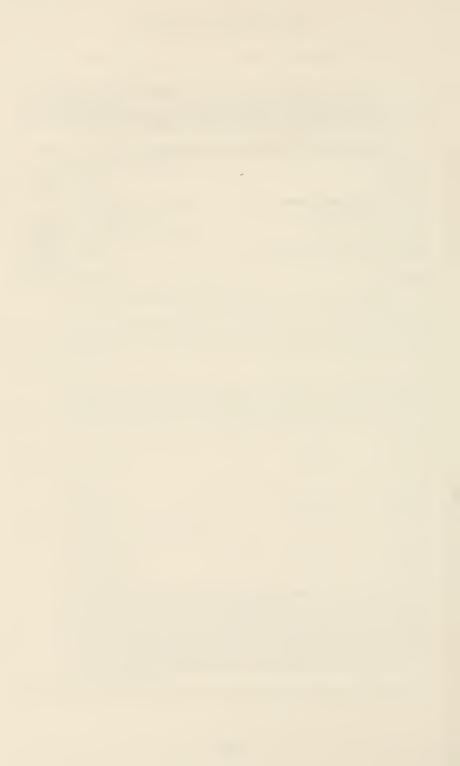
June 30, 2001	Reported Amount	Estimated Fair Value
Assets:		
Cash	$ 2,882,443	$ 2,882,443
Investments	363,342,832	420,354,975
Grant/contributions Receivable	2,127,559	2,127,559
Liabilities:		
Long-term debt	51,195,043	51,195,043
Note payable	1,033,365	1,033,365

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, 2001, 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.

M. DISCLOSURES OF PROMISES TO GIVE (CONTRIBUTIONS RECEIVABLE)

	June 30, 2001
Unconditional promises to give:	
Less than one year	$ 259,000
One to five years	569,992
	828,992
Discount on promises to give	(34,237)
	$ 794,755

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