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INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

1999–2000

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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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 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 lifelong 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 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, the Nobel equivalent for mathematicians, have been Institute Faculty and 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

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"To work in the Institute's research community seems to me a uniquely valuable opportunity: the power of the Institute to refresh and recreate one as a researcher is strong ... That the Institute makes research a priority and all its structures are seriously directed to allowing one to work permits a kind of attentiveness and concentration that is elsewhere usually frayed by conflicting demands and pressures. Even a short stay in an institution so committed to research priorities and serious freedom of thought creates a kind of seedbank of new thought and refreshed vision as a researcher which will continue to be productive long after one has left."

— Member, School of Historical Studies

Fuld Hall as reflected in a corner window of the Historical Studies/Social Science Library.

The Institute concluded this past year — its 70th — in very good health academically and financially, and without question as strongly committed to its fundamental purpose as it was in 1930. "The primary purpose is the pursuit of advanced learning and exploration in fields of pure science and high scholarship," commented Abraham Flexner, the Institute's first Director, and his words accurately describe the focus of this institution today.

A highlight of the year past was the naming of Simonyi Hall, home of the School of Mathematics, one of the Institute's four Schools, in honor of Institute Trustee Charles Simonyi. Trustee Martin Leibowitz's remarks on that occasion, although specifically about the School of Mathematics, seem to me to capture the essence of the entire Institute for Advanced Study. Dr. Leibowitz mentioned, in part, the beauty of the research work itself, the unanticipated applications that sometimes occur many years in the future, and the outreach to other fields that is so fruitful.

"It has been written," Dr. Leibowitz said, "that pure mathematics aspires to be the ultimate flowering of the human mind – beautiful words that were undoubtably penned by some mathematician. But the impurity of pragmatism often infects even the purest of mathematicians, and we know that much practical value has been derived from mathematical pursuits that may have at first seemed to have only a tangential relation to the real world. In the history of the Institute, we have witnessed tremendous payoffs in such areas as game theory and in the development of the early seeds of computer science.

"Mathematics has outreach to other scientific fields, such as the Deligne/Witten program in string theory and the interaction with the new initiative in theoretical biology. In addition, the School has just begun a major new emphasis in the field of computer science under the leadership of Professor Avi Wigderson.

"The Institute can be extremely proud of its high standing in the world of mathematics. The key has been the excellence of its faculty and the very special environment that the Institute provides. Simply put, we would like to think that there is no better place for the best scientists and scholars in the world to ply their craft."

As a small institution, the Institute recognizes that it must identify specific areas in which it can serve as a center of scholarship and offer something of substantial value to a field. The Institute has also created ways to alter its traditional orientation in some fields and adopt a more global and culturally diverse perspective, as has happened in the School of Historical Studies. In a variety of ways — through looking at the classical cultures from new perspectives, the introduction of study of the Islamic field, the inclusion of Members from the Central Asian republics, and explorations in East Asian studies — the School is complementing its distinguished scholarship in Western studies with other growth areas of research.

The School of Social Science has traditionally focused on interdisciplinary inquiry and interpretive understanding in the social sciences. Through the creation of the Albert O. Hirschman Chair in Economics, the School will be involved with possibilities emerging in the field of economics, and will look to the first Hirschman Professor, Eric Maskin, to integrate economics with other fields. Institute Trustees Ronaldo Schmitz and Wilfried

Guth recognized the importance of the Faculty's idea to create a chair that would allow the renewed presence of economics in the School of Social Science. The Albert O. Hirschman Chair was created with leadership gifts from Deutsche Bank, Richard B. Fisher, Giorgio and Elly Petronio, The Horace W. Goldsmith Foundation, and Daniel and Joanna Rose, together with the support of past Members of the School of Social Science, other Trustees and Friends of the Institute, and friends of Albert and Sarah Hirschman. We anticipate that this will make a major difference to the Institute.

The W.M. Keck Foundation this year awarded the School of Natural Sciences a challenge grant in support of a program in which scientists grapple with some of the puzzles of modern observational astronomy using tools of modern theoretical physics. The Institute is uniquely suited to this sort of program. First, research in this kind of forefront science requires individuals with a deep immersion in astrophysics as well as outstanding people in theoretical physics. The Institute Faculty is composed of the rare individuals who can lead such research. Second, the Institute provides a venue for sustained research, both individual and collaborative, that contributes to the intellectual enrichment of entire fields. This is a rare opportunity for outstanding young scientists to focus on research in an exciting area of science for a continuous period of time.

Other foundations and corporations have also provided very important program support for areas such as theoretical biology, theoretical computer science, and the IAS/Park City Mathematics Institute. Datek Online directed its first-ever corporate gift to the Institute, and generous grants were received also from the David & Lucile Packard Foundation, Andrew W. Mellon Foundation, RGK Foundation, Alfred P. Sloan Foundation, J. Seward Johnson, Sr. Charitable Trusts, The Seaver Institute, the Florence Gould Foundation, Geraldine R. Dodge Foundation, Toyota USA Foundation, W.K. Kellogg Foundation, The Starr Foundation, The Spencer Foundation, the Ford Foundation, the John D. and Catherine T. MacArthur Foundation, and the Gladys Krieble Delmas Foundation. The Clay Mathematics Institute operated programs in conjunction with the Institute's School of Mathematics. To each of these and to all foundations and corporations who so kindly supported the work of the Institute, I extend our appreciation.

Five years ago Trustee Hamish Maxwell drew the attention of the Board to the importance of attracting new funds to the endowment. Since then, with the leadership of Michael Bloomberg and Vartan Gregorian and a remarkable team effort involving the Board and Faculty, the Institute has met some critical development goals. In addition to Trustees mentioned elsewhere in my report, I especially want to note the support this year of Richard Black, Martin Chooljian, Theodore Cross, Ralph Hansmann, Immanuel Kohn, Martin Leibowitz, Robert Menschel, Ladislaus von Hoffmann, Brian Wruble, and Mortimer Zuckerman.

We are immensely grateful for each and every gift to the Institute, and in this regard I particularly want to thank the members of the Association of Members of the Institute for Advanced Study (AMIAS), the Friends of the Institute, and the members of the Einstein Legacy Society.

It is my pleasure to welcome David K.P. Li, Chairman and Chief Executive of The Bank of East Asia, Limited, who was elected a member of the Board of Trustees on May 5th. He was a member of the Legislative Council of the Hong Kong Special Administrative

Region and has served as Legislative Councillor since 1985. Dr. Li serves on the Board of Directors of Dow Jones & Company and several other companies in Hong Kong and overseas, including Sime Darby Hong Kong Limited, Sime Darby Berhad, and South China Morning Post (Holdings) Limited. He is a graduate of Cambridge University and holds an M.A. degree in Economics and Law.

It is a rare privilege to serve an institution as intellectually vital as the Institute for Advanced Study. Such centers of scholarship are more essential than ever before, more to be valued, more to be sustained. To the Faculty, AMIAS, Friends, Trustees, to the Director and his remarkable team, and to all others who contribute to this unique enterprise, I express my gratitude.

James D. Wolfensohn
Chairman

I am pleased to announce the appointment of two new Faculty members: Jonathan Israel to the School of Historical Studies, and Eric S. Maskin to the School of Social Science.

A leading historian of early modern Europe, Jonathan Israel's scholarly interests are unusually broad, and his thematic and geographic range extends from Central America to Russia, from Spain and Italy to Scandinavia. The author of several major works on various aspects of the Dutch Golden Age, he is presently engaged in writing a book on the Dutch contribution to the early Enlightenment (1660-1740) as well as several essays on European great power politics in the age of the Thirty Years War. Professor Israel received his undergraduate education at Queens College, Cambridge, and did his graduate work at the University of Oxford and the Colegio de México, Mexico City. He received his Ph.D. from the University of Oxford in 1972. He has been Professor of Dutch History and Institutions at University College London since 1985. From 1973-75 he was an Assistant Lecturer and then a Lecturer in Early Modern Europe (1492-1789) at the University of Hull. From 1974-81 he was a Lecturer in Early Modern European History at University College London, and a Reader in Modern History there from 1981-85. He is the author of numerous articles and eight books, and is the co-author or co-editor of four additional books.

Eric Maskin has been appointed the first Albert O. Hirschman Professor in the School of Social Science. Professor Maskin's consistently innovative work, at the forefront of economic theory, has important policy implications and touches on many issues of broad interest to social scientists. He received his A.B. degree in mathematics from Harvard University in 1972, and his A.M. and Ph.D. degrees in applied mathematics from Harvard University in 1974 and 1976, respectively. Professor Maskin also holds an M.A. degree (honorary, 1977) from Cambridge University, where he was a Research Fellow at Jesus College during 1976-77. He taught at the Massachusetts Institute of Technology from 1977-84, moving to Harvard University in 1985 as Professor of Economics. He became the Louis Berkman Professor of Economics at Harvard in 1997. Professor Maskin is a Fellow of the American Academy of Arts and Sciences and of the Econometric Society. The author of numerous journal articles and book chapters, he is the editor of three books. Professor Maskin is currently the editor of the journal *Economics Letters*; this work will now be based at the Institute.

Clifford Geertz, a Faculty member in the School of Social Science, became Professor Emeritus as of June 30. Professor Geertz came to the Institute in 1970 to found the School of Social Science; he was the School's first Faculty member, and became the Harold F. Linder Professor of Social Science in 1982. He was educated at Antioch College (A.B. in philosophy, 1950) and Harvard University (Ph.D. in anthropology, 1956), and has taught at Harvard University; the University of California, Berkeley; the University of Chicago; the University of Oxford; and Princeton University. He has done fieldwork in Indonesia (Java, Bali, Sumatra, Sulawesi) and Morocco. Dubbed by an English colleague "the Priest-King of American Cultural Anthropology," he is the author of numerous books, translated into many languages, and the recipient of many honors and honorary degrees.

I regret to announce the passing of Homer Armstrong Thompson, Professor in the School of Historical Studies from 1947-1977 and Professor Emeritus from 1977-2000. Professor Thompson, one of this century's leading classical archaeologists, was an internationally recognized scholar who played a central role in the excavation and reconstruction of the Agora, the ancient Athenian marketplace where the accomplishments and fissures of democracy first emerged. Homer Thompson's work revealed the heart of ancient Athens

and created a new understanding of its architecture, art, history, and politics. In the process, he also formed two generations of archaeologists and shaped our understanding of ourselves.

Over the past nine years, generous support from the Andrew W. Mellon Foundation has given the School of Historical Studies the opportunity to identify and explore new areas in humanistic studies in addition to those represented by the scholarly interests of the Faculty, and to offer opportunities to scholars across a broad range of fields and interests. The Mellon Visiting Professor Program has allowed the School to bring in, 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. The topic this past year, the second in a three-year program on the history and culture of traditional China, was "Late Imperial Chinese Culture and Science." Benjamin A. Elman, Professor of Chinese History at the University of California, Los Angeles, is the Two-year Visiting Mellon Professor for 1999-2000 and 2000-2001. In addition to Professor Elman, six China scholars were in residence at the Institute, and participated in a series of seminars to which scholars from outside the Institute were invited. In addition to talks given by the Asian scholars in residence at the Institute, scholars from Bryn Mawr College; New York, Princeton, Rutgers, and Cambridge Universities; the University of California Santa Barbara; the University of Pennsylvania; and the University of Southern California participated in several different events organized by Professor Elman, including seminars and three different colloquia throughout the year.

The Distinguished Visiting Professor in the School of Mathematics this year was Henryk Iwaniec, Rutgers University. Together with Peter Sarnak of Princeton University and Institute Faculty members Enrico Bombieri and Robert Langlands, Professor Iwaniec led a special program in analytic number theory. Three seminar lectures took place every week, with a total of over 70 lectures delivered by Institute Faculty and Members as well as by invited speakers from various universities. A very large area of mathematics was explored, from the traditional, concrete notions of the analytic theory of automorphic forms and L-functions, to the abstract ideas culminating in the conjectures of Professor Langlands. The Langlands conjectures were among the revolutionary ideas of the last century in mathematics, and provided a conjectural unification of traditional ideas in number theory. This special year ended with a workshop on "Recent Trends in Analytic Number Theory"; the workshop was a joint project of the Institute and the Clay Mathematics Institute, which provided substantial financial support. The Ambrose Monell Foundation continues to support the Distinguished Visiting Professor Program in the School of Mathematics, which allows it to focus on particular areas in mathematics and to bring to the Institute each year a distinguished scholar with interests in those areas. With Monell Foundation support, the School is able both to continue its stewardship of core mathematics and to explore selected areas of concentrated activity in mathematics.

Last October, Robert Langlands began a series of lectures titled "The Practice of Mathematics." Originally planned as eight lectures for the academic year 1999-2000, with the possibility that additional sets of lectures would be given in future years, the lectures grew from eight to sixteen during this first year. Over the course of the sixteen lectures, Professor Langlands covered the Pythagorean theorem; the discovery of the irrationality of numbers like 2, 3, and 5; the construction of the regular pentagon with the aid of a ruler and compass alone; the introduction of coordinate geometry; the introduction of complex numbers; the construction of the regular heptadecagon with ruler and compass; the notion of an algebraic symmetry (Gauss and Galois); division of the lemniscate; use of complex numbers to prove Fermat's theorem for n = 3; factorization into primes; factorization into Kummer's ideal numbers; its use in Kummer's treatment of Fermat's theorem;

and calculation of the number of essentially different ideal numbers in concrete, elementary terms. In future years, Professor Langlands would like to continue the lectures with a series on classical fluid mechanics and turbulence. The final series of lectures would address the analytical problems suggested by renormalization in statistical mechanics and quantum field theory.

With the appointment to the Faculty of Avi Wigderson, this past year also saw the School of Mathematics establish an ongoing presence in theoretical computer science, a field last explored at the Institute during John von Neumann's tenure as a Faculty member. Professor Wigderson's specialty is theoretical computer science and discrete mathematics; during this past year he led a weekly seminar on combinatorics and complexity theory. The Institute is one of the very few academic institutions where work in mathematics and computer science takes place in one School, and is not divided into separate academic departments.

This is a period of great excitement — perhaps even a golden age — in physics and astronomy. Both are currently at a point where great progress seems possible, where major breakthroughs may be within our grasp. A new program supported by the W.M. Keck Foundation will help to train theoreticians in an area — the interface between astronomy and physics — in which progress is explosive and qualified scientists are scarce.

Frank Wilczek, the J. Robert Oppenheimer Professor in the School of Natural Sciences at the Institute for Advanced Study, has been appointed the first Herman Feshbach (1942) Professor of Physics at MIT. Professor Wilczek joined the MIT physics faculty in September 2000.

The Program in Theoretical Biology, led by Martin Nowak, completed its second year at the Institute for Advanced Study. Five Members worked with Dr. Nowak on research that included the mathematical modeling of infectious agents, viral population genetics, antiviral treatment, and the complex interaction between viruses and the immune system. More recent research includes work on cell signaling and mathematical models of tumor progression and chemotherapy. The Biology Lecture Series continued this year, and included eleven public lectures on topics ranging from the evolution of cooperation to the neurobiology of sensory information processing. Walter Fontana, Research Professor at the Santa Fe Institute, was a visiting Member for the year, and led a special program in genomics.

The Institute Concert Series, organized by Artist-in-Residence Robert Taub, once again welcomed full houses to each of its nine performances (three programs, each performed three times). In addition to his pre-concert lectures for the Institute community, Dr. Taub initiated a second series of talks on new music, given as a series of conversations with invited guests: composers Jonathan Dawe and Jane O'Leary, and pianist Bruce Brubaker. In addition to his responsibilities as Artist-in-Residence, Robert Taub has maintained an active international performance schedule during his years at the Institute. Most recently, he gave a solo piano concert in May 2000 at the Library of Congress, where the 300th anniversary of the piano was celebrated with programs that related to autograph scores in the Library's collections. Following this performance, Taub joined James Levine and the Munich Philharmonic on an eight-concert tour of Germany.

Robert Taub will complete his term as the Institute's Artist-in-Residence in June 2001, and the Institute has appointed Jon Magnussen as the next Artist-in-Residence. Dr. Magnussen is a composer of music for the concert hall, dance, and drama. His scholarly

focus to date has been the work of Debussy and the early 20th century, and he is a pianist and folk-guitarist. He began his period of residence at the Institute in June 2000, allowing one year of overlap with Robert Taub before taking over responsibility for the concert series and assuming his other duties as Artist-in-Residence.

From May 30 through June 9, the Institute for Advanced Study hosted the IAS/Park City Mathematics Institute's annual Mentoring Program for Women in Mathematics, organized by Chuu-Lian Terng of Northeastern University and Karen Uhlenbeck of the University of Texas at Austin. Graduate students, undergraduates, postdoctoral scholars, and senior researchers made up the 40 participants. The program emphasized the content and culture of mathematics and included lectures, seminars, working problem groups, mentoring and networking sessions and the opportunity to meet and interact with leading mathematicians.

The Summer Session of the IAS/Park City Mathematics Institute (PCMI) was held this year on the campus of the Institute for Advanced Study from July 16 through August 5. Computational Complexity Theory was the research topic for PCMI's Graduate Summer School and Research Program. Avi Wigderson, Faculty member in the Institute's School of Mathematics, co-organized this program with Steven Rudich, Carnegie Mellon University. Over 200 participants attended six separate but overlapping programs for researchers, high school teachers, undergraduate faculty, mathematics education researchers, and undergraduate and graduate students. Once again, the support of IAS Trustee Jon M. Huntsman, Jr. made it possible for PCMI to host a concert by Robert Taub, and a talk, "Mathematics, Music, and the Sublime," by Robert Taub and Edward Rothstein, Cultural Critic-at-Large for *The New York Times*.

Each year the Institute welcomes Director's Visitors, distinguished visitors whose interests often do not fall within the school structure of the Institute. These individuals contribute a great deal to the Institute community. This year Director's Visitors included Steve Batterson, Emory University; Melvyn Nathanson, Lehman College CUNY; and Alexandre Vinogradov, the Russian Academy of Natural Sciences and the University of Salerno, Italy.

The Institute hosts regional gatherings every year in the United States and abroad for AMIAS members and their guests. One such gathering this spring was a lecture and reception at California Institute of Technology, at which Edward Witten, Professor in the School of Natural Sciences, gave the lecture "Quest for Unification." Contributions from AMIAS members support the scholarship of Members currently in residence at the Institute: this past year AMIAS funded two Members, one in the School of Historical Studies, and one in the School of Natural Sciences.

No account of the Institute's activities would be complete without recognizing the many individuals whose various contributions play such an essential part in building the Institute's strength and vitality. To the Faculty, Trustees, Members and former Members, the Friends of the Institute, and our staff, I express my deepest gratitude.

Phillip A. Griffiths
Director

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

Institute Film Series

New Member Reception

Friends of the Institute
Friends' Forum: "The Evolution of Cooperation: How to be Nice to Each Other"
MARTIN NOWAK, *Head, Program in Theoretical Biology, Institute for Advanced Study*

Institute Film Series

Friends of the Institute
Culture & Cuisine Series: "The Importance of Eating Everything"
JEFFREY STEINGARTEN, *Vogue Magazine*

Faculty/Colleague Dinner

Institute Play-reading Series

Institute Film Series

Institute Play-reading Series

Lunchtime Talk on New Music
"Minimalism and Meximalism: A Performer's Perspective"
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study* and BRUCE BRUBAKER, *pianist*

Institute Trip
Metropolitan Museum of Art

Institute Film Series

Friends of the Institute
Friends' Forum: "The Hippocratic Oath: Personal and Professional Conduct in Ancient Medicine"
HEINRICH von STADEN, *Professor, School of Historical Studies, Institute for Advanced Study*

Institute Ballroom Dancing Series

Friends of the Institute
Fireside Chat: "The Architect's Task: Six Degrees of Connection"
BOB GEDDES, *Geddes Demshak Architecture and Planning*

Institute Concert Series
Pre-concert Lecture
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study*

Institute Concert Series
Bartok: Sonata; Stravinsky: Three Pieces; Brahms: Sonata in F Minor, Op. 120 No. 1; Davidovsky: Synchronisms No. 9; Bartok: Contrasts
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study*, CURTIS MACOMBER, *violinist*, and CHARLES NEIDICH, *clarinetist*

Institute Lecture
"Preparing for the 21st Century? World Politics Today"
JACK MATLOCK, Jr., *Professor, School of Historical Studies, Institute for Advanced Study*

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THE GIVE & TAKE JUGGLERS

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Lunchtime Talk on New Music
"Creative Processes: A Composer's Perspective"
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study* and JONATHAN DAWE, *composer*

Institute Ballroom Dancing Series

Institute Lecture
"The World's Numerical Recipe"
FRANK WILCZEK, *Professor, School of Natural Sciences, Institute for Advanced Study*

New Member Reception

Institute Ballroom Dancing Series

Institute Film Series

Institute Concert Series
Pre-concert Lecture
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study*

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Schubert: Die Winterreise
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study*, RANDALL SCARLATA, *baritone*

Institute Play-reading Series

Institute Ballroom Dancing Series

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Einstein Legacy Society Presentation
"Women's Financial and Philanthropic Planning"
CINDY STERLING, *Vassar College*

Mid-winter Party

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Institute Ballroom Dancing Series

Institute Lecture
"Global Governance: What is the Best We Can Do?"
MICHAEL WALZER, *Professor, School of Social Science, Institute for Advanced Study*

Lunchtime Talk on New Music
"New Music and the Audience: A Composer's Perspective"
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study* and JANE O'LEARY, *composer*

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Friends' Forum: "English Poets on Britain and Rome"
JASPER GRIFFIN, *Member, School of Historical Studies, Institute for Advanced Study*

Faculty/Colleague Dinner

Institute Play-reading Series

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Pre-concert Lecture
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study*

Institute Concert Series
Haydn: Sonata in E-Flat Major, Hob. XVI:52; Babbitt: Canonical Form (1983); Liszt: Etude d'exécution Transcendante in F Minor; Schumann-Liszt: Fruhlingsnacht; Verdi-Liszt: "Rigoletto" Paraphrase; Liszt: Mephisto Waltz
ROBERT TAUB, *Artist-in-Residence, Institute for Advanced Study*

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Philadelphia Flower Show

Einstein Legacy Society Presentation
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Annual Meeting and Picnic

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— Louis Bamberger and Mrs. Felix Fuld, Letter addressed by the Founders to their Trustees, June 6, 1930

Albert Einstein, a Faculty member in the School of Mathematics from 1933-1955, and Rabbi Levy look at a copy of Time *magazine that predates the December 31, 1999 issue in which Professor Einstein was named* Time*'s Person of the Century.*

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The von Neumann Fund
The Weyl Fund
Edwin C. and Elizabeth A. Whitehead Fellowship
The James D. Wolfensohn Fund

"This has been the most productive year of my career, a direct result of the intellectually stimulating environment, collegial atmosphere and optimum material conditions for work ... I found the combination of organized seminars and informal lunches with the complete freedom to pursue my research interests a constant source of fresh ideas, and often those I rejected provided as productive a stimulus to my writing as those I decided to incorporate into my own thought."

— Member, School of Social Science

THE SCHOOL OF HISTORICAL STUDIES

GLEN W. BOWERSOCK
GILES CONSTABLE
PATRICIA CRONE, *Andrew W. Mellon Professor*
IRVING LAVIN
JACK F. MATLOCK, Jr., *George F. Kennan Professor*
HEINRICH von STADEN

BENJAMIN ELMAN

MARSHALL CLAGETT
OLEG GRABAR
CHRISTIAN HABICHT
GEORGE F. KENNAN
PETER PARET
HOMER A. THOMPSON
(deceased May 7, 2000)
MORTON WHITE

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 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 that of Julius Caesar, on both of which subjects he wrote several books. Medieval history came to the Institute Faculty with Ernst Kantorowicz, whose interest stretched 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 at the Institute his great work on late medieval manuscript painting in Burgundy.

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 Russia, 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 a 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.

In late September of 1999 PROFESSOR GLEN BOWERSOCK participated in a congress on the history and archaeology of central Syria at the invitation of the Director General of Antiquities and Museums of the Syrian Arab Republic. He spoke on late antique Chalcis (Qinneshrin). Since the congress took place in Hama, he took the opportunity to spend several days beforehand at the Belgian excavations in Apamea. In Damascus he conferred with a new academic publisher who will be issuing Arabic translations of western scholarly work (including his own). In October, Professor Bowersock gave an introductory lecture at an international conference held at Smith College on new directions in the study of Late Antiquity. In early November, he spent several days at the Center for Hellenic Studies in Washington, DC, as a scholar in residence.

During that time he conducted a seminar on a Greek inscription and presented a talk on new developments at Petra in Jordan.

In 1999, Professor Bowersock was elected a Foreign Member of the Russian Academy of Sciences in Moscow, and he received an honorary doctorate from the Ecole Pratique des Hautes Etudes in Paris. During his visit to Paris for the ceremony in December he addressed the Académie des Inscriptions et Belles-Lettres on the topic of "Les *Euemerioi* et les confréries joyeuses." In the first part of 2000, he spoke on the *Euemerioi* before the Near Eastern Department at Indiana University, and he delivered a Faculty Lecture at the University of Western Ontario on the building of the first basilica of St. Peter's on the Vatican in Rome. He contributed a paper (unfortunately in absentia) to a session on W. L. Westermann at the annual meeting of the American Association of Ancient Historians, held in Madison, Wisconsin. In early June, he joined several colleagues in a two-week visit to Sicily.

Among the publications of Professor Bowersock in 1999-2000 was the encyclopedic volume that he edited together with Peter Brown and Oleg Grabar, *Late Antiquity: A Guide to the Postclassical World*, published by Harvard. His other publications included a study of Petra as a Graeco-Roman city and a long delayed analysis of historical material in the Syriac Life of Rabbula. He continued to serve on the editorial boards of several journals, and he saw two new volumes published in the series *Revealing Antiquity*, for which he is General Editor at the Harvard University Press. One of those volumes was *The End of the Past: Ancient Rome and the Modern West* by former Institute Member Aldo Schiavone. Professor Bowersock flew back to Europe at the end of June to chair a meeting of the Comité Scientifique of the Maison de l'Orient in Lyon.

In the academic year 1999-2000, PROFESSOR GILES CONSTABLE published a collection of articles (his fifth), which included a bibliography of his publications from 1953 through 1999. He also published three further articles, a memoir, and a review. He gave lectures or talks at the Ninth Annual Conference of the Texas Medieval Association in Amarillo (September), a colloquium on "Byzantine Monastic Documents" at Dumbarton Oaks (March), a meeting on "Spanning Consciousness: The Mediterranean as Fons et Origo" at the University of Messina (March), and the University of Oxford (May), and he commented on a paper presented at the Davis Center, Princeton (April). Together with Professor Robert Somerville of Columbia, he organized a meeting (the first to be held in this country) of the Commission Internationale de Diplomatique (September), which (in spite of hurricane Floyd) met both at the Institute for Advanced Study and at Columbia University, with a side trip to The Cloisters. Professor Constable attended meetings at Princeton University, the University of Pennsylvania, and Fordham University. He arranged the usual meeting of the Delaware Valley Medieval Association, at which several members of the School of Historical Studies spoke, in December. He was appointed to the Advisory Board of the *Oxford Dictionary of the Middle Ages*.

PROFESSOR PATRICIA CRONE continued to work on Islamic political thought, deciding to take the book she is writing on that subject down to the Mongol invasions (mid-thirteenth century) instead of stopping in c. 1100. She gave lectures on various aspects of political thought in early Islam in Frankfurt in January, in Princeton in February, and at Harvard in March, and she spoke about developments in the study of Islamic history in the last fifty years at a conference on the future of history at Wellesley in April.

She also taught a graduate course on Ismailism at the University of Pennsylvania in the first semester, and another on the Islamic adaptation of the Greek tradition of political thought at Princeton University in the second semester. Two of her articles appeared in print, one on military recruitment in the first centuries of Islamic history, another on the symbolic significance of a weapon used in two major revolts. Her book with Professor Moreh, *The Book of Strangers: Medieval Arabic Graffiti on the Theme of Nostalgia*, was published in November 1999. Her book with Dr. Zimmermann, *The Epistle of Salim b. Dhakwan*, is now in proof and she compiled the index. Professor Crone continued to serve on the editorial board of *Arabica* and *Studia Islamica* and to organize the regular Islamicist seminar at the Institute. She also organized a second seminar of a more informal kind in which six to eight people met to read Arabic texts on topics related to the formation of Sunnism. This was highly rewarding, but only possible because of the unusually large number of Islamicists at the Institute this year, so it is unlikely to continue.

PROFESSOR BENJAMIN ELMAN'S book entitled *A Cultural History of Civil Examinations in Late Imperial China* appeared from the University of California Press in January 2000. It represents the culmination of a fifteen-year project researching the key intellectual, social, political, and economic features of the civil examination system that made it a core element in the cultural continuity and social cohesion of late imperial state and literati society in China from 1400 to 1900. Elman also completed a chapter entitled "The Socio-Cultural Roles of Literati," for *The Cambridge History of China, Volume 9, Part 1: Early Ch'ing*, which is forthcoming. In addition, Elman's chapter entitled "The Transformation of the Civil Service Curriculum Between 1250 and 1400 and the Role of the Yuan Dynasty in Classical Studies," is forthcoming in the conference volume for the "Yuan Dynasty Classical Studies" International Conference held at Academia Sinica, Taiwan.

Professor Elman presented lectures in Germany and Japan, in addition to local universities. Based on his current research project while at the Institute for Advanced Study, he presented the keynote address entitled "From Pre-modern Chinese Natural Studies to Modern Science in China" at the conference on "Translating Western Knowledge into Late Imperial China," held at the University of Göttingen, Germany, December 6-9, 1999. "The Changing Role of Historical Knowledge in Ming-Ch'ing Times," was presented at the conference "Turning Points in Historical Thinking: A Comparative Perspective," organized by SUNY/Buffalo & Niagara University, August 19-21, 1999. "Natural Studies, Philosophy, and Philology in Late Imperial China, 1600-1800" was presented at the conference on "Das Naturverständnis in China und Europa vom 6. Jh. v.u.A. bis zum 17. Jh.," held at the Rheine/Westf. Conference Center, Germany, March 23-25, 2000. Elman also lectured at the Institute for Chinese Studies at Heidelberg University on March 30th. All of the above conference presentations will be published in the near future. In addition, Elman prepared two special lectures in Japanese on his "Civil Examinations" book, which were presented at Kyoto University and Tokyo University while he was a Visiting Scholar sponsored by the School of Humanities, Kyoto University, January 3-15, 2000. Finally, Elman presented the lecture "Translation and Transformation: New Perspectives on the Jesuits in Late Imperial China" for the Asian Pacific American Heritage Month at Rowan University on April 11, 2000.

While at the School of Historical Studies this year, Elman organized a series of events sponsored by the Mellon Foundation, and with additional funds generously provided by John P. Birkelund and Ladislaus von Hoffmann, under the title "Chinese Studies at the

School for Historical Studies, 1999-2000: Seminars and Colloquia on Late Imperial Chinese Culture and Science," with a "Chinese Studies" website located under the School's website. In addition to leading one seminar on his own current research project on October 4, 1999, Elman also organized three winter-spring colloquia: 1) "Jesuits, Textualism, and Science in China and Europe in the 17th and 18th Centuries: A Roundtable Discussion" (January 24, 2000); 2) "Colloquium on Culture and Science in Late Traditional China" (March 17-18, 2000); and 3) "Colloquium Comparing Chinese and Greek Natural Philosophy and Science, 400 B.C. - A.D. 200" (April 21, 2000), which included presentations by Geoffrey Lloyd, Cambridge University, and Nathan Sivin, University of Pennsylvania. Elman also presented a talk entitled "Cultural Prisons or Impartial Testing Sites? Civil Examinations in Late Imperial China," for the Friends of the Institute for Advanced Study (March 8, 2000) and as part of the East Asian Studies Colloquium at the University of Pennsylvania (October 11, 1999).

In his final year next year, Elman will organize a series of events entitled "East Asian Studies at the School of Historical Studies, 2000-2001: Seminars and Colloquia on Chinese, Japanese, Korean, and Vietnamese Traditional History and Civilization." His own research will focus on the influence of late imperial Chinese classical scholarship in Tokugawa, Japan (1600-1867) before the Meiji Restoration.

PROFESSOR IRVING LAVIN continued to serve as a member of the National Committee for the History of Art, and as advisor to the city of Modena for a structural fantasy designed by the architect Frank Gehry, to the architect Michael Graves for the decorative program of a new Federal Court House in Washington, and to the Storm King Art Center, Mountainville, NY, for the future planning and development of that institution. Professor Lavin gave courses of lectures at the Collegio San Carlo in Modena and at the Istituto Italiano per gli Studi Filosofici in Naples, and gave a number of lectures and papers presented at symposia, including: Blanton Museum of Art, University of Texas at Austin; Yale University; Accademia dei Lincei, Rome. Professor Lavin serves on the editorial boards of a number of scholarly journals, including *Quaderni d'italianistica*, *History of European Ideas*, *Art e Dossier*, *Palladio*, and *Rivista di storia dell' architettura e restauro*. His publications include books and papers in Italian and English: *Santa Maria del Fiore. Il duomo di Firenze e la Vergine incinta*, Rome, 1999; [With Marilyn Aronberg Lavin] *Liturgia d'amore. Immagini dal Canto dei Cantici nell'arte di Cimabue, Michalangelo, e Rembrandt*, Modena, 1999; "Bernini's Bumbling Barberini Bees," in J. Imorde, et al., eds., *Barocke Inszenierung*, Zurich, 1999, 50-71; "Bernini's Bust of the Savior and the Problem of the Homeless in Seventeenth-century Rome," *Italian Quarterly*, XXXVII, 2000.

PROFESSOR JACK F. MATLOCK, Jr. delivered a Faculty lecture at the Institute for Advanced Study on "Preparing for the 21st Century? World Politics Today." He also lectured at the University of Edinburgh; for World Affairs Councils in Greensboro, NC, Seattle, Washington, and Washington, DC; for the Santa Fe Council on International Relations; the University of Wisconsin-Eau-Claire; the National Bureau of Asian Research; the U.S. Institute of Peace; the Princeton Committee on Foreign Relations; the Miller Center at the University of Virginia; and at a workshop sponsored by Sit Investments in Palm Springs. Professor Matlock was the keynote speaker for a presentation to the MIT Center for International Studies held at the National Press Club in Washington, DC where he spoke on foreign policy, international relations, and national interest. He delivered the Second Annual Robert Strausz-Hupe Lecture at the Foreign Policy Research Institute in Philadelphia. He

traveled to Stockholm to deliver the keynote address for a conference on Latvia under foreign occupation. He was interviewed by the BBC in connection with a documentary on Yeltsin, and by CNN on current Russian matters.

Professor Matlock participated in several conferences, including ones in Munich on the end of the Cold War and German unification, and in Berlin on the U.S.-Russian-European Agenda. He also addressed a conference at Hofstra University on Prime Minister Thatcher. He took part in workshops sponsored by the Carnegie Endowment for International Peace on National Missile Defense, by the U.S. Institute of Peace on early warning of ethnic conflict, and by The Gorbachev Foundation on the future of U.S. and Russian relations. In the fall, he participated in a roundtable discussion with Eduard Shevardnadze, President of the Republic of Georgia, and served as an election observer for the Appeal of Conscience Foundation during the Russian parliamentary elections.

Articles completed during the year included essays for *The New York Review of Books*, *Foreign Affairs*, *The New York Times Book Review*, and the *Los Angeles Times*. An op-ed piece entitled "Russia Votes: Will Democracy Win?" appeared in *The New York Times*. He also wrote an introduction and a foreword to books by Heyward Isham and Walter Clemens and submitted a chapter for inclusion in a book called *Turning Points in the Ending of the Cold War*.

Professor Matlock continued his research and writing for the two books he is preparing with the working titles *Understanding Russia* and *Reagan and Gorbachev: How the Cold War Ended*.

PROFESSOR HEINRICH von STADEN presented an invited paper in September 1999 at a symposium at the University of Heidelberg on theories of anger in Greco-Roman antiquity. In early October 1999, he lectured in France (University of Nice) at a colloquium on the Hippocratic Corpus. At the end of October, he gave seminars and lectures at Howard University in Washington, DC, as the guest of the Department of Classics, the Department of Biology, and the Ralph J. Bunche International Affairs Center. In early November 1999, he gave a talk on the Hippocratic Oath to the Friends of the Institute, and in late November he gave a lecture on Galen in London at a conference co-sponsored by the University of London and the Wellcome Institute for the History of Medicine. In early December 1999, he delivered the annual Sheila Kassman Memorial Lecture at the Institute of Classical Studies in London. In late December he chaired a panel on "Technology and the Sciences" at the annual meeting of the American Philological Association in Houston. In January 2000 he gave a lecture at UCLA, jointly sponsored by the Department of History and the School of Medicine. In February 2000 he lectured at Yale University, first on the early history of medical specialization (under the auspices of the School of Medicine), and then on ancient scientific and cultural responses to the observation of exceptions to established scientific rules or laws (at the Whitney Humanities Centre). In April, he gave lectures in Italy at the Universities of Florence and Milan. He was also invited to give the Fielding H. Garrison lecture in May 2000, at the annual meeting of the American Association of Historians of Medicine in Bethesda, Maryland.

His publications in the academic year 1999-2000 included "Rostovtzeff a Yale," in *Rostovtzeff e l'Italia*, edited by Arnaldo Marcone (Naples: Edizioni Scientifiche Italiane, 1999), pp. 63-95; "Reading the Agonal Body," in *Medicine and the History of the Body. Proceedings*

of the 20th, 21th, and 22nd International Symposium on the Comparative History of Medicine – East and West, edited by Yasuo Otsuka, Shizu Sakai, and Shigehisa Kuriyama (Tokyo: Ishiyaku EuroAmerica, 1999), pp. 287-294; "Rupture and Continuity: Hellenistic Reflections on the History of Medicine," in *Ancient Histories of Medicine. Essays in Medical Doxography and Historiography in Classical Antiquity*, edited by P. J. van der Eijk (Leiden: E. J. Brill, 1999), pp. 143-187; "Celsus as Historian?," in the same collection of essays, pp. 251-294; "Caelius Aurelianus and the Hellenistic Epoch: Erasistratus, the Empiricists, and Herophilus," in *Le traité des 'Maladies Aiguës' et des 'Maladies Chroniques' de Caelius Aurelianus. Nouvelles approches*, edited by Philippe Mudry (Nantes: Institut Universitaire de France, 2000), pp. 85-119; a number of articles in encyclopedias; and several book reviews. In February 2000, Professor von Staden was elected a member of the 'scientific committee' of the Italian journal *Filologia antica e moderna*. He also continued to serve on the editorial boards of the journals *Configurations: Literature, Science, and Technology* and *Bulletin of the History of Medicine*, on the board of managers of the *Journal of the History of Medicine and Allied Sciences*, and as a member of a research unit at the Sorbonne (Université de Paris-IV) associated with the Comité National de Recherche Scientifique.

PROFESSOR MARSHALL CLAGETT continued research and writing necessary for the completion of Volume Four of his *Ancient Egyptian Science: A Source Book*. His work has involved an analysis and translation of the major medical papyri primarily from the Middle Kingdom (ca. 2040 to 1640 B.C.), the classical period of the literature of Pharaonic Egypt, as well as the study of Egyptian techniques of representing nature. This will be the last volume of this series.

PROFESSOR OLEG GRABAR lectured at the David Museum in Copenhagen, and summarized a symposium on Andalusia at New York University and one on Ottoman art at Harvard University. He continued to serve on the grants committee of the Max van Berchem Foundation in Geneva and was appointed representative of the Director General of UNESCO for the preservation of the Old City of Jerusaelm. His publications were: "The Meaning of Sinan's Architecture," in Aktas-Yasa ed. Mimar Sinan Sempozyomu Bildeirileri (Ankara, 1966), pp. 275-83; "The Many Gates of Ottoman Art," 10th International Congress of Turkish Art (Geneva, 1999), pp. 19-26; "Aux frontières de Byzance et de l'Islam," E.S. Smirnova ed., Drevne-Russkoe Iskusstovo (Essays for the 100th Anniversary of the Birth of A, Grabar) (Moscow, 1999), pp. 111-14; "Qu'est-ce-que l'Art Fatimide," M. Barrucand ed., L'Egypte Fatimide, Son Art et Son Histoire (Paris, 1999), pp. 11-18; "Il Sacro recinto di Gerusalemme," KOS, 172-3 (2000), pp. 30-37; "Architecture in the Encyclopedia Iranica," Studia Iranica 31 (1998), pp. 371-76; "The Implications of Collecting Islamic Art," in S. Vernoit ed., Discovering Islamic Art (London, 2000), pp. 194-200; "Kunst und Kultur in der Welt der Islam," M. Hattastein and P. Delius eds., Islam Kunst und Architektur (Köln, 2000), pp. 35-53.

PROFESSOR CHRISTIAN HABICHT continued to serve on committees of the American Philosophical Society and the Berlin-Brandenburgische Akademie der Wissenschaften. He was a Ph.D. thesis examiner for the dissertation of Lara O'Sullivan, "The Regime of Demetrius of Phalerum in Athens" (University of Western Australia). He was elected a Corresponding Member of the Academy of Athens; his inaugural lecture,

scheduled for February 29th, was postponed because of illness and rescheduled for October. In Uppsala (Sweden), he participated in May in an international symposium on Kos in the hellenistic period and gave a paper, "The Dating of the Koan Monarchoi."

The Harvard University Press published, in the summer of 1999, a paperback edition of his *Athens from Alexander to Antony*. A French edition, *Athènes hellénistique*, translated by Martine and Denis Knoepfler, was published in March 2000, by Les Belles Lettres, Paris.

His publications included "Städtische Polemarchen in Thessalien," *Hermes* 127, 1999, 254-256; "Zum Vertrag zwischen Latmos und Pidasa," *Epigraphica Anatolica* 30, 1999, 9-10; "Zu griechischen Inschriften aus Kleinasien," *Epigraphica Anatolica* 31, 1999, 19-29, and a review of Jochen Bleicken, *Augustus. Eine Biographie*, in *Rechthistorisches Journal* 18, 1999, 12-22. Six other articles and two reviews were accepted for publication.

PROFESSOR GEORGE KENNAN, concerned to restrict his writings and statements to ones not unseemly for one of his age and condition, devoted most of his scholarly efforts in 1999 to the preparation of a small history of the first three generations of his New England family. The book is scheduled to be published in October 2000.

By way of exceptions to this restraint, he gave in the same year two interviews, one with Professor Richard Ullman of Princeton University, for publication in *The New York Review of Books*; and the other to Mr. George Seay of the Woodrow Wilson Center, for dissemination over National Public Radio.

He also attended, as guest of honor and speaker, a formal Washington dinner for which both the Woodrow Wilson Center and the Kennan Institute for Advanced Russian Studies figured as hosts. The occasion for the dinner was the celebration of the 25th anniversary of the later institution.

PROFESSOR PETER PARET has begun work on a new project, a study of the relationship between certain forms of modernism in German art and the aesthetics of Adolf Hitler, a subject that grew out of his forthcoming book on German modernism. During the academic year, he published an expanded version of his *Festvortrag* at the annual meeting of the Fontane- Gesellschaft in Potsdam in September 1999, "Fontane und der nicht gegenwärtige Clausewitz," in *Fontane Blätter*, LXIX (2000). His address at the annual meeting of the Clausewitz Gesellschaft in Hamburg in August 1999, "Wege der Annäherung an das Werk des Generals von Clausewitz," appeared in a special number of the *Akademie Information* of the *Führungsakademie der Bundeswehr* (1999); and an essay, "The History of Armed Power," in *The Blackwell Companion to Historical Thought*, ed. Lloyd Kramer and Sara Maza, Blackwell, Oxford. A review essay, "Three Perspectives on Art as a Force in German History," is forthcoming in *Central European History*. He revised his entry "Clausewitz" for the second edition of the *Oxford Dictionary of International Politics*. His introduction to Carl von Clausewitz, *Two Letters on Strategy*, came out in a third edition by the Army War College Foundation and the Command and General Staff College, Fort Leavenworth, Kansas. In June, Professor Paret received the Order of Merit from the German Federal Republic.

PROFESSOR MORTON WHITE delivered the John Dewey Memorial Lecture, "From Rationalism to Holistic Pragmatism," on April 25, 2000, at the annual meeting of the John Dewey Society and the American Educational Research Association in New

Orleans; an expanded version of the lecture will be published as a book. He also delivered a talk entitled "Some Reminiscences of Nelson Goodman" at a symposium in memory of Professor Goodman at Harvard University on March 18, 2000. His paper, "Peirce's *Summum Bonum* and the Ethical Views of C. I. Lewis and John Dewey," appeared in the December 1999 issue of *Philosophy and Phenomenological Research*. His paper, "The Psychologism of Hume and Quine Compared," delivered to the Twentieth World Congress of Philosophy in 1998, appeared in *Modern Philosophy*, Volume Seven of the Proceedings of the Congress. He continues to work on a critical history of the philosophy of culture from Descartes to the twentieth century.

MAGDA AL-NOWAIHI
Arabic Literature
Columbia University · *f*

JUNE ALLISON
Classics
The Ohio State University · *s*

CHRISTIANE ANDERSSON
Renaissance Art History
Bucknell University · *f*

ROBERT ANTLIFF
Art History
Duke University · *s*

MARTIN AURELL
Medieval History
Université de Poitiers · *f*

ALISON BEACH
Medieval History
Institute for Advanced Study · *a*

NIKOLAI BOLKHOVITINOV
History of International Relations, History of the USA and Russia
Russian Academy of Sciences, Moscow

HARRY BONE
Islamic History
Institute for Advanced Study · *a*

WARD BRIGGS
Classical Tradition
University of South Carolina

CYNTHIA BROKAW
Late Imperial Chinese History (Ming and Qing Dynasties)
University of Oregon

PINGYI CHU
Chinese History
Academia Sinica, Taiwan · *vs*

KEVIN CLINTON
Greek Epigraphy
Cornell University · *n*

OLIVIA REMIE CONSTABLE
History of Medieval Near East and Mediterranean World
University of Notre Dame · *vf* · *s*

PETER DINZELBACHER
Medieval Studies
University of Stuttgart and University of Vienna

SUSAN DOWNEY
Archaeology, Art History, Classics
University of California, Los Angeles · *f*

NOËL DUVAL
Christian Art and Archaeology
La Sorbonne, Paris · *s*

THEODORE EVERGATES
Medieval History
Western Maryland College · *s*

VALERIE FLINT
Medieval Ecclesiastical History
University of Hull · *vf*

SARAH FRASER
Art History (Chinese Painting)
Northwestern University · *vf*

MARY LOUISE GILL
Ancient Greek Philosophy
University of Pittsburgh

RICHARD GRASSBY
Early Modern British History
Independent Scholar

JASPER GRIFFIN
Greek and Latin Literature
University of Oxford · *s*

MIRIAM GRIFFIN
Ancient History
University of Oxford · *vs*

ROGER HART
Traditional Chinese History and History of Science
Stanford University · *n*

JANE HATHAWAY
Near Eastern Studies
The Ohio State University · *s*

JULIE HESSLER
Soviet History; Twentieth-century History
University of Oregon

f First Term · *s* Second Term · *v* Visitor · *a* Research Assistant · *n* NEH Supported

DAVID HOLLINGER
United States History
University of California, Berkeley · *s*

C. STEPHEN JAEGER
Medieval German Literature
University of Washington · *n*

CHRISTOPHER ANDREW JONES
Anglo-Saxon Church History
The Ohio State University

BIRGIT KRAWIETZ
Islamic Law, Islam and Modernity
University of Tübingen

BHADRIRAJU KRISHNAMURTI
Historical Linguistics
University of Hyderabad

HELEN LANG
Ancient Philosophy
Trinity College · *s*

JOHN LEDONNE
Russian History
Harvard University

PATRICIA LEIGHTEN
Late Nineteenth- and early Twentieth-century Art and Politics; Modernism
Duke University · *s*

CHRISTOPHER MELCHERT
Islamic History
Institut Français des Etudes Arabes de Damas · *n*

VIVIAN NUTTON
History of Medicine
Wellcome Institute for the History of Medicine, London · *s*

STEVEN PINCUS
Early Modern British History
University of Chicago

DAVID PORTER
Eighteenth-century Literary and Cultural History
University of Michigan

HAN QI
History of Science and Late Imperial Chinese History
Chinese Academy of Sciences, Beijing · *s*

GIUSEPPE RAGONE
Greek History and Epigraphy
University of Basilicata, Potenza · *s*

SULHINISO RAHMATULLAEVA
Islamic Art and Culture
Academy of Sciences of Tajikistan

SARA RAPPE
Classics
University of Michigan, Ann Arbor · *s*

CHASE ROBINSON
Islamic History
University of Oxford · *f* · *vs*

CYNTHIA ROBINSON
Art History
Institute for Advanced Study · *a*

NORMAN ROSE
International History
The Hebrew University of Jerusalem, Israel

THOMAS RÜTTEN
History of Medicine
Institute for Advanced Study · *a*

NINA SEREBRENNIKOV
Northern European Art of the Sixteenth and Seventeenth Centuries
Davidson College · *f*

BETTE TALVACCHIA
Art History
University of Connecticut

VERA TOLZ
Russian History
University of Salford · *f*

JÖRG TRAEGER
Art History
Universität Regensburg · *f*

THOMAS WILSON
Traditional Chinese Cultural History
Hamilton College

JOCELYN WOGAN-BROWNE
Medieval Studies
University of Liverpool · *f*

f First Term · *s* Second Term · *v* Visitor · *a* Research Assistant · *n* NEH Supported

THE SCHOOL OF HISTORICAL STUDIES

RECORD OF EVENTS

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

Islamic History Seminar: "Gender Practice, Three Mamluk Views of Futuwwa"
MEGAN REID, *Princeton University*

Historical Studies Colloquium: "The Formation of the Sunni Community: The Islamic Sciences"
CHRISTOPHER MELCHERT, *Member, Institute for Advanced Study*

Chinese Studies Seminar: "Rethinking the Transition from 'Chinese Science' to 'Modern Science' in China"
BENJAMIN ELMAN, *Mellon Visiting Professor, Institute for Advanced Study*

Historical Studies Colloquium: "Excavating the Past: 300 B.C. and A.D. 1937: The Temple of Zeus Megistos at Dura-Europos"
SUSAN DOWNEY, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "Alternatives to Perspective in Sixteenth-century Central Italy"
MARCIA HALL, *Temple University*

Historical Studies Colloquium: "Eleanor of Aquitaine (1124-1204) and Her Modern Historians: The Destruction of a Myth"
MARTIN AURELL, *Member, Institute for Advanced Study*

Medieval Seminar: "*Pandocheion, Funduq and Fondaco*: Problems of Transition and Terminology"
OLIVIA REMIE CONSTABLE, *Member, Institute for Advanced Study*

Chinese Studies Seminar: "The Publishing Industry and the Reading Public in Late Imperial China"
CYNTHIA BROKAW, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "An Ampler Ether, A Diviner Air: Picturing Space in Early Modern Europe"
NINA SEREBRENNIKOV, *Member, Institute for Advanced Study*

Islamic History Seminar: "Medina in an Eighteenth-century European Illustration"
OLEG GRABAR, *Professor Emeritus, Institute for Advanced Study*

Historical Studies Colloquium: "Some Results of the Study of Russian America, 1732-1867"
NIKOLAI BOLKHOVITINOV, *Member, Institute for Advanced Study*

Medieval Seminar: "A Nun's Letter Collection from Twelth-century Admont"
ALISON BEACH, *Research Assistant, Institute for Advanced Study*

Historical Studies Colloquium: "Researching the Churchill and Weizmann Biographies"
NORMAN ROSE, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "David's Sacre and the Performative"
TODD PORTERFIELD, *Princeton University*

Chinese Studies Seminar: "Reading Essays and Punctuating Classical Texts"
BENJAMIN ELAMN, *Mellon Visiting Professor, Institute for Advanced Study*

Historical Studies Colloquium: "The Role of Perspective in Raphael's Disputa del Sacramento'"
JORG TRAEGER, *Member, Institute for Advanced Study*

School of Historical Studies Lecture: "Cut Your Glosses: New Evidence for Language Learning in Late Antiquity"
JAMES CLACKSON, *University of Cambridge*

Medieval Seminar: "The Coronation of Harold in the Bayeux Tapestry"
BARBARA ENGLISH, *Visiting Fellow, Princeton University*

Islamic History Seminar: "The Traditional Buildings of the Merv Oasis"
GEORGINA HERMANN, *University College, London*

School of Historical Studies Lecture: "Ancient and Medieval Merv: A City on the Great Silk Road"
GEORGINA HERMANN, *University College, London*

Chinese Studies Seminar: "Ritualizing Confucius"
THOMAS WILSON, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "Work in Progress: 'tel en latin, tel en rumanz': Women's Vernacular Theology in Anglo-Norman England?"
JOCELYN WOGAN-BROWNE, *Member, Institute for Advanced Study*

Medieval Seminar: "La Cour Plantagenêt (1154-1204): Entourage, Savoir et Civilité"
MARTIN AURELL, *Member, Institute for Advanced Study*

Chinese Studies Seminar: "Quantifying Ritual: Political Cosmology, Courtly Music, and Precision Calculation in Seventeenth-century China"
ROGER HART, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "The Central Middle Ages as Europe's 'Achsenzeit'. Problems of Approach"
PETER DINZELBACHER, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "The Emergence of Collage in the Context of Late Nineteenth-century Paris"
JACK SPECTOR, *Rutgers University*

Islamic History Seminar: "Medieval Islamic Historiography"
CHASE ROBINSON, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "Russian National Identity: Between Empire and the West"
VERA TOLZ, *Member, Institute for Advanced Study*

Medieval Seminar: "Our Steward, St. Jerome"
JOCELYN WOGAN-BROWNE, *Member, Institute for Advanced Study*

School of Historical Studies Lecture: "The Pope Who Made Our Millennium: Gregory XIII and the Art of Calendrical Politics in the Counter-Reformation"
NICOLA COURTRIGHT, *Amherst College*

Historical Studies Colloquium: "Cristoforo dei Buondelmonti, Vytautas of Lithuania, and the First Modern Map of Constantinople"
GIUSEPPE RAGONE, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "Folla/Follà: Futurism and the Crowd"
CHRISTINE POGGI, *University of Pennsylvania*

Historical Studies Colloquium: "Human Anxieties and the Evil Eye in Islam"
BIRGIT KRAWIETZ, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "The Basic Mechanism of Sound Change: The Neogrammarian Controversy"
BHADRIRAJU KRISHAMURTI, *Member, Institute for Advanced Study*

Chinese Studies Seminar: "Jesuits, Textualism, and Science in China and Europe in the 17th and 18th Centuries"
Roundtable Discussion with ANTHONY GRAFTON, *Princeton University*, ROGER HART, *Member, Institute for Advanced Study*, R. PO-CHIA HSIA, *Princeton University*, WILLARD PETERSON, *Princeton University*, and BENJAMIN ELMAN, *Mellon Visiting Professor, Institute for Advanced Study*

Islamic History Seminar: "Ninth-century Views of Taking Payment for Religious Services"
CHRISTOPHER MELCHERT, *Member, Institute for Advanced Study*

School of Historical Studies Lecture: "Charlemagne's Court Library Re-visited"
DONALD A. BULLOUGH, *St. Andrews University*

Historical Studies Colloquium: "China and the Invention of British Aesthetic Culture"
DAVID PORTER, *Member, Institute for Advanced Study*

Medieval Seminar: "Animal Trials in the Late Middle Ages"
PETER DINZELBACHER, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "Reconsidering the Raising of the Cross: The Real Significance of Rubens' Roman Sojourn"
CYNTHIA LAWRENCE, *Temple University*

Historical Studies Colloquium: "B.L. Gildersleeve and the Oscillations of American Classical Scholarship"
WARD BRIGGS, *Member, Institute for Advanced Study*

Chinese Studies Seminar: "Chinese Literati's Attitudes to Western Science: Transition from the Late Kangxi Period to the Mid-Qianlong Period (ca. 1700-1760)"
HAN QI, *Member, Institute for Advanced Study*

Islamic History Seminar: "Modern Muslim Discussions of Criteria of Death"
BIRGIT KRAWIETZ, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "Returning the Sacrifices to Confucius: The Grand Feast and the Meaning of Confucianism"
THOMAS WILSON, *Member, Institute for Advanced Study*

Chinese History Seminar: "The Editions of the Gezhi Congshu Collectanea"
Discussion led by BENJAMIN ELMAN, *Mellon Visiting Professor, Institute for Advanced Study*

Medieval Seminar: "The Aristocratic Family in Medieval France"
THEODORE EVERGATES, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "Lost in Translation: Clement Greenberg, Anselm Kiefer and the Subject of History"
LISA SALTZMAN, *Bryn Mawr College*

Historical Studies Colloquium: "Rewriting Arab History, 1516-1800"
JANE HATHAWAY, *Member, Institute for Advanced Study*

Two-day symposium on "Culture and Science in Late Traditional China"
"Producing Medical Knowledge Through Cases: History, Evidence, and Action"
CHARLOTTE FURTH, *University of Southern California*
"Domestic Architecture and the Engineering of Social Order in Late Imperial China"
FRANCESCA BRAY, *University California, Santa Barbara*
"Disputing Confucius: Debates on the Status of the Sage in the State and Family Cults of Confucius"
THOMAS WILSON, *Member, Institute for Advanced Study*
"The Jesuits as Missionaries of Science: Euclid's Elements in Seventeenth-century China"
ROGER HART, *Member, Institute for Advanced Study*
"Mathematical Sciences in the Kanxi Emperor's Court"
QI HAN, *Member, Institute for Advanced Study*
"Boundaries Crossing: Western Astronomy in Confucian China, 1600-1800"
PINGYI CHU, *Visitor, Institute for Advanced Study*
"On the History of the Book in Late Imperial China"
CYNTHIA BROKAW, *Member, Institute for Advanced Study*
"New Answers to Old Questions on the Late Imperial Chinese Civil Examinations, 1400-1900"
BENJAMIN ELMAN, *Mellon Visiting Professor, Institute for Advanced Study*
"In Search of Old Peking"
SUSAN NIQUIN, *Princeton University*

Historical Studies Colloquium: "Commerce in Culture: The Sibao Publishing Industry, 1663-1946"
CYNTHIA BROKAW, *Member, Institute for Advanced Study*

Medieval Seminar: "Suspect Doctrines and Intellectual Freedom in Late Medieval England: Some Instances of Book Ownership and Patronage"
KATHRYN KERBY-FULTON, *Visiting Fellow, Princeton University*

Islamic History Seminar: "An Uncanonical Prayer Denounced by Twelfth-century Scholars"
DANIELLA TALMON-HELLER, *Princeton University*

Historical Studies Colloquium: "Place and Extension: The Problems and Language of Ancient Physics (especially Aristotle)"
HELEN LANG, *Member, Institute for Advanced Study*

Historical Studies Colloquium: "The Grand Strategy of the Russian Empire 1700-1825"
JOHN LEDONNE, *Member, Institute for Advanced Study*

Medieval Seminar: "The Lost Love Letters of Aberlard and Heloise"
STEPHEN JAEGER, *Member, Institute for Advanced Study*

Princeton Art History Colloquium: "Mimesis and Ideation in Vermeer's Home"
H. PERRY CHAPMAN, *University of Delaware*

Islamic History Seminar: "A Poem by Abu Nuwas"
MAGDA AL-NOWAIHI, *Visitor, Institute for Advanced Study*

Chinese Studies Seminar: "Colloquium: Comparing Chinese and Greek Natural Philsophy and Science, 400 B.C.-A.D 200"
SIR GEOFFREY LLOYD, *Cambridge University*, and NATHAN SIVIN, *University of Pennsylvania*

Islamic History Seminar: "The School of Gundeshapur"
VIVIAN NUTTON, *Member, Institute for Advanced Study*

Islamic History Seminar: "Military and Society in the Early Islamic World"
HUGH KENNEDY, *University of St. Andrews*

Islamic History Seminar: "The Development of the *Funduq*"
OLIVIA REMIE CONSTABLE, *Member, Institute for Advanced Study*

Chinese Studies Seminar: "The Practice of the Imperial Ritual of Sacrifice in China"
THOMAS WILSON, *Member, Institute for Advanced Study*

In addition to the events listed above some groups also met informally on a regular basis. These included weekly gatherings over lunch for Members and Visitors in art history, who met to discuss on-going projects and specific problems encountered in their research. Some of the Islamicists also met regularly for discussion of selected readings. Although they do not appear on the above list, these informal gatherings played an important role in the intellectual life of the School.

Beyond any production of mathematical papers, this academic year has been extremely profitable to my mathematical education. The program has been very rich and was for me a unique opportunity to grasp some aspects of the theory which were very remote from my original background."

— Member, School of Mathematics

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

ARMAND BOREL
ATLE SELBERG

The largest program in the School of Mathematics for 1999-2000 was the special year in the analytic theory of automorphic forms and L-functions. This program was organized by P. Sarnak of Princeton University, H. Iwaniec of Rutgers University, who was the Distinguished Visiting Professor for the year, and School Faculty members E. Bombieri and R. Langlands. The special year focused on the analytic theory of GL(2) automorphic functions and its application to classical problems in number theory; spectral problems in quantum chaos; and the analytic theory of general L-functions such as the Riemann Hypothesis. (There was some material on automorphic functions for other groups, but this was stressed less. This will be the subject of a special year at the Institute in 2000-2001.)

Aside from informal interactions, the main activity of this special year was a series of lectures held three times per week, and designed to be accessible to a fairly general mathematical audience. This was a very successful approach, since modular forms tend to be considered by mathematicians coming from very different scientific backgrounds. Lectures were given by H. Iwaniec, P. Sarnak, E. Kowalski, D. Bump, B. Conrey, F. Shahidi, J. Cogdell, W. Kohnen, H. Jacquet, K. Soundararajan, D. Ramakrishnan, H. Kim, S. Friedberg, R. Murty, D. Goldfeld, H. Stark, N. Katz, A. Panchishkin, M. Furusawa, P. Michel, J. VanderKam, S. Böecherer, P. Cohen, S. Zhang, W. Li, Y. Choie, A. Perelli, A. Zaharescu, S. Wolpert, Z. Mao, T. Watson, S. Johansson, S. Kudla, R. Heath-Brown, S. Rallis, W. Luo, and E. Goins.

L. Lafforgue of CNRS - Orsay gave a series of three lectures on his spectacular recent proof of the Langlands correspondence over function fields. Z. Rudnick of Tel Aviv University gave a series of two lectures on number theoretic problems in quantum chaos. P. Deligne gave a series of two lectures showing how to get information about trigonometric sums, a very concrete object, l-adic cohomology, usually seen as rather abstract.

E. Bombieri gave a series of four lectures entitled "Some elementary remarks on the Guinand-Weil explicit formula." His approach to the Riemann Hypothesis is to give lower bounds for the number of zeros of the Zeta function off of Riemann's line, while the usual methods of analytic number theory put upper bounds on the number of zeros off the line.

On the research front, Shahidi and Kim, experts on the Langlands-Shahidi method, felicitously combined for the special year with Cogdell and Piatetski-Shapiro, experts on converse theorems, proved some spectacular new cases of functoriality, with applications to the Ramanujan conjectures. Cogdell, Piatetski-Shapiro, and Sarnak solved Hilbert's 11^{th} problem over a number field.

Vladimir Voevodsky, who is at the Institute on a multi-year appointment, ran a special year entitled "A^1 homotopy theory." In the beautiful subject, a theory is developed in algebraic geometry that mimics usual homotopy theory from topology, with the complex line replacing the unit interval, except that there are two different kinds of homotopy circles: the complex line minus a point and the complex line with two points identified. This program will continue in the year 2000-2001. The program will present the material needed to understand Voevodsky's celebrated proof of the Milnor Conjecture.

The A^1 homotopy theory program consisted of two courses and a weekly seminar. The first course, entitled "Lectures on Motivic Cohomology," was given by Voevodsky himself. This course concerned the construction and properties of the triangulated category of motives. The second course, "Lectures on Norm Varieties," was given by Markus Rost of The Ohio State University, who was a Member for the year. This course concerned various constructions related to algebraic K-theory, including Steenrod operations and cobordism. The seminar associated with this special program was on Homotopy Theory (the ordinary topological kind). This was the first time in many years that homotopy theory was a serious part of the program at the Institute. Speakers were D. Christensen, C. Rezk, F. Morel, G. Carlsson, M. Bendersky, A. Neeman, P. Hu, and H. Miller.

This academic year was the first year that our new Professor, Avi Wigderson, was in residence. His specialty is theoretical computer science and discrete mathematics. A weekly seminar was held on Combinatorics and Complexity Theory, run by Wigderson. This was a continuation of our now long-standing weekly seminar on discrete mathematics. Speakers were M. Saks, R. Raz, E. Fischer, A. Razborov, E. Ben-Sasson, J. Kahn, L. Trevisan, L. Valiant, E. Friedgut, D. Aharonov, J. Beck, A. Samorodnitsky, Y. Peres, N. Alon, M. Sudan, J. Hastad, R. Shaltiel, P. Winkler, B. Sudakov, A. Yao, and R. Impagliazzo. In the year 2000-2001, there will be a special year on Complexity Theory, run by Wigderson.

Additional weekly seminars included the Analysis Seminar organized by J. Bourgain and T. Spencer, the joint Princeton/IAS/Rutgers Nonlinear Analysis Seminar organized by S. Klainerman, H. Bezis, and J. Bourgain, and as usual, the Members Seminar, whose field of mathematics changes every week. The Princeton/IAS/Rutgers Number Theory Seminar was in abeyance for the year, because all of its organizers were participating in the program on Modular Forms.

The Marston Morse Lectures were given by M. Hopkins of MIT. They were entitled "Modular forms, theta functions, and algebraic topology." It was a tale of a remarkable

cohomology theory that is associated with a family of elliptic curves. By-products of the theory are an explanation for congruencies involving modular forms, and computations of homotopy groups of spheres that are more extensive than was possible before.

A new lecture series was inaugurated: The Ruth and Irving Adler Expository Lectures. These were endowed by Professor Adler of the School of Natural Sciences, in honor of his parents. It is anticipated that this series will be given annually. The object of this series is to have clear expositions of mathematicals, rather than to insist on the newest results. The first lecture was "Modules over Nonunital Rings," a lecture by D. Quillen of Oxford.

In April, there were two workshops at the Institute which were held in partnership with the Clay Mathematics Institute and the School of Mathematics. The first of these was on Localization and Lyapunov Exponents, organized by J. Bourgain and T. Spencer. The second workshop, on Recent Trends in Analytic Number Theory, was organized by E. Bombieri and H. Iwaniec.

Much of the academic activity of the School of Mathematics revolves around informal discussions and collaborations among the Members and with the Faculty. The School continued to refine its mechanisms to encourage these interactions. This year, we began a policy of encouraging home pages for members on our Web site, so that members will know something about each other's work. In addition, we continued and enlarged the practice of having short talks by all postdoctoral Members at the beginning of the year, with an exposition of some aspect of their research interests.

In a bold experiment in mathematical outreach, R. Langlands delivered a series of lectures for a general non-mathematical audience entitled, "The Practice of Mathematics." There were eight lectures in the fall and eight lectures in the spring. They started with classical constructions for Euclid, then the construction with ruler and compass of the regular heptadecagon by Gauss and moved through Kummer's work on Fermat's theorem. These lectures have been videotaped, and both notes and cassettes are available. Avi Wigderson gave a Faculty Lecture entitled "The digital envelope - a crash course in modern cryptography", also intended for a general non-mathematical audience.

In May, Jean Bourgain was elected as a foreign member of the Polish Academy of Sciences; in the month of June, he was elected a foreign associate of the French Academy of Sciences.

The main building of the School of Mathematics has been renamed Simonyi Hall, after Charles Simonyi, Distinguished Engineer, Microsoft Corporation, and Trustee of the Institute, in recognition of his generous support of the programs of the School of Mathematics.

JINHO BAIK
Integrable Systems and Random Permutations
Courant Institute of Mathematical Sciences · i

EUGENI BALKOVSKY
Statistical Theory of Turbulence
Weizmann Institute of Science, Israel

SIEGFRIED BÖCHERER
Modular Forms
Universität Mannheim, Germany

J. DANIEL CHRISTENSEN
Algebraic Topology
The Johns Hopkins University

JAMES COGDELL
Automorphic Forms
Oklahoma State University

PAULA COHEN
Number Theory; Non-commutative Geometry
Université des Sciences et Technologies de Lille, France · s

CATERINA CONSANI
Arithmetic Algebraic Geometry
Massachusetts Institute of Technology

RAPHAËL DANCHIN
Harmonic and Numerical Analysis
Université Paris 6, France

INGRID DAUBECHIES
Applied Harmonic Analysis, Wavelets
Princeton University · *f*

CALIN DIACONU
Analytic Number Theory, Automorphic Forms
Brown University

DAMIANO FOSCHI
Nonlinear Wave Equations
Princeton University

JOHN FRIEDLANDER
Analytic Number Theory
University of Toronto, Scarborough

MASAAKI FURUSAWA
Automorphic Forms and L-functions
Osaka City University, Japan

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

EDRAY GOINS
Elliptic Curves, Number Theory
Stanford University

MICHAEL GOLDSTEIN
Nonlinear Equations, Spectral Theory
University of Toronto

MARK GORESKY
Geometry, Automorphic Forms
Institute for Advanced Study

LEONID GURVITS
Optimization
NEC Research Institute

DENNIS HEJHAL
Analytic Number Theory, Modular Forms
University of Minnesota, Minneapolis · s

DAVID INGERMAN
Inverse Problems and Approximations
Courant Institute of Mathematical Sciences

ALEXANDRU IONESCU
Analysis on Lie Groups
Princeton University

HENRYK IWANIEC
Analytic Number Theory
Rutgers University · *dvp*

HERVÉ JACQUET
Automorphic Forms
Columbia University · *v*

STEFAN JOHANSSON
Automorphic Forms
Rutgers University

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

MIRIAM KANTOROVITZ
Commutative Algebra
University of Illinois, Urbana-Champaign

NICHOLAS KATZ
Arithmetical Algebraic Geometry
Princeton University

HENRY KIM
Automorphic L-functions
Southern Illinois University

ANDREW KLAPPER
Cryptography and Coding Theory
University of Kentucky · *vf*

NATALIA KOMAROVA
Nonlinear Systems and Pattern Formation
University of Warwick, United Kingdom

LEONID KORALOV
Random Flows, Turbulence, Hamiltonian Systems
Institute for Advanced Study

EMMANUEL KOWALSKI
Automorphic Forms and L-functions
Institute for Advanced Study · *i*

ALEXANDER KUZNETSOV
Algebraic Geometry
Independent Moscow University, Russia

WEN-CHING LI
Automorphic Forms, Graph Theory
The Pennsylvania State University · *s*

ELON LINDENSTRAUSS
Ergodic Theory; Topological Dynamics
The Hebrew University of Jerusalem, Israel

ZHENGYU MAO
Automorphic Forms
Rutgers University

GEORGIY MEDVEDEV
Applications of Partial Differential Equations
Boston University · *i*

PHILIPPE MICHEL
Analytic Number Theory, Modular Forms
Université Montpellier II, France

WERNER MÜLLER
Geometric Analysis, Automorphic Forms
Universität Bonn, Germany · *s*

M. RAM MURTY
Number Theory
McGill University · *f*

MELVYN NATHANSON
Number Theory
Lehman College, City University of New York · *v*

DMITRI ORLOV
Algebra
Steklov Mathematical Institute, Russia

ALEXEI PANCHISHKIN
P-adic L-functions and Automorphic Forms
Institut Fourier, France · *f*

ALBERTO PERELLI
Analytic Number Theory; Zeta Functions
University of Genova, Italy · *s*

ILYA PIATETSKI-SHAPIRO
Automorphic Forms and L-functions
Yale University

HARU PINSON
Mathematical Physics
Institute for Advanced Study · *a*

DINAKAR RAMAKRISHNAN
L-functions of Curves and Automorphic Forms
California Institute of Technology

ALEXANDER RAZBOROV
Combinatorics, Theoretical Computer Science, Complexity Theory
Steklov Mathematical Institute, Russia · *v*

OMER REINGOLD
Cryptograpy, Computational Complexity
Weizmann Institute of Science, Israel · *v*

CHARLES REZK
Homotopy Theory
Northwestern University

MARKUS ROST
Algebraic K-theory, Galois Cohomology
Universität Regensburg, Germany

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

ALEX SAMORODNITSKY
Coding Theory, Complexity, Extremal Set Theory
The Hebrew University of Jerusalem, Israel

PETER SARNAK
Analytic Number Theory, Automorphic Forms
Princeton University

RAINER SCHULZE-PILLOT
Quadratic Forms, Automorphic Forms
Universität des Saarlandes, Germany

CHRISTOPHER SKINNER
Number Theory
Princeton University

MARTIN SOMBRA
Intersection Theory of Arithmetic Varieties
Universidad Nacional de la Plata, Argentina

KANNAN SOUNDARARAJAN
Number Theory, Modular Forms
Princeton University

HAROLD STARK
Analytic and Algebraic Number Theory, Modular Forms, Transcendence and Interrelations
University of California, San Diego · *v*

BENNY SUDAKOV
Combinatorics
Tel Aviv University · *i*

MICHAEL SULLIVAN
Symplectic Geometry
Stanford University

MARIO SZEGEDY
Combinatorics, Complexity Theory
AT&T Shannon Labs

PETER TRAPA
Representation Theory of Reductive Groups
Institute for Advanced Study

ALEXANDER VISHIK
Quadratic Forms, K-theory
McMaster University · *s*

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

CHARLES WEIBEL
Algebraic K-theory and Motivic Cohomology
Rutgers University · *v*

ANDREW WILES
Algebraic Number Theory
Princeton University · *s*

ALEXANDRU ZAHARESCU
Number Theory
McGill University

UMBERTO ZANNIER
Diophantine Approximation
Instituto Universitario di Architettura di Venezia, Italy · *s*

s Second Term *v* Visitor *i* Veblen Research Instructorship

THE SCHOOL OF MATHEMATICS

RECORD OF EVENTS

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

Academic Year [illegible]

September [illegible]
Combinatorics and Complexity Theory Seminar:
"An Improved Exponential-time Algorithm for k CNF Satisfiability"
MICHAEL SAKS, *Rutgers University*

September 30
Automorphic Forms and L-functions Seminar:
"Overview of Analytic GL(2) Theory and Applications"
HENRYK IWANIEC, *Institute for Advanced Study*

"Overview of Analytic Theory of L-functions and [illegible] Applications"
PETER SARNAK, *Institute for Advanced Study*

October 4
Combinatorics and Complexity Theory Seminar:
"Operator Scaling and Approximating the Mixed Discriminant"
LEONID GURVITS, *NEC Institute*

Princeton-IAS-Rutgers Nonlinear Analysis Seminar:
"Lyapounov Exponents, Quasi-periodic Localization and Semi-algebraic Sets"
JEAN BOURGAIN, *Institute for Advanced Study*

October 5
Automorphic Forms and L-functions Seminar:
"Number Theoretic Problems in "Quantum Chaos""
ZEEV RUDNICK, *Tel Aviv University*

October 6
Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

October 7
Automorphic Forms and L-functions Seminar: "Spectral Formulae for the Fourier Coefficients of Modular Forms and Applications"
EMMANUEL KOWALSKI, *Institute for Advanced Study*

"Rankin-Selberg L-functions on GL(n)"
DANIEL BUMP, *Stanford University*

October [illegible]
Combinatorics and Complexity Theory Seminar:
"Exponential Separation of Quantum and Classical Communication Complexity, and Some Geometrical Properties of the Sphere S^n"
RAN RAZ, *The Weizmann Institute of Science, Israel*

October [illegible]
Automorphic Forms and L-functions Seminar:
"On Quantum Ergodicity for Toral Automorphisms"
ZEEV RUDNICK, *Tel Aviv University*

Homotopy Theory Seminar: "Phantom Maps"
J. DANIEL CHRISTENSEN, *Institute for Advanced Study*

Homotopy Theory Seminar: "On Analogies Between Algebraic and Real Cobordism"
IGOR KRIZ, *University of Michigan*

October [illegible]
Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

October 14
Automorphic Forms and L-functions Seminar:
"Mean-values of Zeta and L-functions: An Overview"
BRIAN CONREY, *Institute for Advanced Study*

"Trigonometric Sums and l-adic Cohomology: An Overview"
PIERRE DELIGNE, *Institute for Advanced Study*

October [illegible]
Analysis Seminar: "Universality and the 2 Dimensional Ising Model"
HARU PINSON, *Institute for Advanced Study*

October [illegible]
Special Seminar: "Total Positivity Criteria and Matrix Factorization"
SERGEY FOMIN, *University of Michigan* and *Massachusetts Institute of Technology*

Automorphic Forms and L-functions Seminar: "Another Approach to L-functions with Applications: A Survey"
FREYDOON SHAHIDI, *Purdue University*

Homotopy Theory Seminar: "Some Dualities in the Stable Homotopy Category"
CHARLES REZK, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "Toeplitz Identities, Shur Functions, and Unitary Statistics"
DANIEL BUMP, *Stanford University*

"Converse Theorems"
JAMES COGDELL, *Institute for Advanced Study*

Special Homotopy Theory Seminar: "Operads of Braids and Trees"
JACK MORAVA, *Johns Hopkins University*

Analysis Seminar: "Symmetrized Random Permutations"
JINHO BAIK, *Princeton University* and *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar: "Graph Embeddings via the Regularity Lemma"
ELDAR FISCHER, *Tel Aviv University*

Members Seminar: "Complexity of Algebraic Proof Systems
ALEXANDER RAZBOROV, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Central Critical Values of Spinor Zeta-function"
WINIFRIED KOHNEN, *Heidelberg University*

Homotopy Theory Seminar: "Adams Spectral Sequence and Cohomology Invariants of Quadratic Forms"
FABIEN MOREL, *University of Paris VII*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "Trigonometric Sums and l-adic Cohomology (continued)"
PIERRE DELIGNE, *Institute for Advanced Study*

"Gelfand Pairs and L-functions"
HERVE JACQUET, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "www.monodromy.edu"
NICHOLAS KATZ, *Institute for Advanced Study*

Special Homotopy Theory Seminar: "Segal's Conjecture and Other Descent Problems in the Equivariant Stable Homotopy Theory"
GUNNAR CARLSSON, *Stanford University*

Analysis Seminar: "Pointwise Theorems for Amenable Groups"
ELON LINDENSTRAUSS, *The Hebrew University of Jerusalem, Israel*

Members Seminar: "Modular Forms in Homotopy Theory"
CHARLES REZK, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Mollifying L-functions"
KANNAN SOUNDARARAJAN, *Institute for Advanced Study*

Homotopy Theory Seminar: "The Adams-Novikov Spectral Sequence"
CHARLES REZK, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Analysis Seminar: "Averages of Shifts of Plurisubharmonic Functions, Eliminations of Variables in Inequalities, and Anderson Localization of Eigen Functions"
MICHAEL GOLDSTEIN, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Landau-Siegel Zeros and Cusp Forms"
DINAKAR RAMAKRISHNAN, *Institute for Advanced Study*

"Langlands-Shahidi Methods and Poles of Automorphic L-functions"
HENRY KIM, *Institute for Advanced Study*

Members Seminar: "Supercuspidal Lifts from PGL_3 to G_2"
WEE TECK GAN, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar: "Many Hard Examples for the Polynomial Calculus Joint Work with Russell Impagliazzo, from UCSD"
ELI BEN-SASSON, *The Hebrew University of Jerusalem, Israel*

Automorphic Forms and L-functions Seminar: "Langlands Correspondence Over Function Fields: Principle of the Proof"
L. LAFFORGUE, *Centre National de la Recherche Scientifique, University of Orsay*

"Langlands Correspondence Over Function Fields: Implementation of This Principle"
L. LAFFORGUE, *Centre National de la Recherche Scientifique, University of Orsay*

"Langlands Correspondence Over Function Fields: More About Compactifications"
L. LAFFORGUE, *Centre National de la Recherche Scientifique, University of Orsay*

Combinatorics and Complexity Theory Seminar: "Entropy, Independent Sets and Antichains"
JEFF KAHN, *Rutgers University*

Members Seminar: "On Some Analysis Problems Stemming from Analog-to-digital Conversion"
INGRID DAUBECHIES, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "On a Conjecture of Kummer on Class Numbers of Cyclotomic Fields"
RAM MURTY, *Institute for Advanced Study*

Homotopy Theory Seminar: "The Bousfield-Kan Spectral Sequence Based on Periodic Complex K-theory"
MARTIN BENDERSKY, *City University of New York, Hunter College*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "Automorphic Forms and the ABC-conjecture"
DORIAN GOLDFELD, *Columbia University*

"A Century of Class Numbers"
HAROLD STARK, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar: "A PCP Characterization of NP with Optimal Amortized Query Complexity"
LUCA TREVISAN, *Columbia University*

Members Seminar: "K-theoretic Invariants for Symplectic Floer Homology"
MICHAEL SULLIVAN, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Theta Liftings and Classical Theta Series"
R. SCHULZE-PILLOT, *Institute for Advanced Study*

Homotopy Theory Seminar: "On the Work of Smirnov on Grothendieck's Standard Conjectures"
A. NEEMAN, *Australian National University*

Combinatorics and Complexity Theory Seminar: "Robust Logic"
LESLIE G. VALIANT, *Harvard University*

Members Seminar: "On a Conjecture for Product Codes"
MARIO SZEGEDY, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Some Divisibility Properties of Class Numbers of Quadratic Fields"
E. FOUVRY, *University of Orsay*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"www.monodromy.com"
NICHOLAS KATZ, *Institute for Advanced Study*

"p-adic L-functions for GSp_4"
A. PANCHISHKIN, *Institute for Advanced Study*

Analysis Theory Seminar: "On Quasi Periodic Schroedinger Equation"
W. SCHLAG, *Princeton University*

Combinatorics and Complexity Theory Seminar:
"Projections of Subsets of the Discrete and Continuous Cube"
EHUD FRIEDGUT, *MSRI/University of California, Berkeley*

Members Seminar: "Prime Values of Polynomials"
JOHN FRIEDLANDER, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar:
"On Central Critical Values of Degree Four L-functions for Gsp(4): Fundamental Lemma"
M. FURUSAWA, *Institute for Advanced Study*

Homotopy Theory Seminar: "The Picard Group of the Stable A^1-homotopy Category"
PO HU, *University of Chicago*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"On the Arithmetic Geometry of $X_0(q)$: Analytic Methods and L-functions"
P. MICHEL, *Institute for Advanced Study*

Analysis Theory Seminar: "Laplace Operator and Continued Fractions"
DAVID INGERMAN, *Institute for Advanced Study*

Members Seminar: "Approximating the Permanent"
ALEX SAMORODNITSKY, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar:
"A Quantum to Classical Phase Transition in Noisy Quantum Computers"
DORIT AHARONOV, *University of California, Berkeley*

Homotopy Theory Seminar: "S-modules in the A^1-homotopy Theory"
-PO HU, *University of Chicago*

Homotopy Theory Seminar: "Leray in Oflag XVIIa: Cohomology, Sheaves, and Spectral Sequences"
HAYENS MILLER, *Massachusetts Institute of Technology*

Automorphic Forms and L-functions Seminar:
"On Theta Series Associated to Orders in Quaternion Algebras (A Conjecture of Hashimoto)"
S. BOECHERER, *Institute for Advanced Study*

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

Combinatorics and Complexity Theory Seminar:
"The Erdos-Szekeres Game"
JOZSEF BECK, *Rutgers University*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Combinatorics and Complexity Theory Seminar:
"On the Optimum of Delsarte's Linear Program"
ALEX SAMORODNITSKY, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"Modularity and Galois Representations: An Overview"
CHRISTOPHER SKINNER, *Institute for Advanced Study*

"Convexity Breaking and the Amplification Method"
J. VANDERKAM, *Institute for Defense Analysis*

Special Seminar: "Differentiability of Lifshitz Functions and Negligible Sets in Hilbert Space"
JORAM LINDENSTRAUSS, *The Hebrew University of Jerusalem, Israel*

Combinatorics and Complexity Theory Seminar: "Two Erdos Problems on Lacunary Sequences: Chromatic Number and Diophantine Approximation"
YUVAL PERES, *The Hebrew University of Jerusalem, Israel*

Members Seminar: "Infinite Matrix Products"
LEONID GURVITS, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Average Values for Powers of Quadratic Dirichlet L-functions"
CALIN DIACONU, *Institute for Advanced Study*

Analysis Seminar: "Dynamics of Solitons and Waves in the Non-linear Hartree Equation"
TAI-PENG TSAI, *Courant Institute*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "Primes in Arithmetic Progressions"
JOHN FRIEDLANDER, *Institute for Advanced Study*

"Intersecting a Subvariety of G_m^n with the Algebraic Subgroups"
UMBERTO ZANNIER, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar: "Economical Covers with Geometric Applications"
NOGA ALON, *Tel Aviv University*

Joint School of Mathematics and Program in Theoretical Biology Lecture: "Why Fibonacci Numbers Appear on Plants"
IRVING ADLER

The First Ruth and Irving Adler Expository Lecture: "Modules Over Nonunital Rings"
DANIEL QUILLEN, *University of Oxford*

Automorphic Forms and L-functions Seminar: "Some Elementary Remarks on the Guinand-Weil Explicit Formula"
ENRICO BOMBIERI, *Institute for Advanced Study*

Special Seminar: "On the Homotopy Type of p-adic Analytic Spaces"
VLADIMIR BERKOVICH, *Weizmann Institute of Science*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "Arithmetic Invariants on the Modular Curve $X_0(N)$"
EMMANUEL ULLMO, *Princeton University* and *University of Orsay*

"How Many Zeros are Off the Line?"
DENNIS HEJHAL, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar: "List Decoding of Error-correcting Codes"
MADHU SUDAN, *Massachusetts Institute of Technology*

Automorphic Forms and L-functions Seminar: "Some Elementary Remarks on the Guinand-Weil Explicit Formula (continuation)"
ENRICO BOMBIERI, *Institute for Advanced Study*

Special Combinatorics and Complexity Theory Seminar: "Some Optimal Inapproximability Results"
JOHAN HASTAD, *Royal Institute of Technology*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "Singularities of Eisenstein Series and the Arthur Trace Formula"
WERNER MULLER, *Institute for Advanced Study*

"Converse Theorem, Proof and/or Application"
JAMES COGDELL, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar:
"Distribution of Special Points on Subvarieties of Shimura Varieties and Applications"
PAULA COHEN, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar:
"Some Elementary Remarks on the Guinand-Weil Explicit Formula (continuation)"
ENRICO BOMBIERI, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"Automorphic Pairing of CM-points"
SHOU-WU ZHANG, *Columbia University*

"Automorphic L-functions Over Function Fields"
WEN-CHING LI, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar:
"Extracting Randomness via Repeated Condensing"
RONEN SHALTIEL, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar:
"Axiomatic L-functions: The Selberg Class"
ALBERTO PERELLI, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Some Elementary Remarks on the Guinand-Weil Explicit Formula (continuation)"
ENRICO BOMBIERI, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar: "New Estimates Towards Ramanujan and Selberg Conjectures for GL(2)"
FREYDOON SHAHIDI, *Purdue University*

"Some Remarks on the Landau-Siegel Zeros"
ALEXANDRU ZAHARESCU, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar:
"Percolation and Collision"
PETER WINKLER, *Bell Labs*

Automorphic Forms and L-functions Seminar:
"Semi-classical Limits for the Hyperbolic Plane"
SCOTT WOLPERT, *University of Maryland*

Automorphic Forms and L-functions Seminar: "Some Elementary Remarks on the Guinand-Weil Explicit Formula (continuation)"
ENRICO BOMBIERI, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"A Formula of Kohnen-Zagier"
ZHENGYU MAO, *Institute for Advanced Study*

"Equidistribution of Maass Forms and Rankin Triple L-functions"
THOMAS C. WATSON, *Princeton University*

Combinatorics and Complexity Theory Seminar:
"Max Cut and the Smallest Eigenvalue"
BENNY SUDAKOV, *Princeton University* and *Institute for Advanced Study*

Special Seminar: "Motives of Quadrics"
ALEXANDER VISHIK, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar:
"Numerical Expedition in Search of Elusive Maass Forms"
STEFAN JOHANSSON, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"Seeking a Slightly Saintly Grail (A Matter of Zero Import)"
HAROLD STARK, *Institute for Advanced Study*

"Modular Generating Functions for Arithmetic Cycles"
STEPHEN KUDLA, *University of Maryland*

Automorphic Forms and L-functions Seminar: "Primes of the Form $x^3 + 2y^3$"
ROGER HEATH-BROWN, *University of Oxford*

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

Automorphic Forms and L-functions Seminar: "Families of Automorphic L-functions Constructed by Rankin-Selberg Method"
STEPHEN RALLIS, *The Ohio State University*

"Nonvanishing of L-values and the Weyl Law"
WENZHI LUO, *The Ohio State University*"

Combinatorics and Complexity Theory Seminar: "On Quantum Complexity of Graph Properties"
ANDREW YAO, *Princeton University*

Marston Morse Memorial Lecture: "Modular Forms, Theta Functions and Algebraic Topology"
MICHAEL J. HOPKINS, *Massachusetts Institute of Technology*

Automorphic Forms and L-functions Seminar: "Does Zeta Have the Largest First Zero?"
STEVE MILLER, *Yale University*

Marston Morse Memorial Lecture: "Modular Forms, Theta Functions, and Algebraic Topology"
MICHAEL J. HOPKINS, *Massachusetts Institute of Technology*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Special Seminar: "Rings, Codes, Combinatorics"
STEFAN SCHMIDT, *Massachusetts Institute of Technology*

Automorphic Forms and L-functions Seminar: "Endoscopy and Beyond"
ROBERT LANGLANDS, *Institute for Advanced Study*

Automorphic Forms and L-functions Seminar: "Modular Forms Over CM Fields and Galois Representations"
DINAKAR RAMAKRISHNAN, *Institute for Advanced Study*

Marston Morse Memorial Lecture: "Modular Forms, Theta Functions, and Algebraic Topology"
MICHAEL J. HOPKINS, *Massachusetts Institute of Technology*

Combinatorics and Complexity Theory Seminar: "Convex Complexity Measures"
RUSSELL IMPAGLIAZZO, *University of California, San Diego*

Special Lecture in Representation Theory: "Distinguished Representations for Quadratic Extensions"
DIPENDRA PRASAD, *MRI, India*

Automorphic Forms and L-functions Seminar: "An Icosahedral Representation Attached to a Q-curve"
EDRAY GOINS, *Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

Special Math/Physics Seminar: "Integrable Structure of Conformal Maps and Interface Dynamics"
PAUL WIEGMANN, *University of Chicago*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Combinatorics and Complexity Theory Seminar: "Pseudorandom Generators in Propositional Proof Complexity"
ALEXANDER RAZBOROV, *Princeton University* and *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar:
"Polynomial Invariants of Graphs on Surfaces"
BELA BOLLOBAS, *Memphis and Cambridge University*

Special Seminar: "Some Connections Between the Ergodic Theory of Lie Groups and Problems in Quantum Unique Ergodicity and Number Theory"
ELON LINDENSTRAUSS, *Institute for Advanced Study*

Combinatorics and Complexity Theory Seminar:
"Analytical Methods in Integer Programming"
GREGORY FREIMAN, *Tel Aviv University*

Combinatorics and Complexity Theory Seminar:
"Selective Decommitment, Magic Functions, and 3-round Zero Knowledge"
OMER REINGOLD, *AT&T and Institute for Advanced Study*

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Automorphic Forms and L-functions Seminar:
"The Local Langlands Conjecture"
RICHARD TAYLOR, *Harvard University*

"Some Remarks on the Fontaine-Mazur Conjecture"
RICHARD TAYLOR, *Harvard University*

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

Lectures on Norm Varieties
MARKUS ROST, *Institute for Advanced Study*

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

Special Combinatorics and Complexity Theory Seminar: "Enumeration of Equicolorable Trees"
NICHOLAS PIPPENGER, *University of British Columbia*

Combinatorics and Complexity Theory Seminar:
"A Computational Bézout"
MARTIN SOMBRA, *Institute for Advanced Study*

"I found the years that I spent at the Institute to be remarkably productive ones. I have benefited enormously both from the stimulating intellectual environment, and from the peaceful physical surroundings."

— *Member, School of Natural Sciences*

Astrophysicists Sara Seager, Wayne Hu, and Andrei Gruzinov

STEPHEN L. ADLER, Particle Physics, *New Jersey Albert Einstein Professor*
JOHN N. BAHCALL, Astrophysics, *Richard Black Professor*
PIET HUT, Astrophysics
NATHAN SEIBERG, Theoretical Physics
FRANK WILCZEK, Theoretical Physics, *J. Robert Oppenheimer Professor*
EDWARD WITTEN, Mathematical Physics, *Charles Simonyi Professor*

PAWAN KUMAR, Astrophysics

FREEMAN J. DYSON, Mathematical Physics and Astrophysics

PROFESSOR STEPHEN ADLER'S time this year was divided between work on modified forms of quantum mechanics, in particular phenomenological modifications of the Schrödinger equation, and work on particle phenomenology.

In the area of quantum mechanics, Adler expanded a manuscript co-authored with Horwitz into a paper giving a detailed study of the structure and properties of the Hughston stochastic Schrödinger equation, including an analysis of its relation to other proposed stochastic equations and an initial discussion of empirical issues. One significant added result is that only when the dissipation is driven by an operator commuting with the Hamiltonian does one get a stationary limiting behavior at all; as shown in the paper, in this case the limiting probabilities for various final states to occur agree with the quantum mechanical probabilities computed from the initial state. The use of Itô calculus methods in this paper led Adler to a new, and very simple, understanding of the Lindblad structure for the generator of a completely positive density matrix evolution, as an infinitesimal Itô specialization of the Kraus form for a global, completely positive density matrix map. As part of a continuing phenomenological study, in collaboration with graduate student Indrajit Mitra, of whether the Hughston equation can give a satisfactory empirical account of state vector collapse, Adler found an exact solution of a simple model for the statistical fluctuations in the number of adsorbed model on an active surface. (The mass fluctuations associated with such molecules play a crucial role in the Hughston equation model for state vector reduction.) He also gave a review talk on the role of probability in quantum mechanics, focusing on the issue of postulated versus emergent probabilities, at the Ischia conference on *Chance in Physics* in late November. Additionally, Professor Adler gave an unpublished survey talk, "Explorations in Quantum Mechanics," reviewing highlights of his work on quantum mechanics, at the conference *Symmetry Found and Lost* held at the Institute in mid-October in honor of his 60th birthday.

In particle phenomenology, Adler initiated a study, to be continued, of the possible role of a Lifshitz phase in gauge symmetry breaking. As a by-product, he analyzed the generalization of the most attractive channel rule that is relevant to the formation of dynamical fermionic condensates under the influence of scalar exchange forces. This paper shows that in certain cases of interest, the sign and magnitude of the scalar exchange force is governed by a generalized Racah coefficient, and gives a number of possible applications to SO(10) and E_6 grand unification.

Over the next year or two, Professor Adler expects to continue to divide his time approximately equally between studies in quantum mechanics and studies in particle phenomenology. The quantum mechanics work will focus on trace dynamics as a possible fundamental pre-quantum mechanics, and on analyses of phenomenological modifications of the Schrödinger equation. The particle phenomenology work will emphasize dynamical symmetry breaking and possible family groups.

PROFESSOR JOHN BAHCALL again concentrated on high energy (> 1 GeV) and low energy (< 20 MeV) neutrinos from astrophysical sources. Both subjects are the focus of much interest by both theoretical and experimental physicists. However, the two subjects have very different goals. The search for high energy neutrino sources will be carried out by several new neutrino observatories under the ocean (in the Mediterranean) or under the ice (in Antarctica). The search for high energy neutrinos is exploratory. We do not know whether Nature provides sources of high energy neutrinos that are sufficiently intense to be observed.

Together with Sarbani Basu (IAS) and Marc Pinsonneault (Ohio State), Bahcall refined the Standard solar model predictions for solar neutrino experiments. In addition, they calculated for the first time the detailed time dependence of many of the important quantities that characterize solar-type stars, such as luminosity, radius, effective temperature, depth and mass of the convective zone. Future precise observations on other solar-type stars of different ages may test these predictions.

Bahcall continued his collaboration with Plamen Krastev (University of Wisconsin) and Alexei Smirnov (ICTP, Trieste); they are trying to determine what are the neutrino properties that are manifested in solar neutrino experiments. These theorists calculated the predictions of all of the currently allowed neutrino oscillation solutions for 10 experimental quantities that will be measured by the Sudbury Neutrino Observatory (SNO), a kiloton detector of heavy water. The first of the experimental results will be released sometime before the end of the year 2000. Bahcall, Krastev, and Smirnov also showed by extensive examples the correlations that are expected between the measured values of different experimental quantities, depending upon what neutrino scenario is adopted.

In the more uncertain domain of high energy astrophysical neutrinos, Peter Meszaros (Pennsylvania State University) and Bahcall showed that many models of gamma-ray-burst (GRB) sources give rise to a potentially measurable flux of 5-10 GeV neutrinos from interactions between neutrons and protons in the GRB. Bahcall and Waxman (Weizmann Institute) showed that current models of GRB's also predict a possibly measurable flux of very high-energy neutrinos (~ 10^{18} eV) neutrinos formed by the interaction of the photon fireball with the medium surrounding the GRB. As an extension of their work on the connection between GRB's and ultra-high energy cosmic rays (10^{20} eV) and very

high-energy neutrinos, Bahcall and Waxman showed that the existing observations of ultra-high energy cosmic rays could be understood by assuming a plausible degree of clustering among the sources of the cosmic rays, whatever those sources may be.

Bahcall joined the international experimental collaboration, ICECUBE, that is proposing a km^2 detector of high-energy astronomical neutrinos under the Antarctic ice.

PROFESSOR PIET HUT explored a novel way to visualize the results of simulations of star cluster evolution at the newly completed Hayden Planetarium of the American Museum of Natural History, in New York City. Using the planetarium dome, the world's largest virtual reality environment, he applied their interactive visualization capabilities to explore various forms of data mining. Combining the dual functions of a virtual telescope and an active laboratory device, the planetarium equipment allowed him and his collaborators to analyze the local interactions of multiple star systems within the full global setting of a whole star cluster. The simulations formed part of a collaborative project with Jun Makino from Tokyo University, Steve McMillan from Drexel, and Simon Portegies Zwart from MIT.

Currently, Hut is involved in the ongoing project to develop the GRAPE-6, which at a speed of more than 100 Teraflops, will become once again the world's fastest computer in the fall of the year 2000, regaining the title that its predecessor, the GRAPE-4, had held in 1995 and 1996. One of the first GRAPE-6 boards, at a speed of 500 Gigaflops, was presented to the American Museum of Natural History as part of a three-way collaboration between Hut's team at the Institute, Makino's team at Tokyo, and Michael Shara's team at the Museum. This occurred during a conference on Stellar Collisions at the Museum, for which Hut was one of the organizers.

Hut organized a summer school, titled "Values in a World of Fact," in August 1999, 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 second public offering of the Kira Institute (web site: http://www.kira.org).

Among several other interdisciplinary activities, Hut was invited to debate E. O. Wilson at the World Economic Forum in Davos, in January 2000. At the Institute, Hut organized a series of lunch meetings on intentionality, co-chaired with David Waltz, president of the NEC research laboratory at Princeton, in which they discussed Brian Smith's notion of 'the origin of objects'. Hut took part in a panel on Science and Art at the College Art Association Conference in New York, in February. In Hayama, Japan, Hut gave an invited talk at the "Mind and Brain" conference, organized by the Japan Association for the Advancement of Research Corporation.

During the period 1999-2000, PROFESSOR PAWAN KUMAR continued working on gamma-ray bursts, tidal interactions and helioseismology. Gamma-ray bursts are enigmatic phenomenon involving an explosion of some object about which we do not yet know very much. Kumar's work on gamma-ray bursts explored the consequences of highly anisotropic explosion on the radiation we observe and their luminosity function or the observed distribution of the energy. He showed that a number of puzzling observed results, such as the broad distribution of flux in the gamma-ray explosion and narrower

distribution for the flux in the x-ray several hours after the burst, are naturally explained if the explosion is non-isotropic. Work with Alin Panaitescu, of Princeton University, explored in great detail the effect of density stratification of the medium surrounding these bursts and collimated explosion on the observed light-curve.

Kumar and Tal Alexander, an Institute Member, investigated the effect of tidal interaction on the rotation of stars, and discovered that in dense stellar systems, such as the Galactic center, stars can be spun up by tidal interactions with other stars to a speed of order 10% of their centrifugal breakup speed.

During the last year, PROFESSOR NATHAN SEIBERG focused on various aspects of noncommutative geometry, its appearance in string theory, the properties of field theories on a noncommutative space, and possible extensions of this geometry.

With E. Witten earlier ideas about the appearance of noncommutative geometry in string theory with a nonzero *B*-field were investigated. A limit in which the entire string dynamics is described by a minimally coupled (supersymmetric) gauge theory on a noncommutative space was identified, and the corrections away from this limit were discussed. This analysis led to an equivalence between ordinary gauge fields and noncommutative gauge fields, which is realized by a change of variables that can be described explicitly. This change of variables was checked by comparing the ordinary Dirac-Born-Infeld theory with its noncommutative counterpart. This led to a new perspective on noncommutative gauge theory on a torus, its *T*-duality, and Morita equivalence, and to a new analysis of the *D0/D4* system, the relation to M-theory in DLCQ, and a possible noncommutative version of the six-dimensional (2,0) theory.

In two papers (one with S. Minwalla and M. Van Raamsdonk and the other with M. Van Raamsdonk) the perturbative dynamics of noncommutative field theories on R^d was analyzed. A surprising mixing of the UV and the IR was found. High energies of virtual particles in loops produce non-analyticity at low momentum. Consequently, the low energy effective action is singular at zero momentum even when the original noncommutative field theory is massive. Some of the nonplanar diagrams of these theories are divergent, but these divergences were interpreted as IR divergences and were dealt with accordingly. The origin of this UV/IR mixing was explained as arising from the underlying noncommutativity. This phenomenon is reminiscent of the channel duality of the double twist diagram in open string theory, and the new massless modes were identified as "closed strings."

It was further argued that all IR singularities in nonplanar one loop diagrams may be interpreted as arising from the tree-level exchanges of such new light degrees of freedom, one coupling to each relevant operator. Some of these degrees of freedom are required to have propagators that are inverse linear or logarithmic. It was suggested that these can be interpreted as free propagators of a continuum of massive particles, which are perhaps massless in one or two extra dimensions. Some of the IR singular terms appearing at two loops in noncommutative scalar field theories were also analyzed, and they exhibit a complicated momentum dependence which is more difficult to interpret.

Further insight into the properties of the noncommutativity was obtained in two papers with L. Susskind and N. Toumbas, where the time coordinate was considered not

commute with one of the space coordinates. In the first paper, field theories on such a space were shown to be seriously acausal and inconsistent with conventional Hamiltonian evolution. To illustrate these effects, the scattering of wave packets in a field theory with such space/time noncommutativity was studied, and effects which seem to precede their causes were found. Also, the theory was shown to describe rigid rods, which grow instead of Lorentz contract as they are boosted. These field theories are evidently inconsistent and violate causality and unitarity.

Since open string theory in a background electric field is expected to exhibit space/time noncommutativity, this raises the question of whether it also leads to such acausal behavior. It was shown that this is not the case. Stringy effects conspire to cancel the acausal effects that are present for the noncommutative field theory leaving the theory consistent.

In a second paper with L. Susskind and N. Toumbas, open strings in a constant background electric field were analyzed further. 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. This critical field prevents a limit in which the theory becomes a field theory on a noncommutative spacetime from existing. However, an appropriate limit toward the critical field leads to a novel noncritical string theory on a noncommutative spacetime. Contrary to standard lore, these noncommutative open string theories involve only open strings and no closed strings.

Extensions of these ideas were studied with R. Gopakumar, S. Minwalla and A. Strominger. Here, limits of string theory were found leading to theories without gravity exhibiting new surprising properties. These theories exist in six and fewer spacetime dimensions and their underlying geometric structure is not yet clear. Unlike the noncommutative theories which depend on a deformation of spacetime involving a two-index tensor, here the deformation involves a tensor with three or more indices. The strong coupling limit of these theories in the various dimensions was studied, and an interesting web of dualities was found to relate them. This web includes all previously studied theories: commutative and noncommutative field theories, the newly discovered noncommutative open string theories, the enigmatic little string theories and many others.

This was a year of consolidation in PROFESSOR FRANK WILCZEK'S work on understanding matter at high density, using QCD and asymptotic freedom. The major qualitative results that emerge in the lowest order of approximation, including confinement and chiral symmetry breaking, are now pretty well understood. This approximation becomes accurate as the density goes to infinity, but to treat problems of great physical interest, and to make experimentally testable quantitative predictions, we need to do better. Wilczek has some ideas for this, but they need more work.

Wilczek did extensive work with Jonathan Feng (IAS) and Konstantin Matchev (Fermilab) on the physical consequences of low-energy supersymmetry. Specifically, they pursued the "focus point" hypothesis for supersymmetry breaking. This is a new theoretical idea which avoids some of the apparent difficulties in reconciling low-energy supersymmetry with established facts. The group's main original contribution was to show that the focus point hypothesis naturally leads one to predict the production of cosmologically stable particles with density just sufficient to provide the astronomers' "missing

matter", and to analyze in some detail how one might detect them in practical experiments. These conclusions contradicted conventional wisdom in the field, but they are gaining general acceptance.

Wilczek spent a lot of time thinking about the problem of the cosmological term, and wrote a paper (with Feng, Savdeep Sethi of the Institute, and John March-Russell of CERN) suggesting physical mechanisms whereby its relaxation to a small value might be understood. We certainly have not yet seen our way to the bottom of this problem, but Wilczek thinks the circle of ideas being explored has considerable promise. In any case, it's a great problem, and Wilczek is going to keep hammering away.

PROFESSOR EDWARD WITTEN'S most significant result in the last year was to extend the application of K-theory to string theory to show that the Ramond sector p-form fields (as well as the corresponding D-brane charges) are classified by K-theory. Witten showed how to implement the p-form self-duality in terms of K-theory and (in work with G. Moore and E. Diaconescu) showed how in this framework to analyze certain global anomalies and to compare the K-theory formalism of Type IIA superstrings to M-theory.

During the year, Witten also completed some old work analyzing Tr $(-1)^F$ and associated topological invariants for four-dimensional supersymmetric gauge theories, analyzed certain world-sheet instantons of the heterotic string, and investigated tachyon condensation from the point of view of string field theory.

The new and revised edition of PROFESSOR EMERITUS FREEMAN DYSON'S book *Origins of Life* was published in Fall 1999 by Cambridge University Press. He continues to be actively engaged in studying theories and experiments in this rapidly changing field.

In May 2000, Dyson was awarded the Templeton Prize for Progress in Religion. Much of his time was spent in festivities and travel associated with the prize.

Profesor Dyson's number-theory paper, "The Sixth Fermat Number and Palindromic Continued Fractions," was accepted for publication in *L'Enseignement Mathématique*.

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Institute for Advanced Study · *m*

f First Term · *s* Second Term · *m* Long Term Member · *d* Director's Visitor · *v* Visitor

THE SCHOOL OF NATURAL SCIENCES

RECORD OF EVENTS

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

Astrophysics Talk: "Neutrinos from Superheavy Dark Matter"
LAM HUI, *Institute for Advanced Study*

Astrophysics Talk: "The Bispectrum of IRAS Galaxies"
ROMAN SCOCCIMARRO, *Institute for Advanced Study*

Astrophysics Talk: "Migrating Planets"
NORM MURRAY, *CITA*

Astrophysics Talk: "The Cooling Flow to Accretion Flow Transition"
ELIOT QUATAERT

High Energy Theory Seminar: "Fractional Branes and BPS States in Orbifold Theories"
EMANUEL DIACONESCU, *Institute for Advanced Study*

High Energy Theory Seminar: "Physics of Large Extra Dimensions"
GIA DVALI, *New York University*

Astrophysics Talk: "Supernova and Gamma-Ray Burst Explosions in Stellar Winds"
ROGER CHEVALIER, *University of Virginia*

Astrophysics Talk: "An Accretion Model for Anomalous X-ray Pulsars"
LARS HERNQUIST, *Harvard University*

High Energy Theory Lunchtime Seminar: "The 4D Trace Anomaly: Conformal Symmetry Lost and Conformal Symmetry Found"
EMIL MOTTOLA, *Los Alamos National Labs*

High Energy Theory Seminar: "epsilon'/epsilon from QCDSP: First Results"
ROBERT MAWHINNEY, *Columbia University*

Astrophysics Talk: "From Hints to Evidence to Facts: Latest Neutrino Results from Super-Kamiokande"
ED KEARNS, *Boston University*

Astrophysics Talk: "X-ray Coronae of Accreting Black Holes"
ANDREI BELOBORODOV, *Stockholm University*

Astrophysics Talk: "Disks, Jets, and Clusters: The Violent Environment of Star Formation"
JOHN BALLY, *Univsity of Colorado, Boulder*

Astrophysics Talk: "Disk Instabilities and Viscosity in Close Binaries"
KRISTEN MENOU, *Princeton University*

High Energy Theory Seminar: "Gauge Theory and the Censorship of 'Repulson' Singularities"
CLIFFORD V. JOHNSON, *University of Durham*

High Energy Theory Seminar: "2+1 Dimensional Yang-Mills Theory: Vacuum Wavefunction and String Tension"
V.P. NAIR, *Institute for Advanced Study* and *City College of New York*

Astrophysics Talk: "High Precision Cosmology: Galaxies vs. Weak Lensing"
UROS SELJAK, *Princeton University*

Astrophysics Talk: "The Measurement of Galaxy Power Spectra"
ANDREW HAMILTON, *University of Colorado, Boulder*

Astrophysics Talk: "Black Hole Flares and Halos"
ANDREI GRUZINOV, *Institute for Advanced Study*

Astrophysics Talk: "Detecting the Earliest Galaxies in the Universe"
RENNAN BARKANA, *Institute for Advanced Study*

High Energy Theory Lunchtime Seminar: "Fun With Wrapped Branes"
SHAMIT KACHRU, *Institute for Advanced Study*

High Energy Theory Seminar: "Weakly Coupled Little String Theory"
DAVID KUTASOV, *University of Chicago*

Astrophysics Talk: "Measuring Mass Functions with Pixel Microlensing"
TED BALTZ, *University of California, Berkeley*

High Energy Theory Seminar: "Strings in AdS_3 and the SL(2,R) WZW Model"
JUAN MALDACENA, *Harvard University*

Astrophysics Talk: "Magnetically Driven Warping, Precession and Resonances in Accretion Disks"
DONG LAI, *Cornell University*

Astrophysics Talk: "Constraining Reionization Using the Thermal History of the Baryons"
JOOP SCHAYE, *Institute of Astronomy, University of Cambridge*

Special High Energy Theory Seminar: "On Calabi Yau Mirror Symmetry as Gauge Theory Duality"
MINA AGANAGIC, *Harvard University*

High Energy Theory Lunchtime Seminar: "RG Flow on D1 Branes: Small N Gauge Theory and Small N Supersymmetry"
EVA SILVERSTEIN, *Institute for Advanced Study*

High Energy Theory Seminar: "Life, the Universe, and Nothing: Life in an Ever Expanding Universe"
LAWRENCE KRAUSS, *Case Western Reserve University*

High Energy Theory Lunchtime Seminar: "Maximally Supersymmetric RG Flows and AdS Duality"
KEN INTRILIGATOR, *University of California, San Diego*

High Energy Theory Lunchtime Seminar: "The Small Instanton Transition in Heterotic-M Theory"
JAEMO PARK, *Institute for Advanced Study*

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

Astrophysics Talk: "Hydrodynamical Disk Transport"
STEVEN BALBUS, *University of Virginia*

High Energy Theory Seminar: "Life, the Universe, and Nothing: Life in an Ever Expanding Universe"
LAWRENCE KRAUSS, *Case Western Reserve University*

Astrophysics Talk: "Future Telescopes on the Ground and in Space"
ROGER ANGEL, *University of Arizona*

Astrophysics Talk: "Many Open Problems and (Few) Answers About Gamma-ray Bursts"
DAVIDE LAZZATI, *Osservatorio Astronomico di Brera, Italy*

Astrophysics Talk: "Adventures with Rubble Piles: The Evolution of Fragile Planetesimals"
DEREK RICHARDSON, *University of Washington*

High Energy Theory Lunchtime Seminar: "On the D5-D1 Conformal Field Theory"
ROBBERT DIJKGRAAF, *University of Amsterdam*

Astrophysics Talk: "Gamma-ray Bursts and Afterglows: Some Recent Developments"
PETER MÉSZÁROS, *Institute for Advanced Study* and *Pennsylvania State University*

Astrophysics Talk: "Why Do Some of the Sub-millimeter Sources Have No Optical Counterparts? Could It Be Source Confusion Alone?"
DAVID HOGG, *Institute Advanced Study*

Astrophysics Talk: "Early Results from the Chandra X-ray Observatory"
CLAUDE CANIZARES, *Massachusetts Institute of Technology*

Astrophysics Talk: "R-modes: Another Window into Neutron Stars?"
YURI LEVI, *University of California, Berkeley*

Princeton/IAS High Energy Theory Seminar: "Holographic Reconstruction of Spacetime in the AdS/CFT Correspondence."
KOSTAS SKENDERIS, *Princeton University*

Astrophysics Talk: "The Mass Assembly History of Galaxies"
RICHARD ELLIS, *Caltech*

Princeton/IAS High Energy Theory Seminar: "Semiclassical Noncommutative Field Theory"
ANDREW STROMINGER, *Harvard University*

Astrophysics Talk: "The Violent X-ray Sky as Viewed by the All Sky Monitor on the Rossi X-ray Timing Explorer"
HALE BRADT, *Massachusetts Institute of Technology*

Princeton/IAS High Energy Theory Seminar: "Neutrinos from Heaven: Lessons for Model Building"
YOSSI NIR, *Weizmann Institute of Science* and *Institute for Advanced Study*

Astrophysics Talk: "To the Solution of the Solar Neutrino Correlations and Observables"
ALEXEI SMIRNOV, *International Center for Theoretical Physics, Trieste*, and *Institute for Advanced Study*

Astrophysics Talk: "Gravitational Radiation from Accreting Neutron Stars: Implications for Millisecond Pulsar Formation and LIGO"
LARS BILDSTEN, *Institute for Theoretical Physics, Santa Barbara*

Princeton/IAS High Energy Theory Seminar: "The Liouville Boundary Problem"
JOERG TESCHNER, *Dublin Institute*

Astrophysics Talk: "The Shape of Gravity With Extra Dimensions"
LISA RANDALL, *Princeton University*

Astrophysics Talk: "Detecting Cosmic Shear"
DAVID WITTMAN, *Bell Labs*

IAS/Princeton University High Energy Theory Seminar: "Quantum Field Theory as a Matrix Model"
VLADIMIR KAZAKOV, *École Normale Supérieure*

Astrophysics Talk: "Dark Halo and Disk Galaxy Scaling Laws in Hierarchical Universes"
MATTHIAS STEINMETZ, *University of Arizona*

High Energy Theory Seminar: "T-duality, Noncommutative Geometry and the Born-Infeld Action"
LORENZO CORNALBA, *Institut des Hautes Études Scientifiques, France*

Astrophysics Talk: "Accretion Dynamics Near Black Holes"
JULIAN KROLIK, *Johns Hopkins University*

Astrophysics Talk: "Pulsar Inner Accelerators and Radio Emission Death Lines"
BING ZHANG, *NASA-GSFC*

Astrophysics Talk: "Atmospheres of the Close-in Extrasolar Giant Planets"
SARA SEAGER, *Institute for Advanced Study*

Astrophysics Talk: "GRBs: What is New"
SHRI KULKARNI, *Caltech*

IAS/Princeton University High Energy Theory Seminar: "Brane-antibrane Constructions"
SUNIL MUKHI, *Tata Institute*

IAS/Princeton University High Energy Theory Seminar: "Monopoles and Their Gravitational Properties Near the Black Hole Threshold"
ARTHUR LUE, *Columbia University*

Astrophysics Talk: "Accretion, Advection, Convection, Confusion"
RAMESH NARAYAN, *Harvard University*

Astrophysics Informal Discussion: "Implications of Recent CMB Measurements"
WAYNE HU, *Institute for Advanced Study*

Astrophysics Talk: "Physics in the Fluid Limit: Galaxies, X-ray Clusters and Dark Matter"
GREY BRYAN, *Massachusetts Institute of Technology*

IAS/Princeton University High Energy Theory Lunchtime Seminar: "Branes and Strings as Noncommutative Solitons"
JEFF HARVEY, *University of Chicago*

Astrophysics Talk: "Non Gaussianities Induced by Gravity"
MATIAS ZALDARRIAGA, *Institute for Advanced Study*

Astrophysics Talk: "Sizing Up Close-in Planets Around Sun-like Stars"
DAVID CHARBONNEAU, *Harvard-Smithsonian CfA and National Center for Atmospheric Research*

IAS/Princeton University High Energy Theory Seminar: "A Derivation of K-theory from M-theory"
GREG MOORE, *Rutgers University*

IAS/Princeton University High Energy Theory Lunchtime Seminar: "One-dimensional Models of Stripes in Cuprate Superconductors"
OLEG TCHERNYSHYOV, *Institute for Advanced Study*

Astrophysics Talk: "Accreting Neutron Stars: The Link Between Magnetic Field Evolution and Gravitational Radiation"
ANDREW MELATOS, *University of California, Berkeley*

Astrophysics Talk: "The Boomerang CMB Measurement"
ANDREW LANGE, *Caltech*

Astrophysics Talk: "Gamma-ray Background from Structure Formation"
ELI WAXMAN, *Weizmann Institute of Science*

Astrophysics Talk: "The History of the Discovery of Dark Matter in the Universe"
SIDNEY VAN DEN BERGH, *National Research Council, Canada*

Astrophysics Talk: "Exozodiacal Dust and Extrasolar Planet Detection"
MARC J. KUCHNER, *Caltech*

Astrophysics Talk: "Neutrino Astrophysics: IUPAP Centennial Lecture"
JOHN BAHCALL, *Institute for Advanced Study*

Astrophysics Talk: "Cross-correlating Weak Lensing Survey with CMB"
KARIM BENABED, *Saclay, France*

Astrophysics Talk: "Aperture Mass Statistics in Weak Lensing Surveys"
FRANCIS BERNARDEAU, *Saclay, France*

Astrophysics Talk: "Active Galactic Nuclei and Black Holes"
AMRI WANDEL, *Hebrew Institute of Jerusalem*

Astrophysics Talk: "Weak Lensing Measurements: Present and Future"
LUDOVIC VAN WAERBEKE, *CITA*

Astrophysics Talk: "Keck Studies of M31's Stellar Halo"
PURAGRA GUHATHAKURTA, *UCO/Lick Observatory, University of California, Santa Cruz*

Astrophysics Talk: "Sgr A* — Towards the Event Horizon"
HEINO FALCKE, *Max-Planck-Institut fur Radioastronomie*

I derived enormous academic benefits from my year at the Institute and am extremely grateful for the opportunity to have been here. The research environment at the Institute is outstanding. It has been an invaluable opportunity for me to leave behind the daily demands of teaching and administration and devote myself entirely to my research."

— Member, School of Social Science

West Building, home to both the School of Historical Studies and the School of Social Science.

CLIFFORD GEERTZ, *Harold F. Linder Professor*
JOAN WALLACH SCOTT
MICHAEL WALZER, *UPS Foundation Professor*

ALBERT O. HIRSCHMAN

ADAM ASHFORTH

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 1999-2000 academic year—from a pool of 158 individuals who applied for membership. One research assistant also participated in the year's activities. The National Endowment for the Humanities partially or fully funded three fellows. Fields of inquiry of the group included anthropology, three; history, three; law, one; literature, one; philosophy, four; political science, five; and sociology, two.

The theme for 1999-2000 was "the universalism of human rights." What is the history of the idea that human rights are universal rights? What is the history of political theories that make universalist claims? What has been the political impact of recent human rights campaigns? What sorts of cultural (legal, religious, international) conflicts have emerged in the name of, or in opposition to, calls for enforcement of human rights? How have debates about the status of women or concern for the environment been articulated in terms of human rights? Is recent (post-WWII) attention to questions of human rights an aspect of "globalization?"

VISITING ASSOCIATE PROFESSOR ADAM ASHFORTH'S book *Madumo, A Man Bewitched* was published by the University of Chicago Press. A South African edition will be published in July. In addition to conference papers presented in Mombasa (Council for the Development of Social Research in Africa), Perth (African Studies Association of Australasia and the Pacific), and Philadelphia (African Studies Association), Professor Ashforth lectured at Harvard University, the University of Western Australia, and the University of the Witswatersrand on topics relating to the political dimensions of witchcraft and spiritual insecurity in contemporary South Africa. He also gave a talk to the "Friends' Forum" at the Institute. His article "Réflections sur L'Insécurité Spirituelle dans une Ville Africaine Moderne (Soweto)" was published in *Politique Africaine*. *Transition* published his "Soweto Witch Project," and "Weighing Manhood in Soweto" appeared in *Codesria Bulletin*.

PROFESSOR CLIFFORD GEERTZ spoke in June 1999 at a semiotics conference at the Institut Ferdinand de Saussure Center, Archamps, Geneva; at the U.S. Embassy at Jakarta on the occasion of the 50th anniversary of US-Indonesia relations in December 1999; at a conference on "Model Systems in the Social Sciences," Princeton History of Science Program, also in December; at a special session on his work at the Modern Language Association Meetings in Chicago, also in December; at Harvard, to the anthropology department and to the study of nationalism group in February; again at the Model Systems (in history) Workshop at Princeton University, in April 2000; and at a conference honoring his work in Sefrou, Morocco in May 2000. He traveled for research purposes to Indonesia during November/December 1999 and Morocco during April/May 2000. His new book, *Available Light: Anthropological Reflections on Philosophical Topics*, was published in May by Princeton University Press. His earlier works *The Interpretation of Cultures* (1973) and *Local Knowledge* (1983) were reissued with new introductions in Basic Books' Classics Series. Articles published include: "Indonesia: Starting Over" (*New York Review of Books*), "Awas Buaya" (*Mencari Demokrasi*, Jakarta), "Geiger at Antioch" (*The Antioch Review*), "When the Poet Speaks Arabic" (*To Be: 2B*); "Afterword" (*Interpreting Cultures, Twenty-Five Years Later*, Bloomington); and "The Introduction into Anthropology of a Genuinely Historical Eye" (*Journal of Victorian Culture*). In July, exhausted by all of this, Professor Geertz retired.

In October, PROFESSOR EMERITUS ALBERT O. HIRSCHMAN was the recipient of The Order of the Southern Cross bestowed upon him by the Brazilian Government. This decoration was decided on by the President of Brazil, Fernando Henrique Cardoso, and was presented to Professor Hirschman by the Ambassador, Rubens Barbosa, at the Brazilian Embassy in Washington, DC.

Professor Hirschman spent one week (March 4-8) in Budapest and presented a paper on "The Paradoxes of Unintended Consequences" in honor of George Soros, the President of the Central European University in Budapest and the principal benefactor, on his seventieth birthday.

In March/April, he spent four weeks in Berlin at the Wissenschaftskolleg zu Berlin. The Rektor of the Institute, Wolf Lepenies, gave a speech in Professor Hirschman's honor in celebration of his 85th birthday. In April, Professor Hirschman spent a week in Rome.

On May 6th, the Albert O. Hirschman Chair in Economics was inaugurated at the Institute. The celebration was attended by James D. Wolfensohn, President, The World Bank, and Chairman of the Board, Institute for Advanced Study; and by Ronaldo H. Schmitz and Wilfried Guth, Deutsche Bank AG, Trustees of the Institute for Advanced Study, who had contributed to the establishment of the Chair.

Professor Hirschman has been notified that his book, *Exit, Voice, and Loyalty*, (Harvard University Press) will be printed in Chinese sometime next year.

PROFESSOR JOAN SCOTT gave the Frederick Artz lecture at Oberlin College; a Sawyer Seminar at Columbia University; and a paper at a conference on contemporary French politics at Rutgers. She taught a short (two-week) course at the Central European University in Budapest. She served on the Visiting Committee on Diversity at Brown University and she continued to chair the Committee on Academic Freedom and

Tenure of the American Association of University Professors. In December 1999, she was awarded the Hans Sigrist Prize for excellence in scholarly research (in her case for her work in Gender Studies) by the University of Bern (Switzerland). She is in the process of writing a book on the French movement for "parité," the recent successful attempt to grant equal participation in politics to men and women.

During the academic year 1999-2000, PROFESSOR MICHAEL WALZER gave the Tasan Memorial lectures at four universities in Korea, and also lectured at Princeton and Columbia Universities, at Boston College, the University of San Diego, and the Catholic Theological Union in Chicago. He spoke in Frankfurt on the occasion of the 75th anniversary of the Institute for Social Research, gave the keynote address at a conference on multiculturalism at the University of Santiago de Compostela in Spain, and lectured on global governance (the subject also of his faculty lecture at the Institute) at the University of Padua in Italy. In May 2000, volume one of *The Jewish Political Tradition*, titled *Authority*, was published by Yale University Press, a collaborative project that he has been working on for the past decade. His Horkheimer lectures were published in Germany under the title *Vernunft, Politik and Leidenshaft* (Reason, Politics, and Passion). Two of his books, *The Company of Critics* and *On Toleration* appeared in Russian translations; *Spheres of Justice* came out in Japanese and Korean; *On Toleration* also appeared in Portugese, Greek, Bulgarian, and Hebrew.

THE SCHOOL OF SOCIAL SCIENCE

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Anthropology
University of Wisconsin, Madison

CLAIRE JEAN KIM
Political Science
University of California, Irvine · *n*

WOLF LEPENIES
Sociology
Wissenschaftskolleg zu Berlin · *vf*

LI XIAORONG
Philosophy
University of Maryland

LIANG ZHIPING
Law
Chinese Academy of Arts

MENACHEM LORBERBAUM
Political Science
Tel Aviv University

JEREMY MOON
Political Science
University of Western Australia · *vs*

ROXANNE PANCHASI
History
Rutgers University · *a*

THOMAS POGGE
Philosophy
Columbia University

MARY LOUISE ROBERTS
History
Stanford University

KRISTIN ROSS
French Cultural Studies
New York University · *n*

DANILYN RUTHERFORD
Anthropology
The University of Chicago

CHARLES SHEPHERDSON
Philosophy
Emory University · *v*

MOSHE SHOKEID
Anthropology
Tel Aviv University

EVE TROUTT POWELL
History
University of Georgia

f First Term · *s* Second Term · *v* Visitor · *a* Research Assistant · *n* NEH Supported

THE SCHOOL OF SOCIAL SCIENCE

RECORD OF EVENTS

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

Social Science Thursday Luncheon Seminar: "May '68 and Its Aftermath: Debates, Commemorations, Reprisals"
KRISTIN ROSS, *New York University; Member, School of Social Science*

Political Economy Seminar: Organizational Meeting
JOAN SCOTT, *Professor, School of Social Science*

Social Science Thursday Luncheon Seminar: "The White Edge of the Margin: Textuality and Authority in Biak, Irian Jaya, Indonesia"
DANILYN RUTHERFORD, *The University of Chicago; Member, School of Social Science*

Political Economy Seminar: Discussion of Alastair Davidson, "Mildness: A New Civic Virtue" and Claire Kim, "The Racial Triangulation of Asian Americans."
ALASTAIR DAVIDSON, *Swinburne University of Technology* and CLAIRE KIM, *University of California, Irvine; Members, School of Social Science*

Social Science Thursday Luncheon Seminar: "Constructing the Rule of Law in China: An Internal Perspective"
LIANG ZHIPING, *Chinese Academy of Arts; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "'At 10 A.M. Torture Stopped': Israel's Supreme Court and Human Rights"
ANAT BILETZKI, *Tel Aviv University; Member, School of Social Science*

Political Economy Seminar: Discussion of Xiaorong Li, "Human Atrocities and Human Rights: A Political Justification of Universality" and Thomas Pogge, "Human Flourishing and Universal Justice."
XIAORONG LI, *University of Maryland* and THOMAS POGGE, *Columbia University; Members, School of Social Science*

Social Science Thursday Luncheon Seminar: "Al-Ikhlas and Aceh on Fifth Avenue: Becoming a Modern Indonesian Artist in New York"
KEN GEORGE, *University of Wisconsin, Madison; Member, School of Social Science*

Political Economy Seminar: Discussion of Danilyn Rutherford, "Of Birds and Gifts: Reviving Tradition on an Indonesian Frontier" and Moshe Shokeid, "From Tearoom to Sanctuary."
DANILYN RUTHERFORD, *University of Chicago* and MOSHE SHOKEID, *Tel Aviv University; Members, School of Social Science*

Social Science Thursday Luncheon Seminar: "Making Space for Leviathan — Hobbes' Political Theology"
MENACHEM LOBERBAUM, *Tel Aviv University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Maurice Barrés and the Roots of French Nationalism: The Art of Being Particular"
GILBERT CHAITIN, *Indiana University; Member, School of Social Science*

Political Economy Seminar: Discussion of Liang Zhiping, "Tradition and Its Change: Law and Order in a Pluralist Landscape" and Eve Troutt Powell, "From Odyssey to Empire: Geographical Images of the Sudan in Egyptian Literature in the Mid-Nineteenth Century."
LIANG ZHIPING, *Chinese Academy of Arts* and EVE TROUTT POWELL, *University of Georgia; Members, School of Social Science*

Social Science Thursday Luncheon Seminar: "Social Criticism and Social Theory"
MICHAEL WALZER, *Professor, School of Social Science*

Social Science Thursday Luncheon Seminar: "Exile and Emigration: The Survival of 'German Culture'"
WOLF LEPENIES, *Wissenchaftskolleg zu Berlin; Visitor, School of Social Science*

Political Economy Seminar: Discussion of Ruth Abbey, "In a Similar Voice: Nietzsche's Critique of Human Rights"; Anat Biletzki, "In Defense of Dogma"; and Gilbert Chaitin, "Lacan With Adorno? The Question of Fascist Rationalism."
RUTH ABBEY, *University of Notre Dame, Australia,* ANAT BILETZKI, *Tel Aviv University,* and GILBERT CHAITIN, *Indiana University; Members, School of Social Science*

Social Science Thursday Luncheon Seminar: "Reflections on Spiritual Insecurity and Political Power in Post-Apartheid Soweto"
ADAM ASHFORTH, *Visiting Associate Professor, School of Social Science*

Political Economy Seminar: Discussion of Menachem Lorberbaum, Yair Lorberbaum, Michael Walzer, and Noam Zohar, *The Jewish Political Tradition, Authority* (vol. 1), Chapter 10 - "The State of Israel."
MENACHEM LORBERBAUM, *Tel Aviv University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "The Transformation of Gender Relationships in a Gay Synogogue"
MOSHE SHOKEID, *Tel Aviv University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Justice"
THOMAS POGGE, *Columbia University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Vengeance and the Rule of Law: Should We Redraw the Boundaries?"
ALASTAIR DAVIDSON, *Swinburne University of Technology; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Millenial Fantasies: The Future of 'Gender' in the Twenty-first Century"
JOAN SCOTT, *Professor, School of Social Science*

Political Economy Seminar: Discussion of Noga Tarnopolsky, "The Family That Disappeared."
NOGA TARNOPOLSKY, *Amherst College*

Social Science Thursday Luncheon Seminar: "The Tools of the Master: Slavery and Empire in Nineteenth-century Egypt"
EVE TROUTT POWELL, *University of Georgia; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Transnational Science and Culture: Views of Genomics from Japan"
JOAN FUJIMURA, *Stanford University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Confuscianism, Human Rights, and the Politics of Culture"
XIAORONG LI, *University of Maryland; Member, School of Social Science*

Political Economy Seminar: Discussion of Thomas Pogge, "Anthropology and Universal Justice."
THOMAS POGGE, *Columbia University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Business Social Responsibility, New Governance and Globalisation"
JEREMY MOON, *University of Western Australia; Visitor, School of Social Science*

Social Science Thursday Luncheon Seminar: "Playing the Racial Trump Card: Asian Americans and Contemporary U.S. Politics"
CLAIRE KIM, *University of California, Irvine; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Up Close and Personal: English-Australian Women Talk about Citizenship"
RUTH ABBEY, *University of Notre Dame, Australia; Member, School of Social Science*

Political Economy Seminar: Discussion of Walter Benjamin, "Critique of Violence"; Christian Krohn-Hansen, "The Anthropology of Violent Interaction"; Paul Heelas, "Anthropology, Violence and Catharsis"; and David Riches, "Aggression, War, Violence: Space/Time and Paradigm."
JOSEPH RAZ, *Columbia University*

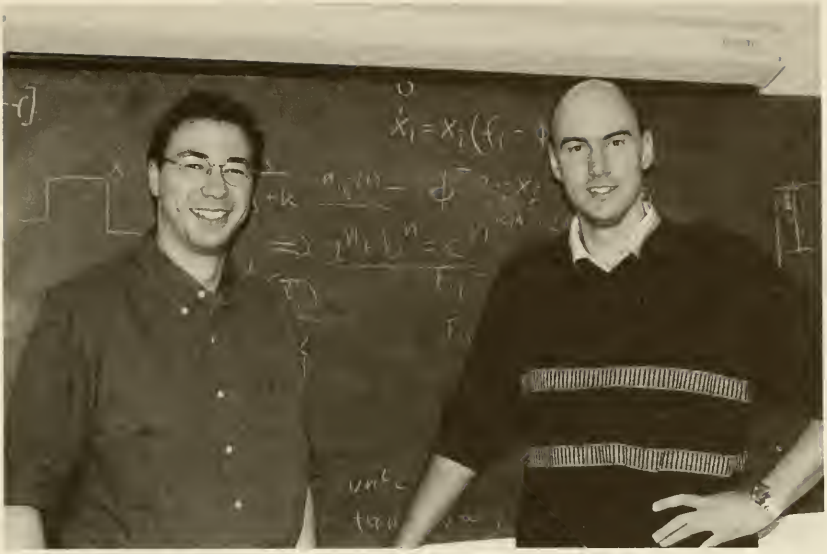
Social Science Thursday Luncheon Seminar: "The Fantastic Sarah Bernhardt: Gender and Theater in Fin-de-siècle France"
MARY LOUISE ROBERTS, *Stanford University; Member, School of Social Science*

Social Science Thursday Luncheon Seminar: "Right to Self-Determination in Africa: A Liberal Democratic Approach"
SIMEON ILESANMI, *Center for Human Values, Princeton University*

Political Economy Seminar: Discussion of Peter Singer, "A Darwinian Left."
PETER SINGER, *Princeton University*

Political Economy Seminar: Discussion of Sonia Bhalotra, "Is Child Work Necessary?"
SONIA BHALOTRA, *University of Cambridge*

Political Economy Seminar: Discussion of Naomi Schor, "French Feminism Is a Universalism" and Eric Fassin, "Fearful Symmetry: Culturalism and Cultural Comparison after Tocqueville."
STANLEY HOFFMANN, *Minda de Gunzburg Center for European Studies, Harvard University*



This has been an intellectually demanding but highly rewarding time and I am convinced that the experience I've gained will be of invaluable benefit for my future work."

— *Member, School of Mathematics*

Walter Fontana, left, a Member in the Institutes's Program in Theoretical Biology, with Martin Nowak, Head of the program.

PROGRAM IN THEORETICAL BIOLOGY
Martin A. Nowak, Head

The current areas of research in the Program in Theoretical Biology are evolutionary theory and the dynamics of infectious diseases. Of special interest are mathematical models of viral infections, anti-viral therapy and drug resistance. Research in evolutionary theory deals with the evolution of fairness, altruistic behavior and human language. Some new questions in oncology and genomics are being explored.

The program is led by Martin Nowak and includes six Members: Walter Fontana, David Krakauer, Alun Lloyd, Karen Page, Lindi Wahl, and Dominik Wodarz. Fontana, a Research Professor at the Santa Fe Institute, was a Member for the 1999-2000 academic year. Joshua Plotkin, a Ph.D. student at Princeton University, began working with Nowak this year. Nowak also collaborated with two members of the School of Mathematics, Peter Trapa and Natalia Komarova.

There have been a number of outside collaborations with experimental groups, including Charles Bangham (Imperial College) on HTLV-1 infection; Jeffrey Lifson (National Cancer Institute) on SIV/HIV dynamics;,Andrew McMichael (University of Oxford) and George Shaw (University of Alabama, Birmingham) on HIV infection; Rolf Zinkernagel (University Hospital of Zurich) and Allan Thomsen (University of Copenhagen) on LCMV infection; Peter Doherty (St. Jude's Hospital) on murine respiratory infections; Lynn Enquist (Princeton University) on CNS infection; and Stuart Sealfon (Mount Sinai Medical School) on signal transduction.

On January 11th, the Institute for Advanced Study and The Rockefeller University jointly sponsored a symposium, "Modeling Life Processes." Institute Member Walter Fontana spoke on "RNA as a Model System for the Study of Evolution." On June 27th, scientists from the Molecular Biology and Ecology and Evolutionary Biology Departments at Princeton University met at the Institute with biology program Members for a half-day session on influenza virus. There have been several meetings between Dr. Arnold Levine's research group at The Rockefeller University and the Institute's biology program to identify areas of collaboration on tumor biology.

In January 2000, with Charles Bangham and Robert May, Nowak organized a Royal Society Discussion Meeting in London on "Virus Dynamics." In July 2000, Martin Nowak and Karl Sigmund organized "European Science Days" in Steyr, Austria. Nowak gave seminars at Harvard Medical School, MIT, Princeton University, the Bristol-Myers-Squibb Research Institute, the NEC Research Institute, and the Gordon Conference in Theoretical Biology. Nowak received the Roger F. Murray Award for the most outstanding paper of the Q-Group's 1999 Seminars.

Specific Research Projects

Martin Nowak has a long-standing research interest in the dynamics of viral and other infectious diseases and works on the evolution of resistance during anti-viral, anti-bacterial and anti-cancer treatment. Dominik Wodarz and Martin Nowak analyzed the effect of memory-immune responses in virus infections. Martin Nowak and Robert May finished a book, *Virus Dynamics*, which will be published by Oxford University Press in fall 2000.

Nowak is working on a mathematical theory for the evolution and population dynamics of human language. With Joshua Plotkin and Vincent Jansen (University of London), he studied the conditions for the evolution of syntactic communication. With Natalia Komarova and Partha Niyogi (University of Chicago), he formulated a theory for the evolution of universal grammar. This work specifies the constraints that universal grammar has to impose for a population to evolve and maintain a coherent grammatical system. Nowak currently works on a similar framework for the acquisition of the lexical matrix. Peter Trapa and Martin Nowak performed a Nash-equilibrium analysis of lexical matrices.

Nowak is interested in the evolutionary dynamics of the Ultimatum Game. In recent years, there has been tremendous interest among economists and psychologists in a very puzzling, experimental observation: when humans are asked to split a certain amount of money, according to the rules of the Ultimatum Game, they discard the rational solution in favor of fairness. Nowak, together with Karen Page and Karl Sigmund (Vienna), developed an evolutionary approach to the Ultimatum Game. A key observation was that fairness out-competes reason if there is some possibility that individuals can obtain information on outcomes of previous interactions.

Walter Fontana's research explores how self-sustaining chemical systems emerge and how to develop a formal method to classify their possible changes. His work goes beyond Darwinian selection, which may explain which of two alternative molecular systems will come to dominate an environment under certain conditions but cannot explain how these alternatives originated in the first place nor offer a complete spectrum of what else could have been possible. While at the Institute, Fontana focused on three areas: genotype-phenotype relations and evolutionary dynamics, evolutionary RNA games and molecular signal transduction.

David Krakauer works on the evolution of prion proteins and related autocatalytic polymers, selection acting on signal transduction networks, stability properties of parasite genomes, and the evolution of sign systems. Each of these problems is characterized by the need to encode heritable information at distinct levels of biological organization, where selection pressures are often independent or in conflict. He has made progress in modeling the dynamics of infection of the nervous system, demonstrating the influence of neural topology on disease propagation, and has investigated viral genome stability in the presence of defective interfering particles, and cellular computation in the GNRH-receptor signal transduction pathways. He was given a visiting assistant professorship at the Department of Ecology and Evolutionary Biology at Princeton University, and made a consultant to the Program on Robustness at the Santa Fe Institute. He continues to work with his experimental collaborators, Professor Lynn Enquist and Dr. Stuart Sealfon.

Alun Lloyd joined the biology program in fall 1999. Before arriving at the Institute, he was Medical Research Council Postdoctoral Research Fellow, working in the Mathematical Biology research group in the Department of Zoology of the University of Oxford and a lecturer at St. Hilda's College, where he taught statistics. One of Lloyd's current projects is an investigation of stochasticity and heterogeneities in transmission on the dynamics of childhood diseases. In particular, he is working on using recently developed mathematical models to develop and inform control strategies for such diseases as measles. He also works on the within-host dynamics of viral diseases, such as HIV.

Karen Page, a mathematician, analyzed the evolutionary dynamics Ultimatum Game. She studied the consequence of reputation and spatial effects. Page formulated a novel adaptive dynamics approach for the Ultimatum Game and showed that fairness can evolve if a small fraction of the population adhere to a "Silver Rule" (offer the minimum amount that you would demand for yourself).

Joshua Plotkin studied mathematics at Harvard University. He researches the determinants of biodiversity in tropical forests. Based upon data from forests across the globe, Plotkin has developed predictive methods to assess large-scale diversity from small-scale censuses. These mathematical models are applicable to the conservation of tropical forests, and they are currently being used to design renewable forestry protocols in northern Malaysia, under a grant from the World Bank.

Lindi Wahl trained in engineering and medical physics and did a D.Phil. in neurobiology at the University of Oxford. Her research contributions have included mathematical models of a range of biological systems with emphases on pharmaceutical kinetics and neurobiology. She worked on resistance and adherence in HIV therapy, tracer kinetics in positron tomography, and mathematical models of experimental evolution.

Dominik Wodarz studied biology at Imperial College for Science, Technology & Medicine in London and did a Ph.D. with Martin Nowak at Oxford. He works on mathematical models of host defenses, with special focus on immunity against virus infections (especially HIV, HTLV, LCMV, and influenza). Wodarz studies factors determining virus clearance versus persistent infection. This has important implications for drug and immuno-therapy against human pathogens. In addition, he works on aspects of tumor biology with special attention to cancer progression and therapy. Wodarz's work is also characterized by several long-term collaborations with experimental scientists including Dr. Jeffrey Lifson, Dr. Allan Randrup Thomsen, Dr. Charles R. M. Bangham, and Dr. Peter Doherty.

The Program in Theoretical Biology Lecture Series
Each year, distinguished scientists in diverse areas of biology are invited to lecture at the Institute. The lecture series is coordinated with a similar series at Princeton University and is funded by the J. Seward Johnson, Sr. Charitable Trusts. The following lectures were presented during the 1999-00 academic year:

September 29	"Simplicity and Complexity in Population Dynamics" Andreas Herz, *Humboldt University*
October 10	"Animal Behavior and the Evolution of Cooperation" Lee Alan Dugatkin, *University of Louisville*
October 27	"The Evolution of the Social Brain" Robin Dunbar, *University of Liverpool*
November 10	"Insights into the Pathogenesis and Prevention of AIDS from Studies in Non-human Primates" Jeffrey D. Lifson, M.D., *National Cancer Institute*
December 8	"Is HIV Infection Curable? Exploring the Limits of Antiretroviral Therapy" Robert F. Siliciano, *Johns Hopkins University*
December 15	"Epigenetics: Its Mechanism and Impact on Genetic Diversity" Shirley Tilghman, *Princeton University*
February 2	"The Evolution of Language" Martin Nowak, *Institute for Advanced Study*
February 9	"Models for Insect Locomotion or How Cockroaches Get Away" Philip Holmes, *Princeton University*
February 16	"Cooperation and Self-interest: Pareto-inefficiency of Nash Equilibria in Finite Random Games" Joel Cohen, *The Rockefeller University*
April 5	"More is Simpler: The Neurobiology of Sensory Information Processing" John J. Hopfield, *Princeton University*
May 17	"Entropy, Complexity and Learning" William Bialek, *NEC Research Institute*

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 1930's 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 200 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 math.

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.

"The high level of intellectual activity at the Institute is certainly a stimulus to think hard, and produce results."

— *Member, School of Natural Sciences*

Julian Bigelow, Herman Goldstine, Robert Oppenheimer, and John von Neumann, with the Institute for Advanced Study computer in the background.

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 1993-94. Participants of PCMI include research mathematicians, graduate students, undergraduate students, mathematics education researchers, undergraduate faculty, and high school teachers. The integration of these diverse groups fosters a stronger sense of the mathematical enterprise as a whole and raises awareness of ongoing work in different areas of the mathematics community.

A major activity of PCMI is the annual three-week Summer Session. Throughout the year, programs also include the year-long High School Teacher Program, the Mentoring Program for Women in Mathematics, the Continuing Outreach Program, and the Lecture Publication Series.

Summer Session

The 10th annual Summer Session of the IAS/Park City Mathematics Institute (PCMI) was held July 16-August 5, 2000, at the Institute for Advanced Study in Princeton, New Jersey. A total of 205 participants were involved in this year's program, with 80 in the Graduate Summer School, 30 in the Research Program, 33 in the High School Teacher Program, 27 in the Undergraduate Program, 11 in the Undergraduate Faculty Program, and 12 in the Mathematics Education Research Program. Twelve guests also were in attendance.

Each year, a specific field in mathematics is chosen to provide the focus for the overall programming. The research topic for this summer was Computational Complexity Theory, organized by Avi Wigderson of the Institute for Advanced Study and The Hebrew University of Jerusalem, and Steven Rudich of Carnegie Mellon University. Professor Wigderson is a leading researcher in the field of Computational Complexity Theory, and Professor Rudich is an outstanding researcher and educator in this field.

Each of the six 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.

The High School Teacher Program

PCMI's High School Teacher Program serves as a national model of professional development for teachers. The daily schedule for the Summer Session 2000 consisted of three courses as well as presentations by returning Teachers-in-Residence, and group and individual presentations by the participating teachers of this year's program. This is the second year of the two-year program cycle for these participants.

The program suffered a loss this summer with the untimely death of Cynthia Hays, a leader in the program and a member of the PCMI Steering Committee for the last eight years. Ms. Hays was an inspiration to teachers and leaders alike, and her perspective as a high school teacher proved to be invaluable to the Steering Committee. Her presence will be sorely missed at PCMI.

The daily courses were *Building Mathematics in the Classroom*, Susan Addington, California State University, San Bernardino, *Advanced Mathematics*, John Polking, Rice University, and *Teaching with Technology*, James King, University of Washington. Hands-on methods and activities were explored during *Building Mathematics in the Classroom* and during the many presentations done by the Teachers-in-Residence and the teacher-participants. The Advanced Mathematics class studied *Spherical Geometry and Cartography*, and the main thrust of the *Teaching with Technology* class was learning to work with software such as Geometer's Sketchpad and with TI-83 graphing calculators, illustrating concepts from both *Building Mathematics in the Classroom* and the Advanced Mathematics classes.

Course and presentation titles were:
Reflections, A Feet-on Activity
Creating Web Pages
Transformation and Coordinates, with a Drawing Activity
Conics
Vectors, Coordinates and Postscript
Transformations and Matrices in the Core Plus Curriculum
More Transformations: Shears and Strains
Cartography
Spherical Geometry
Curve Drawing Devices
Dissections, Area and Transformations
History of Non-euclidean Geometry
Transformations and Problem Solving in Geometer's Sketchpad
Drawing a Conic with Only a Ruler
A Special Ratio Locus
Euclidean Geometry as a Limit of Spherical/Non-euclidean Geometry
Constructing Tensegrity Structures
Activities with Fractals
Space Filling
Transformations and Symmetry in 3 Dimensions
Making Connections
Linear Algebra – Activities for Algebra I with Extensions to Geometry and Algebra II
Brain-based Learning
Rotation/Measurement
Geometric Progression on a Triangle
Geometric Transformation and Music
Calculator and Geometric Transformations
Poly-Swizel Project
Writing in the Math Classroom
History of Mathematics
Polyhedra Models in Origami and Their Euler Characteristic
Postscript Language

A special presentation was made by teacher participants from the Program in Mathematics for Young Scientists (PROMYS) at Boston University. PROMYS and its sister program, the Ross Summer Mathematics Program, will be collaborative partners in teacher enhancement with PCMI, beginning in 2001.

PCMI's future plans involve utilizing selected teachers in leadership positions for focused projects in statistics and in physics and mathematics during the 2001 Summer Session. In particular, one plan will bring a group of teachers to next year's Summer Session for two weeks' immersion in the topic of statistics and the review and production of classroom activities, including the connections to the underlying mathematics. After this two-week immersion, these teachers will meet for the third week of PCMI with the teacher/co-researchers from PCMI's Mathematics Education Researchers to discuss best practice for teaching and learning statistics at the secondary level. The discussions will result in plans for a full-scale program in the summer of 2002, leading eventually to the production and classroom testing of a volume on statistics activities for classroom teachers. This dovetails with a project begun by the Mathematics Education Research Program at this year's Summer Session, and will result in contributing to a national agenda for the K-16 teaching of probability and statistics.

The year-round site program for high school teachers continues at the following current sites: California State University, San Bernardino; Rider University; University of Cincinnati; and the University of Michigan, Dearborn. All of the PCMI teachers continue to be active in site groups, either with group activities or with individual presentations on in-service days or at regional, state, and local chapters of the National Council of Teachers of Mathematics (NCTM).

In November of 1999, two PCMI alumni teachers traveled to Portugal to speak at the Portuguese National Mathematics Educators conference. These teachers gave a presentation on Transformational Geometry and a workshop on Non-euclidean Geometry. Both presentations were translated for the Portuguese audience.

In the Continuing Outreach Program, the alumni sites remain active. Most notably, the University of Washington site group will sponsor its 6th annual residential geometry institute for teachers in the Pacific Northwest, the Duke University alumni site continues to sponsor an annual multi-day workshop for geometry teachers, and the Rice School Mathematics Project, supported by the PCMI Rice University site, continues to run strong programming in Houston, Texas.

The teachers of PCMI report a renewed sense of enthusiasm and a new confidence in teaching from their participation in PCMI. This renewed enthusiasm is carried back to their classrooms, to their colleagues through the in-service teacher enhancement projects they lead, and to the hundreds of students they teach.

Mathematics Education Research Program

The Mathematics Education Research Program met for five days during the first week of PCMI this year. The program was organized by Joan Ferrini-Mundy of Michigan State University, Timothy Kelly of Hamilton College and Richard Lehrer of the University of Wisconsin. Professor Ferrini-Mundy most recently chaired the writing group of the *Standards and Principles for School Mathematics* for the National Council of Teachers of Mathematics. There were 12 distinguished researchers and statisticians in the Mathematics Education Research Program, and the focus of their work is to determine curriculum and best practice for K-16 education in probability and statistics. This project will continue through the 2000-2001 academic year, with an additional meeting of all participants in January of 2001. At least two journal publications will be the result of the initial phase of this project.

Undergraduate Faculty Program

The Undergraduate Faculty Program also met during the first week of PCM1 this year. The program, organized by Daniel Goroff of Harvard University and Joseph Malkevitch of City University of New York, York College, attracted mathematicians and computer scientists from a variety of colleges and universities across the country, including Puerto Rico. Some participants were already knowledgeable about the research topic of Computational Complexity Theory. All were interested in helping their departments adjust to changing demographics and demand for courses due to the increasing popularity of computer science. The Undergraduate Faculty Program participants attended classes offered by the other programs, and welcomed many participants from the other programs to their events. The participants of this program also hosted a video festival each afternoon, showing pedagogical films from TIMSS, from the Derek Bok Center, and from other sources.

Seminar titles:
Discrete Mathematics and Other New Curricula for Liberal Arts Students; Math Courses for Computing, Science, Engineering, and Other Client Disciplines; Reshaping the Mathematics Major.

Clay Mathematics Institute/Park City Mathematics Institute Program for Undergraduates

This year's program for undergraduate students was sponsored by generous funding from the Clay Mathematics Institute of Cambridge, Massachusetts. Twenty-seven undergraduates were involved in the program, an increase of 7 participants over previous years. The Undergraduate program lecturers were David Mix Barrington, University of Massachusetts, Amherst, and Alexis Maciel, Clarkson University.

Lecture titles for the two undergraduate courses:
Algebra and Regular Languages
Problems, Models, and Classes
Graph Reachability and Space-bounded Computation
Reductions and Completeness
Boolean Formulas, NC^1, and M-programs
Arithmetic and Threshold Circuits
NP-complete Problems
Chinese Remainder Representation
Complete Problems for Other Complexity Classes
Logspace Division and Its Consequences
AC0 Circuits Cannot Compute Parity
Measuring the Complexity of Proofs
Proofs, Games, and Alternation
Randomized Computation
Polynomial-size Frege Proofs of the Pigeonhole Principle
Interactive Proofs
A Lower Bound for Tree Eesolution
IP=PSPACE
The Interpolation Method
A Brief Look at Probabilistically Checkable Proofs

In addition to the daily lecture series, there was a problem session held each evening for the undergraduates. Several undergraduate participants also attended the lectures of the Graduate Summer School.

Graduate Summer School and Research Program
The Graduate Summer School met for three formal lectures each day and two problem sessions. More so than in past years, the participants of the Research Program also attended the lectures of the Graduate Summer School.

The lecture series were as follows:
Introduction to Complexity Theory Through Its Open Questions, Steven Rudich, Carnegie Mellon University
Exploring Complexity Through Reductions, Sanjeev Arora, Princeton University
Quantum Computing, Ran Raz, Weizmann Institute of Science
Communications Complexity, Ran Raz
Proof Complexity, Paul Beame, University of Washington
Algebraic Complexity, Michael Ben-Or, The Hebrew University of Jerusalem, Israel
Pseudorandomness: Blum-Micali-Yao Framework, Oded Goldreich, Weizmann Institute of Science
Interactive Proofs, Salil Vadhan, Massachusetts Institute of Technology
Pseudorandomness: Nisan-Wigderson Framework, Luca Trevisan, Columbia University
Probabilistically Checkable Proofs, Madhu Sudan, Massachusetts Institute of Technology

The Research Program held eight seminars during the three-week Summer Session:
Chernoff Type Bounds for Sum of Dependent Random Variables and Their Applications in Randomized Algorithms, Van Vu, Microsoft Research
Phase Transitions in Computer Science, Part I and Part II, Jennifer Chayes and Christian Borgs, Microsoft Research
Enormous Integers in Real Life, Harvey Friedman, The Ohio State University
Computation on Groups. A Bird's Eye View, Igor Pak, Massachusetts Institute of Technolgy
The Zig-Zag Graph Product, and Elementary Construction of Expander Graphs, Omer Reingold, AT&T and Institute for Advanced Study
Diophantine Equations in Two-variables, Minhyong Kim, University of Arizona
Natural Proofs, Steven Rudich, Carnegie Mellon University

Cross Program Activities
The Cross Program Activities consist of a formal presentation four times each week, plus several evening gatherings and social occasions throughout the Summer Session.

Formal presentations were made on Monday, Tuesday, Thursday, and Friday afternoons in Wolfensohn Hall. Titles were as follows:
Some Fundamental Insights of Computational Complexity Theory, Avi Wigderson, Institute for Advanced Study
Knowing and Teaching Elementary Mathematics, Liping Ma, author
Mathematics, Music, and the Sublime, Edward Rothstein, *The New York Times*, and Robert Taub, Institute for Advanced Study

What is Happening at Discretemath.com? Steven Rudich, Carnegie Mellon University
The Coordination of Table Algorithms with Geometry Leading to the Creation of Continuous Exponents: John Wallis and the Seventeenth-century Experiments That Led to the Possibility of Calculus, David Dennis, University of Texas, El Paso
Technically Speaking: Thoughts on Lecturing and Teaching, Steven Rudich
PROMYS and Ross Programs, Glenn Stevens, Boston University, and Daniel Shapiro, The Ohio State University
The Digital Envelope — A Crash Course in Modern Cryptography, Avi Wigderson
Math and Math Learning in Israel (personal impressions), panel discussion moderated by Michael Ben-Or, The Hebrew University of Jerusalem, Israel
The Classroom Stage, Blaga Pauley, California State University, San Bernardino

The computer lab, under the direction of James King of the University of Washington, was equipped with a variety of computer hardware and software, providing Windows, Macintosh, and Linux platforms for participants' use. Software and equipment donated by manufacturers and individual donors included Microsoft Office 2000, Mathematica by Wolfram Research, Cabri Geometry by Texas Instruments, Geometer's Sketchpad by Key Curriculum Press, Maple by Waterloo Maple, Y&Y TeX, TeXtures by Blue Sky Research, and TI-92 calculators by Texas Instruments. The lab was a valuable resource for educational and computational work as well as Internet access, and it was in use around the clock.

On July 20th, through the generous sponsorship of the Huntsman Foundation, PCMI hosted a concert by Robert Taub, Artist-in-Residence at the Institute for Advanced Study. PCMI participants and Institute community members attended the piano concert in Wolfensohn Hall on the Institute campus. Robert Taub and Edward Rothstein of *The New York Times* gave a pre-concert discussion to the PCMI participants during the Cross Program Activity on the day of the concert.

Casual interaction among the participants was also fostered at pizza parties, study sessions, barbecue dinners, and during weekend trips organized by the participants.

Publication Series
This past year saw the publication of Volume 8 in the American Mathematical Society's *Park City Mathematics Series*. It is expected that Volume 9, from the Summer Session of 1999, will be published in late 2000. The full series, which comprises nearly all of the lectures ever given in PCMI's Graduate Summer School, now includes the following titles:

Volume 1, *Geometry and Quantum Field Theory*;
Volume 2, *Nonlinear Partial Differential Equations in Differential Geometry*;
Volume 3, *Complex Algebraic Geometry*;
Volume 4, *Gauge Theory and Four Manifolds*;
Volume 5, *Hyperbolic Equations and Frequency Interactions*;
Volume 6, *Probability Theory and Applications*;
Volume 7, *Symplectic Geometry and Topology*;
Volume 8, *Representation Theory of Lie Groups*.

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

A new *Park City Mathematics Institute Subseries* was established in the AMS *Student Mathematics Series* this year. These volumes are aimed at undergraduate students and are published independently of the Park City Mathematics Series (mentioned above). Published this year were:

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.

Funding
The IAS/Park City Mathematics Institute was made possible by the generosity of the following funders:

Chautauqua Programs
Clay Mathematics Institute
Datek Online Holdings Corporation
Geraldine R. Dodge Foundation
Merrill Lynch Co., Inc. Foundation
National Science Foundation
State of New Jersey
RGK Foundation
William A. Schreyer
Alfred and Ellen Schwartz Philanthropic Fund
The Spencer Foundation
The Starr Foundation
Toyota USA 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, University of Michigan
Herbert C. Clemens, Professor, University of Utah
Ronald L. Graham, Professor, University of California, San Diego
Shirley A. Hill, Professor Emeritus, University of Missouri, Kansas City
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Robert D. MacPherson, Professor, School of Mathematics, Institute for Advanced Study
William A. Schreyer, Chairman Emeritus, Merrill Lynch & Co., Inc.
Elaine B. Wolfensohn, New York, New York.

Steering Committee
Members of the Steering Committee plan and manage the activities of the PCMI as follows:

Chair:
Herbert C. Clemens, Professor, University of Utah
Member at large:
John C. Polking, Professor, Rice University
2000 Organizers:
Avi Wigderson, Professor, School of Mathematics, Institute for Advanced Study
Steven Rudich, Professor, Carnegie-Mellon University
Editor, Lecture Series
David R. Morrison, Professor, Duke University
High School Teachers Program:
James R. King, Professor, University of Washington
Susan Addington, Professor, California State University, San Bernardino
Cynthia Hays, Secondary Mathematics Specialist, Austin Independent School District (in memoriam)
Mathematics Education Research Program:
Joan Ferrini-Mundy, National Research Council
Timothy Kelly, Professor, Hamilton College
Recruitment:
Nathaniel Whitaker, Professor, University of Massachusetts, Amherst
Research Program:
John Morgan, Professor, Columbia University
Women's Program:
Chuu Lian Terng, Professor, Northeastern University
Karen Uhlenbeck, Professor, University of Texas, Austin
Undergraduate Faculty Program:
Daniel Goroff, Harvard University
Undergraduate Program:
Robert L. Bryant, Professor, Duke University

New members of the Steering Committee in 2001:

Research Program: Karl Rubin, Professor, Stanford University
2001 Graduate Summer School/Research Program Organizers: Daniel S. Freed, Professor, University of Texas, Austin; David R. Morrison, Professor, Duke University; Isadore Singer, Massachusetts Institute of Technology
Undergraduate Program: Roger Howe, Professor, Yale University; William Barker, Professor, Bowdoin College

The Mentoring Program for Women in Mathematics was held May 30–June 9 at the Institute for Advanced Study in Princeton. The program, organized by Chuu Lian Terng, Professor, Northeastern University and Karen Uhlenbeck, Professor, University of Texas, Austin, had 36 registered participants from the fields of mathematics and computer science. In addition, many of the lectures and seminars were attended by mathematicians from the local area. The topic of the Women's Program undergraduate course was Computational Complexity Theory; the graduate course for the Women's Program was in the related subject of cryptography.

Joan Feigenbaum from AT&T organized the graduate course. Tal Malkin and Rebecca Wright, also from AT&T, assisted her in giving the lectures. Yael Gertner, a graduate student in computer science at the University of Pennsylvania, ran the graduate problem session. The graduate course covered basic ideas and applications and could be followed by all the participants.

The undergraduate course on computational complexity theory was given by Judy Goldberg from the computer science department at the University of Kentucky, with the assistance of Sara Mocas from Portland State University. The course was attended by all participants, including the graduate students (except those who chose to concentrate only on cryptography). The core group of students who followed the course read papers and gave presentations during the last two days.

Also included in the program were a research seminar, presenting work from many areas of computer science and algebra, and a participant seminar of expository papers.

Three colloquium-style lectures were given. Maria Klawe, University of British Columbia, spoke on designing software for middle school math education, Lenore Blum of Carnegie Mellon University gave an introduction to the ideas of real complexity, and Avi Wigderson, of the Institute for Advanced Study and the organizer of the PCMI summer program, gave an overview of complexity theory which tied into both the undergraduate and the graduate courses.

The Women-in-Science Seminar, organized by Karen Uhlenbeck, had two discussion sessions. In one, the participants introduced themselves and spoke about their present concerns; in the second, specific problems of women-in-science, especially competition, were discussed. Two seminars featured visitors Maria Klawe and Lenore Blum, who offered advice and practical information. Karen Collins, a computer science professor from Wesleyan University, Connecticut, discussed the early history of computer science, and a panel of local women professors dealt with balancing research, teaching and service. Judy Goldsmith organized a session for participants to practice job interviews. Throughout the program, there were many discussions about the differences between research in academia and industry.

Because the students from computer science and mathematics at all levels were involved in the same mathematical undertaking, there was a great deal of formal and informal mentoring within the scientific program. The mixture of computer science and mathe-

matics students, and the strength of the students who chose to participate in this interdisciplinary program resulted in a program of great scientific depth.

Lectures and Seminars:
Undergraduate Lectures Series: *Foundations of Computational Complexity*, Judy Goldsmith, University of Kentucky, and Sarah Mocas, Portland State University.

Graduate Lectures Series: *Cryptographic Complexity Theory*, Joan Feigenbaum, AT&T Research, Rebecca Wright, AT&T Research, Tal Malkin, AT&T Research: *Computational Difficulty, Computational Indistinguishability, Introduction to Encryption; One-way Functions and Pseudorandom Generators, Definitions and Examples; Public-key Encryption* (all by Rebecca Wright); *Many, But Not All, Cryptographic Concepts Are Equivalent To One-way Functions; Interactive Proof Systems and Zero-knowledge; Secret Sharing* (all by Joan Feigenbaum); *Private Information Retrieval* (Tal Malkin).

Research seminar titles: *Graph Theory (Open) Problem About the Hypercube*, Karen Collins, Wesleyan University; *Computational Complexity of Generalized Pattern Matching*, Christine Heitsch, University of California, Berkeley; *Glomming Things Together is Hard*, Judy Goldsmith, University of Kentucky.

Participant seminar titles:
Definition and Uses of the Ideal Class Group, Grisha Stewart, Bryn Mawr College; *Egyptian Mathematics and Solving Number Theory Problems*, Ana Vasiliu, Oklahoma State University; *The Baues Problem (What Children's Puzzles Have To Do With Algebraic Geometry)*, Diana Maclagan, University of California, Berkeley.

Women in Science Seminar titles:
Is Being A Woman In Math (Or Computer Science) Really Different? discussion led by Karen Uhlenbeck, University of Texas, Austin; *The Early History of Computer Science*, Karen Collins, Professor, Wesleyan University; Panel Discussion *Dividing the Pie: Division of Research, Teaching, and Service Commitments at Academic Institutions*. Organized by Professor Lisa Traynor of Bryn Mawr College and Professor Antonella Grassi of University of Pennsylvania, panelists: Alice Chang of Princeton University, Lisa Fastenberg of Yeshiva University, Lisa Traynor, and Antonella Grassi.

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, AT&T Research; 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; and Lisa Traynor, Professor, Bryn Mawr College.

"The Institute is a scholar's paradise. I hope it remains so. I am privileged to have been a Member."

— *Member, School of Historical Studies*

To the right of Wolfensohn Hall is Simonyi Hall, home of the School of Mathematics.

INDEPENDENT AUDITORS' REPORT

The Board of Trustees,
Institute for Advanced Study -
Louis Bamberger and Mrs. Felix Fuld Foundation

We have audited the accompanying balance sheet of Institute for Advanced Study - Louis Bamberger and Mrs. Felix Fuld Foundation (the "Institute") as of June 30, 2000 and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Institute's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior year summarized comparative information has been derived from the Institute's June 30, 1999 financial statements, and in our report dated September 30, 1999, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, such financial statements present fairly, in all material respects, the financial position of the Institute at June 30, 2000 and the changes in its net assets and its cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America.

Deloitte & Touche LLP

September 20, 2000

BALANCE SHEET
JUNE 30, 2000 (WITH COMPARATIVE TOTALS FOR 1999)

ASSETS	2000	1999
CASH	$ 746,898	$ 2,678,020
INVESTMENTS - Held by Trustees (Note B)	6,368,517	14,310,456
ACCOUNTS RECEIVABLE	249,764	236,944
GOVERNMENT GRANTS AND CONTRACTS RECEIVABLE	1,017,761	1,334,918
ACCRUED INCOME ON INVESTMENTS	1,479,613	1,528,916
PREPAID AND OTHER ASSETS	422,840	484,768
CONTRIBUTIONS RECEIVABLE - NET (Note M)	1,283,664	1,433,660
UNAMORTIZED DEBT ISSUANCE EXPENSE	680,447	729,237
LAND, BUILDINGS AND IMPROVEMENTS, EQUIPMENT AND RARE BOOK COLLECTION - NET (Note C)	40,527,807	36,606,666
INVESTMENTS (Note B)	372,634,749	345,027,767
TOTAL ASSETS	$425,412,060	$404,371,352

See notes to financial statements.

LIABILITIES AND FUND BALANCES	2000	1999
ACCOUNTS PAYABLE AND ACCRUED EXPENSES	$ 8,537,727	$ 8,636,939
REFUNDABLE ADVANCES (Note F)	4,787,827	4,419,414
TRUST FUND OBLIGATIONS	2,769,922	1,998,718
NOTE PAYABLE (Note C)	1,087,671	1,140,907
ACCRUED INVESTMENT MANAGEMENT FEES	1,017,270	3,041,528
LONG-TERM DEBT (Note D)	41,466,859	42,389,367
Total liabilities	59,667,276	61,626,873
NET ASSETS:		
Unrestricted	244,176,515	233,210,268
Temporarily restricted (Note J)	28,563,649	23,756,682
Permanently restricted (Note J)	93,004,620	85,777,529
Total net assets	365,744,784	342,744,479
TOTAL LIABILITIES AND NET ASSETS	$ 425,412,060	$ 404,371,352

STATEMENT OF ACTIVITIES
YEAR ENDED JUNE 30, 2000 (WITH COMPARATIVE TOTALS FOR 1999)

	UNRESTRICTED	TEMPORARILY RESTRICTED
REVENUES, GAINS AND OTHER SUPPORT:		
Private contributions and grants	$ 1,357,528	$ 3,273,492
Government grants	-	3,790,775
Income on long-term investments	9,053,835	4,262,644
Net realized and unrealized gains and (losses) on long-term investments (includes $3,911,854 and $2,287,244 in unrealized losses in 2000 and 1999, respectively)	15,430,489	6,721,283
Gain on sale of capital assets	162,037	-
Net assets released from restrictions - satisfaction of program restrictions	13,241,227	(13,241,227)
Total revenues, gains and other support	39,245,116	4,806,967
EXPENSES AND LOSSES:		
School of Mathematics	5,998,078	-
School of Natural Sciences	5,316,261	-
School of Historical Studies	4,205,045	-
School of Social Science	2,238,971	-
Libraries and other academic expenses	4,748,689	-
Administration and general	5,525,697	-
Auxiliary activity - tenants' housing expenses, net of unrestricted revenue $195,403	246,128	-
Total expenses and losses	28,278,869	-
CHANGES IN NET ASSETS	10,966,247	4,806,967
NET ASSETS, BEGINNING OF YEAR	233,210,268	23,756,682
NET ASSETS, END OF YEAR	$244,176,515	$28,563,649

See notes to financial statements.

2000		
PERMANENTLY RESTRICTED	TOTAL 2000	TOTAL 1999
$ 6,580,006	$ 11,211,026	$ 4,512,233
-	3,790,775	4,504,217
-	13,316,479	11,400,861
647,085	22,798,857	6,062,441
-	162,037	847,019
-	-	-
7,227,091	51,279,174	27,326,771
-	5,998,078	4,984,500
-	5,316,261	5,046,766
-	4,205,045	3,488,977
-	2,238,971	2,087,799
-	4,748,689	4,239,203
-	5,525,697	5,189,554
-	246,128	356,197
-	28,278,869	25,392,996
7,227,091	23,000,305	1,933,775
85,777,529	342,744,479	340,810,704
$93,004,620	$365,744,784	$342,744,479

STATEMENT OF CASH FLOWS
YEAR ENDED JUNE 30, 2000 (WITH COMPARATIVE TOTALS FOR 1999)

	2000	1999
CASH FLOWS FROM OPERATING ACTIVITIES:		
Change in net assets	$ 23,000,305	$ 1,933,775
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation	2,479,525	2,055,693
Decrease in accrued income	49,303	321,262
Decrease in accounts and grants receivable	304,337	539,207
Decrease in contributions receivable	149,996	854,857
(Decrease) increase in accounts payable	(99,212)	1,458,898
Decrease (increase) in prepaid and other assets	61,928	(194,634)
Increase in refundable advances	368,413	1,770,221
(Decrease) increase in accrued management fees	(2,024,258)	1,836,755
Contributions restricted for long-term investments	(7,753,013)	(1,652,470)
Net realized and unrealized gains on long-term investments	(22,798,857)	(6,062,441)
Gain on sale of capital assets	(162,037)	(847,019)
Net cash (used in) provided by operating activities	(6,423,570)	2,014,104
CASH FLOWS FROM INVESTING ACTIVITIES:		
Proceeds from sale of capital assets	2,389,680	2,729,304
Purchase of capital assets	(8,628,309)	(16,881,223)
Proceeds from sale of investments	181,766,108	208,526,124
Purchase of investments	(188,032,433)	(208,182,147)
Net cash used in investing activities	(12,504,954)	(13,807,942)
CASH FLOWS FROM FINANCING ACTIVITIES:		
Proceeds from contributions restricted for:		
Investment in endowment	6,123,952	933,098
Investment in plant	387,806	183,115
Investment subject to annuity agreements	1,241,255	536,257
	7,753,013	1,652,470
Other financing activities:		
Increase in trust fund obligations	771,204	407,004
Decrease in unamortized debt issuance expense	48,790	49,902
(Decrease) increase in long-term debt	(922,508)	33,232
Decrease in notes payable	(53,236)	(52,187)
Decrease in investment receivable-bond issue	9,400,139	12,357,458
	9,244,389	12,795,409
Net cash provided by financing activities	16,997,402	14,447,879
NET (DECREASE) INCREASE IN CASH	(1,931,122)	2,654,041
CASH, BEGINNING OF YEAR	2,678,020	23,979
CASH, END OF YEAR	$ 746,898	$ 2,678,020
SUPPLEMENTAL DATA:		
Interest paid	$ 2,439,783	$2,362,599

See notes to financial statements.

NOTES TO FINANCIAL STATEMENTS
YEAR ENDED JUNE 30, 2000

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.

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 deferred amounts 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, 2000 are comprised of the following:

	REPORTED VALUE	FAIR VALUE
Pooled investments:		
Equity securities	$202,628,143	$238,241,270
Debt securities	156,894,202	159,813,207
Mortgages from faculty and staff	3,082,363	3,082,363
Investment accounts receivable	9,954,986	9,954,986
Total pooled investments	372,559,694	411,091,826
Funds invested separately:		
Equity securities	75,055	112,788
Total	$372,634,749	$411,204,614

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 $142,718,000 and a fair value of approximately $148,558,250 at June 30, 2000. The Institute accounts for these investments under the equity method and, accordingly, recognizes its proportionate share of ordinary income and net realized gains attributable to the investments of the partnerships. The Institute's proportionate share of ordinary income and net realized gain was $3,963,634 and $18,321,672, respectively, for the year ended June 30, 2000.

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 $89,683,018 at June 30, 2000. 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 38.3% and 16.1%, respectively, 54.4% collectively of total investments held by the Institute at June 30, 2000. 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, 2000:

	UNRESTRICTED	TEMPORARILY RESTRICTED	PERMANENTLY RESTRICTED	TOTAL
Dividends and interest	$ 9,053,835	$ 4,262,644	$ -	$ 13,316,479
Realized gain on investments reported at fair value	$ 2,572,002	$ 263,654	$971,987	$ 3,807,643
Realized gain (loss) on investments reported at other than fair value	15,470,657	7,757,313	(324,902)	22,903,068
Total realized gain	18,042,659	8,020,967	647,085	26,710,711
Change in unrealized loss	(2,612,170)	(1,299,684)	-	(3,911,854)
Total realized and unrealized gain	$15,430,489	$ 6,721,283	$ 647,085	$ 22,798,857

Investments, beginning of year			$ 345,027,767
Investment purchases			186,574,233
Investment sales			(181,766,108)
Investment returns:			
Realized gains		$ 26,710,711	
Unrealized losses		(3,911,854)	
Total return on investments			22,798,857
Investments, end of year			$ 372,634,749
Investments, beginning of year			$345,027,767
Gifts available for investment:			
Gifts creating a permanent endowment fund			6,580,006
Gifts creating a temporary endowment fund			714,172
Gifts for trust funds			1,241,255
Investment returns:			
Dividends and interest		$ 13,316,479	
Realized gains		26,710,711	
Unrealized losses		(3,911,854)	
Total return on investments			36,115,336
Amounts appropriated for current operations			(16,738,820)
Annuity trust income payment			(304,967)
Investments, end of year			$372,634,749

The participation in the pool and ownership of the other investments at June 30, 2000 is shown in the table below:

Permanently restricted net assets	$ 93,929,787
Temporarily restricted net assets	29,875,295
Unrestricted net assets	248,829,667
	$372,634,749

Short-term investments represent the balance of the proceeds from the 1997 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, 2000, 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, 2000 follows:

Land and improvements	$ 1,043,307
Buildings and improvements	54,851,118
Equipment	14,983,456
Rare book collection	203,508
Joint ownership property	921,717
Total	72,003,106
Less accumulated depreciation	(31,475,299)
Net book value	$40,527,807

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 $1,087,671 has been recorded as a note payable in the accompanying statement of financial position at June 30, 2000. 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, 2000:

2001	54,306
2002	55,397
2003	56,511
2004	57,647
2005	58,805
Through 2017	805,005
Total	$1,087,671

D. LONG-TERM DEBT

A summary of long-term debt at June 30, 2000 follows:

Series F & G 1997 - NJEFA	$41,920,000
Less unamortized bond discount	(453,141)
Total long-term debt	$41,466,859

Interest expense on long-term debt for the year ended June 30, 2000 was $2,108,130.

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 renovation of members housing, construction of a new academic building, and additional capital projects.

The bonds bear interest at rates ranging from 4% to 5%, payable semi-annually, are subject to redemption at various prices and require principal payments and sinking fund installments through July 1, 2028. 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, 2000:

2001	$ 1,140,000
2002	1,195,000
2003	1,250,000
2004	1,310,000
2005	1,375,000
Through 2028	35,650,000
Total	$41,920,000

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, 2000 totaled approximately $1,131,750.

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 2000 are as follows:

Postretirement Benefit Costs:	
Service Cost - benefits attributable to service during the year	$ 139,436
Interest Cost on Accumulated Postretirement Benefit Obligation	309,388
Total	$ 448,824

The actuarial and recorded liabilities for these benefits, none of which have been funded, are as follows at June 30, 1996 (a recomputation of the accumulated postretirement benefit obligation as of June 30, 2000 was not performed due to the immaterial change from the prior measurement date):

Accumulated Postretirement Benefit Obligation	
Retirees	$1,810,053
Fully Eligible Active Plan Participants	604,638
Other Active Plan Participants	948,829
Total	$3,363,520

For measurement purposes, a 13.0% Pre-62 trend rate was used for 1997 health care costs, with the rate decreasing ratably until the year 2006, then remaining constant at 5.50% thereafter. In addition, a 10.0% Post-62 trend rate was used for 1997, declining ratably to 5.50% in 2006 and remaining constant 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 $672,501 at June 30, 1997 and the net periodic cost by $115,444 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, 1999	$4,419,414
Additions:	
Contributions, grants, etc.	7,809,892
Restricted endowment income	12,218,964
Total additions	20,028,856
Deductions:	
Funds expended from contributions, grants, etc.	7,441,479
Funds expended from restricted endowment	6,268,760
Quasi-endowment funds utilized	5,950,204
Total deductions	19,660,443
Balance at June 30, 2000	$4,787,827

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 $4,713,800 as of June 30, 2000, 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 ($478,308 net of $628,267 in revenues) and members' housing ($1,843,328, net of $1,243,508 in revenues) have been allocated among the programs and supporting services benefited. 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 $3,403,830 for the year ended June 30, 2000.

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 $1,738,445 and allocated interest income totaled $-0- for the year ended June 30, 2000.

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

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.
Temporarily restricted net assets are available for the following purposes:

	2000
Academic Services:	
Educational Programs	$28,563,649
Permanently restricted net assets are restricted to:	
Investments to be held in perpetuity, the income from which is expendable to support academic services	$93,004,620

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:	2000
Program expenses:	
School of Mathematics	$3,795,795
School of Natural Sciences	2,205,255
School of Historical Studies	1,856,129
School of Social Science	2,005,582
Academic support costs:	
Libraries and other academic	2,672,215
Computing	92,200
Administration and general:	
Fund raising	8,616
Tenants' housing	135,319
Equipment acquired and placed in service	160,504
Trust fund disbursements	309,612
Total restrictions released	$13,241,227

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:

	2000
Expenses incurred were for:	
Salaries, wages, and benefits	$15,062,320
Stipends	5,055,930
Honoraria	154,597
Grants to other organizations	692,414
Supplies and travel	1,778,899
Services and professional fees	2,982,519
Depreciation	1,409,506
Interest	1,142,684
Total expenses	$28,278,869

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, 2000	Reported Amount	Estimated Fair Value
Assets:		
Cash	$ 746,898	$ 746,898
Investments	372,634,749	411,204,614
Grant/Contributions Receivable	2,301,425	2,301,425
Liabilities:		
Long-term debt	41,466,859	41,466,859
Note payable	1,087,671	1,087,671

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, 2000, 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, 2000
Unconditional promises to give:	
Less than one year	$ 1,021,792
One to five years	315,000
More than five years	2,000
	1,338,792
Discount on promises to give	(55,128)
	$1,283,664

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