INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

1993–94

PRINCETON · NEW JERSEY

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for ADVANCED STUDY

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Extract from the letter addressed by the Founders to the Institute's Trustees, dated June 6, 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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Astronomers and astrophysicists apply the tools of modern physics to help answer age-old questions like: How big is the Universe? How old is the cosmos? What previously unknown objects does it contain? What fuels the most energetic objects in the Universe?

To answer these questions, astronomers and astrophysicists use paper and pencil, small and large computers, and telescopes in space, on the top of terrestrial mountains, and in deep mines. Of particular interest to Institute scientists are the questions that have implications for physics, including the solar neutrino problem, the nature of dark matter, the location and characteristics of black holes, the formation of large-scale structure (involving galaxies and even larger units), and the discrimination between cosmological models. The most remarkable result of the explorations of cosmic systems is that, so far, the laws of physics developed in laboratories and in offices on the tiny planet Earth have proved sufficient for understanding objects at the edge of the Universe.

JOHN BAHCALL

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SHELLEY WALTZ
Computer Manager, School of Natural Sciences

One might say that scholarship and science are international in their nature, and that people like von Neumann or Erwin Panofsky or Ernst Kantorowicz or Eugene Wigner or Bruno Bettelheim or Konrad Bloch or Rudolf Carnap or Max Delbrück or Erik Erikson or Paul Kristeller or Felix Gilbert would have done about what they did wherever they were, and that the resonance would have been heard here. But that is not true. Their physical presence here mattered—and it matters still; their personalities were, and happily in many cases still are, a force in themselves. Even in music, which with science is the most international of endeavors, their presence on a hundred campuses and in innumerable communities permeated and enriched the existing culture. And it was an interactive process. They were affected—their work redirected—by this environment, social and intellectual, which they found, in complicated ways, both liberating and constricting. The intellectual world they helped reshape, re-shaped them.

BERNARD BAILYN
"Realism and Idealism
in American Diplomacy"

INSTITUTE FOR ADVANCED STUDY: BACKGROUND AND PURPOSE

The Institute for Advanced Study is an independent, non-profit institution devoted to the encouragement of learning and scholarship. From its founding in 1930 it has been a community of scholars where intellectual inquiry can be pursued across a broad range of disciplines under the most favorable conditions. In the words of its original statement of mission, "The primary purpose is the pursuit of advanced learning and exploration in the 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." For more than sixty years this founding principle has been sustained and has yielded a distinguished record of definitive scholarship.

Although small in scale, the Institute embraces in some form many of the major academic disciplines. But unlike universities, it has no scheduled courses of instruction or curriculum and does not aspire to represent all branches of learning. It is organized in four Schools: Historical Studies, Mathematics, Natural Sciences, and Social Science. Within each is found a spectrum of scholarly interests which transcends the usual divisions of academic subjects. This breadth of coverage and the opportunity it affords for independent, self-directed scholarship distinguish the Institute from most other centers for research and scholarship. So too does its permanent faculty, twenty-two distinguished scholars who guide the work of the Schools and each year award fellowships to about 160 visiting Members from universities and research institutions throughout the world.

From its beginnings, the Institute has been international in composition and a community in character. More than half of today's faculty began their scholarly careers outside the United States, and each year about a third to half of the Institute's Members come from abroad. This mix of cultures as well as disciplines and of senior and younger scholars greatly enriches the Institute experience, as does the Institute's residential housing, its outstanding dining, numerous lectures, concerts, and other cultural events. Contacts made at the Institute often become life-long intellectual ties spanning national boundaries.

The Institute was established with a major founding gift from New Jersey businessman and philanthropist Louis Bamberger and his sister, Mrs. Felix Fuld. They wished to use their fortunes to make a significant and lasting contribution to society. Abraham Flexner originated the concept from which the Institute took form, encouraged the Bambergers to provide resources for its realization, and served as the Institute's first Director. Through careful management and generous additional support, the Institute's endowment today produces about two thirds of the annual operating budget. Another third is provided through

support from private gifts, foundations, corporations, and federal agency grants. Important additional support comes from corporate and foundation sources outside the United States. The Institute is governed by an elected Board of Trustees which appoints a Director to oversee its operations and guide its development.

The Institute campus is set on about 800 acres of woods and farmlands in Princeton, New Jersey. Although independent from Princeton University, the Institute and the University enjoy a highly cooperative relationship. Each has contributed significantly to Princeton's world-wide reputation as a center for scholarship and science.

REPORT OF THE CHAIRMAN

As Chairman of the Institute's Board of Trustees, it is my pleasure to present the Annual Report for the Institute for Advanced Study for 1993–94. In the pages that follow there is abundant evidence that the Institute continues to serve faithfully the purpose of its founders and original benefactors. Indeed, today its contributions to scholarship and to education are even more indispensable than was the case more than sixty years ago when the Institute's first Members were appointed.

The Institute's influence has taken many forms and can be traced in most areas of human endeavor. The nearly five thousand distinguished scholars who have been here have contributed immeasurably to the ever-growing body of knowledge that is the core of our civilization. They include some who have come to the Institute for just a few months as well as others who have worked here for many years.

Professors George Kennan and André Weil, for instance, have been associated with the Institute since the 1950s. This year, on the occasion of George Kennan's ninetieth birthday, his colleagues at the Institute and friends throughout the world took the opportunity to recognize the importance of his scholorship, his fresh perspectives on nineteenth and twentieth century history and the other distinctive qualities that make his presence at the Institute so fruitful for both scholarship and diplomacy.

André Weil, who is nearing his ninetieth year, received the Kyoto Prize of the Inamori Foundation, regarded as the Japanese equivalent of the Nobel Prize, for his life-long achievements across virtually all of the major areas of mathematics. The work most mathematicians are doing today in number theory, topology, and algebraic geometry largely derives from the contributions he made over the past sixty years, and the entire discipline has been strengthened by his efforts to establish cohesion and order across all mathematical fields.

This year marked the conclusion of the terms of three Institute Trustees, Theodore L. Cross, Bernard Bailyn and Amartya Sen. To each of the outgoing Trustees, we express our deep appreciation.

Ted Cross has served on the Board of Trustees since 1989. As chair of the Board's Buildings and Grounds Committee he has been very active in discussions with government officials and local groups relating to the possible creation of a conservation easement on the Institute Woods and adjacent farmlands. Also during his chairmanship, the new mathematics building and Wolfensohn Hall were constructed, and the ECP building was converted to a child care center and fitness

facility. He has also served as a member of the Finance and Nominating Committees.

Bernard Bailyn has been academic Trustee for the School of Historical Studies and a member of the Board's Budget Committee. He served with the Visiting Committee to the School of Historical Studies which reported to the Board this past year. Professor Bailyn's delightful lecture in tribute to the late Felix Gilbert, *Realism and Idealism in American Diplomacy,* will be published later this year. The lectures Professor Bailyn and Professor Peter Paret presented last year at the 250th anniversary meeting of the American Philosophical Society were published by the Institute as *Two Lectures on Thomas Jefferson (1993).*

Amartya Sen has served as academic Trustee for the School of Social Science and also a member of the Board's Budget Committee. We have followed with great interest his distinguished scholarship in political economy and are delighted that he will serve as an advisor to the Visiting Committee to the School of Social Science in this coming year. Professor Sen will also continue to co-chair a committee which is working to endow a professorship in the School of Social Science in honor of Albert O. Hirschman.

Dr. Nathan P. Myhrvold was elected a member of the Board of Trustees in October 1993. He is Senior Vice President for Advanced Technology and Business Development at Microsoft Corporation. He holds a B.S. degree from the University of California and a Ph.D. in theoretical/mathematical physics from Princeton University. Before joining Microsoft in 1986 he founded Dynamical Systems, Inc., and he also worked with Professor Stephen Hawking of Cambridge University on cosmology and quantum theories of gravity.

Professor Malvin A. Ruderman, Centennial Professor of Physics at Columbia University, succeeds T.D. Lee as academic Trustee for the School of Natural Sciences. He holds degrees from Columbia and the California Institute of Technology. A member of the National Academy of Sciences and the American Academy of Arts and Sciences, he has previously taught or held research appointments at Berkeley, NYU, Stanford, Oxford, Cambridge, the University of Rome and Imperial College, London. Professor Ruderman is a member of the Committee on Human Rights of the National Academy of Sciences and a trustee of Associated Universities Incorporated. His research interests include astrophysics and elementary particle physics, two areas of activity in the Institute's School of Natural Sciences.

At the May 1994 meeting, two new Trustees were elected to the Board. They are Professor Jean Bethke Elshtain and Mr. Mortimer B. Zuckerman.

Professor Elshtain succeeds Amartya Sen as academic Trustee for the School of Social Science. She will soon take up a new appointment as Laura Spelman Professor of Social and Political Ethics at the University of Chicago. She has been Professor of Philosophy, Centennial Professor of Political Science, and Director of the Center for Social and Political Thought at Vanderbilt University. Before coming to Vanderbilt in 1988 she held professorial appointments at the University of Massachusetts, Northeastern University, and Colorado State University and visiting appointments at Yale, Oberlin, Smith, and the Institute for Advanced Study. She received her doctorate from Brandeis University and is the author of more than a dozen books and nearly two hundred articles and reviews.

Mortimer Zuckerman received his bachelor's degree from McGill University, a law degree from Harvard, and an M.B.A. from the University of Pennsylvania. He has been active in law and property development, and since 1980 he has been a leading figure in publishing. He is chairman of Boston Properties, Inc., president and chairman of Atlantic Monthly Co., chairman and editor-in-chief of *U.S. News & World Report,* and chairman and co-publisher of *The New York Daily News*. He was lecturer and then associate professor at Harvard University's Graduate School of Design from 1966 to 1974 and a visiting professor at Yale from 1967 to 1969. He has served as a trustee or director of numerous educational and philanthropic organizations, including the Sidney Farber Cancer Center, the Museum of Science, Beth Israel Hospital, the Urban Institute, the Russell Sage Foundation, Boston University School of Medicine, the Center for Strategic and International Studies, New York University, WNET/Thirteen, Harvard Medical School Board of Overseers, the Wharton School, the Wolf Trap Foundation, the Tennis Hall of Fame, the Council on Foreign Relations, and the International Institute for Strategic Studies.

We welcome our new colleagues and look forward to working with them in the years ahead.

The Report of the Auditor on the financial condition of the Institute as of the conclusion of the 1993–1994 fiscal year reflects the Institute's continuing sound management. A significant part of the Institute's operating expenses is provided from income produced by the Institute's endowment, and in recent years the Board has been successful in making use of new opportunities to improve earnings performance. Important operating funds also come from grants from individuals, foundations, corporations, and government agencies.

The Institute does not receive tuition or undertake directed research, so to a very large degree its independence and opportunities to initiate new programs are sustained by the support received from individual donors, foundations, and corporations. To all who contribute to the Institute, including Trustees, Members,

former Members and many others, I express my deepest appreciation and that of the Board.

Let me especially thank the Friends of the Institute for Advanced Study for their generous support and acknowledge the Executive Committee of the Friends: Mary Keating, Chair, and Enrico Bombieri, Charles L. Brown, James Scott Hill, Charles L. Jaffin, Robert F. Johnston, Immanuel Kohn, Frank E. Taplin, Jr., Judith Ogden Thomson, Gail M. Ullman, and Donald M. Wilson. Their dedicated and generous support has taken many forms and has always been most welcome.

This report affirms the overall intellectual and financial vitality of the Institute and its continuing commitment to the advancement of scholarship and fundamental research. Since 1930, scholars and scientists have come to the Institute to investigate questions about which little is known and the way to discovery largely uncharted. This entails great risk and commitment but can lead to knowledge which can transform our understanding of ourselves and our world. Our foremost obligation as Trustees is to insure that the Institute provides conditions and support in every way possible for that purpose and that we make provision for doing so into the future.

James D. Wolfensohn
Chairman of the Board of Trustees

REPORT OF THE DIRECTOR

From a young post-doctoral astrophysicist who educated and entertained with her splendid presentation to a group of astronomy enthusiasts, to a diplomatic historian whose erudition and energy continued to inspire large and diverse audiences, the Institute for Advanced Study once again was host this past year to a group of unusually accomplished women and men. The sheer variety and range of their interests are remarkable, as evidenced by the lists of scholars and events in the back of this book. The group made enduring contributions to the scholarly life of the Institute and beyond through their publications, lectures and seminars. In turn, as repeated time and again in Members' year-end reports to the Director, their stays at the Institute afforded them a unique opportunity for uninterrupted research in a stimulating atmosphere. Many said their time here was the most productive in their careers.

I am pleased to report the appointments this year of Jean Bourgain and Robert MacPherson to the permanent faculty of the Institute's School of Mathematics. Professor Bourgain, an internationally known scholar in harmonic analysis and related fields, has joined the Institute from the Institut des Hautes Études Scientifiques of Paris, France, where he was Professor of Mathematics. He is especially noted for bringing new techniques to bear on longstanding problems in several areas of mathematics and achieving dramatic progress in their resolution. In August 1994, Dr. Bourgain received the Fields Medal, one of the highest honors given in mathematics.

Professor Robert MacPherson comes to the Institute from the Massachusetts Institute of Technology where he was Professor of Mathematics. He is especially well known for his fundamental work in algebraic geometry. He gave the Herman Weyl Lectures at the Institute in 1982 and was a visiting Member here in 1985. Before his appointment at M.I.T., he was Florence Pirce Grant University Professor at Brown University.

In April 1994, the Institute community paid tribute to retiring Professor Freeman Dyson with a conference which brought together people from many areas in science and beyond, all areas in which Professor Dyson has had profound influence. His colleagues Frank Wilczek and Ed Witten organized the two-day event, "Around the Dyson Sphere."

Also retiring this year is Harry Woolf, former Director of the Institute and Professor-at-Large. We wish them both well. Their long associations with the Institute have indeed helped to create here a thriving community of scholars.

Among the highlights of this past year at the Institute for Advanced Study, my third year as Director, have been several initiatives in areas which present new opportunities for the Institute and others which extend our traditional activities.

The work of two Visiting Committees, for the Schools of Historical Studies and Natural Sciences, was completed this past year with the Board of Trustees' consideration of the Committees' findings and the responses of the respective faculties. We are greatly indebted to the Chairman, Professor Henry Rosovsky, and the distinguished members of both Committees. Their insights and recommendations will serve the Institute well in the years ahead. The second phase of visitations has begun, focusing on the School of Mathematics and the School of Social Science. President Emeritus Hanna Gray of the University of Chicago will chair both Committees.

This year the School of Historical Studies and Professor Peter Paret, with the generous support of the Harry Frank Guggenheim Foundation, have inaugurated an international seminar on Force in History. This builds on the conference on military history held at the Institute in March 1993, which in turn had its roots in the seminar on military and strategic studies conducted at the Institute a half century ago by Edward Mead Earle. The seminar will emphasize comparative and cross-disciplinary studies and will meet three times each year, twice at the Institute and once each year in Europe or Asia.

In October 1993, the Institute celebrated the achievements of the late Erwin Panofsky (1892–1968) with a three-day conference on the Institute art historian's enduring influence on a wide range of fields.

In November, the School of Natural Sciences hosted a special weekend gathering focusing on astronomy. Several of the School's Faculty and Members gave presentations on their current work for a large group of Trustees and invited guests. Topics included dark matter, gravitational lensing, the Hubble Space Telescope, and the Sloan Sky Survey. The sessions were lively and led to much interaction, reflecting the great interest in subjects relating to the universe.

In 1993–94 the School of Social Science inaugurated a four-year program on Transitions with a year-long focus on political change, with Members from Eastern Europe and the former Soviet Union providing valuable perspectives on the recent political history of these regions. In the coming year the School will examine environmentalism and feminism in the context of societal change. In 1995–96 the program theme will be modernization, and in its final year the subject will be science and technology.

A complete listing of the year's events can be found beginning on page 63.

The Institute has assumed leadership of the Institute for Advanced Study/Park City Mathematics Institute, a unique mathematics education program. Learning, teaching and research are incorporated in a vertically integrated format for the participating researchers, graduate and undergraduate students, and high school

teachers of mathematics. The IAS/Park City Mathematics Institute is the successor to the Park City Regional Geometry Institute, begun several years ago by a dynamic group of mathematics teachers and researchers. They invited the Institute for Advanced Study to assume administrative and programmatic oversight of the RGI and to establish it on an ongoing basis with national outreach. The new IAS/Park City Mathematics Institute met this past summer in Park City, Utah. A special two-week mentoring program for women participating in the Mathematics Institute was held at the Institute for Advanced Study in May 1994 in preparation for the summer session. I especially want to thank the National Science Foundation, Exxon Education Foundation, Geraldine R. Dodge Foundation, and others for the support which has made this initiative possible. I have appended to my report a brief account of the accomplishments of the IAS/Park City Mathematics Institute in this, its first year of activity.

The Association of Members of the Institute for Advanced Study (AMIAS) held its biennial meeting in May. Those who returned for the two-day event heard talks by Freeman Dyson on "Looking Ahead, Science and Science Fiction," Paul J. Sally, Jr. on "Who Will Visit the Institute for Advanced Study in the Year 2020?" and Oleg Grabar on "Reconstructing Medieval Jerusalem on a Computer: Accomplishments and Problems." I spoke on "The Institute for Advanced Study: Responding to Change."

The Institute holds a critical trust in higher education to provide for the development of young scholars of great promise who will lead their disciplines in the next century. In honoring this trust, our challenge is to attract the best scholars and to insure that they have as near-ideal conditions as possible to develop their potential.

In three key areas, computers, telephones, and child care, the Institute has taken further steps this year to improve facilities for Faculty and Members. A new, federated structure for administration of the Institute's growing computer facilities was put in place. This, along with efforts to extend e-mail and Internet access to all Schools and significant upgrades of equipment, will help to address one of the most widely expressed needs among Institute scholars. Much of the new and upgraded equipment was acquired through a grant from The Kresge Foundation, and this year an endowment fund for maintenance and replacement of computers was created with an additional challenge grant from The Kresge Foundation and matching contributions from Institute Trustees and others.

During the past year, installation of a new state-of-the-art campus-wide telephone network was completed with the donation of a Meridian system from Northern Telecom. The system extends to the housing complex and provides data as well as voice and voice-mail capacity.

Also this year the Institute's provisions for child care have been greatly improved and expanded. The ECP building was renovated over the course of 1993–94 and opened in the fall of 1994 as a full-day and part-day child care center. The Crossroads Nursery School program combined with the Institute's Infant Center, begun two years ago, and the entire operation relocated to the ECP building. The renovated building also now houses an exercise facility for the Institute community.

Director's visitors during this past year included mathematicians Eiji Horikawa from Tokyo University, Robert Bryant from Duke University, and Maurizio Cornalba from Università di Pavia. Graeme Segal, a mathematician from the University of Cambridge, England, was invited jointly by the Director and the School of Natural Sciences, and physicist Cumrun Vafa of Harvard University was invited by the Director along with the Schools of Mathematics and Natural Sciences. Maxine Singer, Director, Carnegie Institution, and Paul Berg, Director, Stanford University Beckman Center for Molecular and Genetic Medicine, returned to the Institute this past summer to work on a second volume of their book *Genes and Genomes,* and they delivered a well-received lecture on DNA sequencing. Judge John Noonan of the U.S. Court of Appeals for the Ninth Circuit came during the fall to work on a book on the constitutional guarantees of free exercise of religion.

Beginning this year Robert Taub, an accomplished pianist and scholar, becomes the Institute's first artist-in-residence. He will give a series of concerts and lectures for the Institute community and also work on a book on piano technique.

In November 1993 I traveled to Germany for several purposes. In Frankfurt I attended a reception for well over a hundred scholars from throughout Germany who have been visiting Members at the Institute for Advanced Study at some time in their careers. The meeting and a luncheon were hosted by Trustee Ronaldo Schmitz of Deutsche Bank. Professors Clifford Geertz, Robert Langlands, and Peter Paret joined me in making presentations about the work of the Institute and our continuing desire to bring to the Institute the best scholars from around the world.

I went from Frankfurt to Berlin where, at the Wissenschaftskolleg, I met with the directors of five other U.S. and West European scholarly institutes, a group formed several years ago to pursue common projects and interests. While in Berlin we participated in a ceremony to present the first New Europe Prize, the focal point of a project the group initiated to encourage the establishment of indigenous centers for scholarship in the countries of Eastern Europe and the former Soviet Union. With funding from the John D. and Catherine T. MacArthur Foundation and the Fritz Thyssen Foundation, we have established annual

monetary prizes to be awarded to scholars from Eastern Europe who have previously been visiting members at our six institutes and who have returned to their home countries. The awards are to be used to help build a new infrastructure for scholarship through specific means such as library acquisitions, support for travel, and grants to young scholars. The first two New Europe honorees, Alexander Gavrilov of St. Petersburg, a 1991–92 Member in the Institute's School of Historical Studies, and Andre Pleşu of Bucharest, formerly a Member at the Wissenschaftskolleg zu Berlin, received the prizes on November 11, 1993. At the ceremony, Dr. Gavrilov gave a moving acceptance speech, the text of which follows my report. In it he eloquently expresses the fundamental values and also the fragility of scholarship, the conditions in the former Soviet Union under which it languished, and the prospects for a renewal of the scholarly enterprise in the post-Soviet world.

In the Report of the Auditor, grants and gifts are summarized by category, and on page 29 we acknowledge those who have made major contributions to the Institute during the past year. I cannot emphasize enough how essential each of these and other contributions are to the success of the Institute's mission, to our ability to maintain our independence, and to nourish new program initiatives. We are deeply grateful for the generosity of all who, through their donations, have made themselves part of this special institution.

The Institute's central place in scholarship and its dynamic character are well reflected in the reports of the Schools in the pages that follow. I especially want to thank those who have worked, often for many years, to build and maintain the Institute's strength: our Faculty, Trustees, Members and former Members, Staff, Friends of the Institute, and our other supporters.

I look back with pride at our accomplishments over this past year, but not with complacency, for the world of education is changing. As a leader in scholarship at its highest level, the Institute needs not only to anticipate academic currents, but to influence them in profound and positive ways, as we have since our founding. So I look to the future with a sense of anticipation, cognizant of the challenges ahead, and confident that the Institute for Advanced Study will continue to serve as the world's preeminent center for scholarship.

Phillip A. Griffiths
Director

INSTITUTE FOR ADVANCED STUDY/PARK CITY MATHEMATICS INSTITUTE

The Institute for Advanced Study is now the permanent home for the IAS/Park City Mathematics Institute, a flagship mathematics education program that takes a highly comprehensive and integrated approach to the development of effective mathematics teaching from high school through graduate school. Formerly called the Park City Regional Geometry Institute (RGI), the Math Institute incorporates learning, teaching and research, while promoting participant interaction in a unique, four-level integrated format. At its core is a summer session for researchers, graduate students, undergraduates, and high school teachers of mathematics, linked to a year-long program in six regional sites for participating teachers. The 1994 summer session was held in Park City, Utah, from July 10 to 30.

The 1994 topic for the 80 students attending the Graduate Summer School and the 56 researchers in the Research Program was Gauge Theory and the Topology of Four-Manifolds. The Research Program, aimed at mathematicians already carrying out research in gauge theory, has, at most, one organized activity each day. Topics for additional workshops and working groups are chosen by the participants. The following intensive short lecture courses were offered in the Graduate Summer School: *Introduction to Gauge Theory,* John Morgan, Columbia University; *Introduction to Complex Surfaces, Coherent Sheaves, and Algebro-Geometric Computation of Donaldson Polynomials,* Robert Friedman, Columbia University; *Hermitian Differential Geometry and Holomorphic Vector Bundles,* Jun Li, Stanford University; *ASD Connections on Cylinders and the L^2 Moduli Space,* Cliff Taubes, Harvard University; *Decompositions of Four-Manifolds along Homology Three-Spheres and Computations of Donaldson Polynomials,* Ron Stern, University of California at Irvine; *Spaces of ASD Connections Singular along a Riemann Surface and Universal Relations Among the Donaldson Polynomial Invariants,* Tom Mrowka, California Institute of Technology; *Introduction to Geometric Invariant Theory,* David Gieseker, University of California at Los Angeles.

Twenty selected students attended the Undergraduate Program which has been designed to enhance their interest in mathematics in general and geometry and topology in particular. The following courses were offered: *Computer Projects,* Robert Bryant, Duke University; *Tilings and the Topology of Surfaces,* John Harer, Duke University; *An Introduction to Riemann Surfaces and Connections,* Karen Uhlenbeck, University of Texas at Austin.

Last summer, 34 high school teachers worked with researchers and educators to widen their knowledge of mathematics and explore new methods of teaching. The following courses were offered: *Mathematics in the Classroom,* Naomi Fisher, University of Illinois at Chicago; *Technology for Teaching Mathematics,* James King,

University of Washington; *Advanced Mathematics,* John Polking, Rice University and John Wood, University of Illinois at Chicago.

THE MENTORING PROGRAM FOR WOMEN MATHEMATICIANS

Women undergraduate and graduate students participating in the IAS/PC Mathematics Institute summer program attended a preliminary workshop at the Institute for Advanced Study from May 16–27. The workshop provided a mixture of lectures, seminars, working problem groups, mentoring and networking sessions and the opportunity to meet and interact with leading mathematicians. The following lectures were given: *Constant Mean Curvature Surfaces* (eight lectures), Chuu-Lian Terng, Northeastern University; *Gauge Field Theory* (eight lectures), Karen Uhlenbeck, University of Texas at Austin; *Closed Geodesic on Spheres,* Nancy Hingston, Trenton State College; *Surface Motion Due to Surface Energy Reduction,* Jean Taylor, Rutgers University; *Symplectic Geometry and Circle Actions,* Lisa Jeffrey, Princeton University; *The Geometry of Symplectic Energy,* Dusa McDuff, SUNY Stony Brook; *Gauge Theory and Analysis,* Lesley Sibner, Polytechnic University of New York; *Hyperbolic Geometry and Spaces of Riemann Surfaces,* Linda Keen, Herbert H. Lehman College; *Conformal Methods in Surface Theory,* Tilla Weinstein, Rutgers University; *Changing the Image of Women in Science,* Pamela Davis, University of California at Los Angeles.

The Mentoring Program for Women Mathematicians is sponsored by the Institute for Advanced Study and made possible through generous support from the National Science Foundation, the Geraldine R. Dodge Foundation and the Carnegie Corporation of New York. The Mentoring Program is an activity of the Institute for Advanced Study/Park City Mathematics Institute, which is supported through grants from the National Science Foundation, Exxon Education Foundation, the Geraldine R. Dodge Foundation, Xerox Corporation, and Motorola Inc.

ACCEPTANCE SPEECH OF ALEXANDER GAVRILOV, RECIPIENT OF THE 1993 NEW EUROPE PRIZE

First of all, let me express my sincerest thanks to all the organizers and participants of this event, which still remains somewhat unreal to me, even now. The initiative of three American and three Western European scholarly institutions, acclaimed world-wide as eminent centers of science and erudition, to support their East European colleagues, is as unexpected as it is timely. The help is generous; the wish to help reassuring. The appraisal of the situation of scholarship in Eastern Europe seems to me to be astonishingly accurate: that not only the development of classical scholarship (to cite the field especially important for the present speaker), but now its very existence, has been challenged. I admire your sagacity all the more as I have to confess that the combination of newly gained political freedom on the one hand and considerably diminished esteem for knowledge, especially for advanced research, on the other, was unexpected for me and most of my countrymen.

It gives me pleasure to express my gratitude to the distinguished Faculty of Historical Studies at the Institute for Advanced Study in Princeton, which has connected this noble initiative with my modest person. I shall endeavor to prove worthy of this choice, namely by organizing those activities envisaged by the founders of the NEW EUROPE PRIZE FOR HIGHER EDUCATION AND RESEARCH. I also thank the other Institutes, which have shown the same will to provide help and care to the classical community of St. Petersburg. This remarkable ceremony is taking place in the city best suited for it, since for two hundred years both St. Petersburg and Berlin have housed prominent Academies founded in the spirit of Gottfried Leibniz; both have experienced unprecedented political sorcery; and both are returning, not without difficulty, to a normal civic state. I therefore affirm that although the sum of the NEW EUROPE PRIZE is far from being merely symbolic, it manifests an incontestable symbolic dimension.

In order to detail how the Prize will be administered in St. Petersburg I think I should trace very briefly the progress—as well as, alas, the regression—of classical philology in Russia. More than the first half of this millennium was marked by the massive impact of Christian tradition, in its Greek Orthodox form, on Russian spiritual life. The pervasive influence of this strand of Late Antiquity can still be felt today in language, literary genres and in the arts, not to mention some political ideas. Many literary translations from the Greek by the Balkan Slavs were transplanted to Russian soil. In the 17th century there came a brief period of baroque humanism from the western regions of Russia, now Ukraine and Bielorus, which had an undeniable Roman-Catholic flavour. The despotic Europeanization of Peter the Great then brought exponents of Western classical learning into Russia—be it for the study of the origins of the Russian state or, somewhat later, for the due exploration of ancient Greek colonies in the Russian

South. At the beginning of the 19th century, universities, led by Moscow University, began to spread throughout the Russian Empire. Petersburg University was founded only a century after the Academy of Sciences. The diversified and well-supported system of classical education was built laboriously over more than a century. Besides universities, two institutes (in St. Petersburg and Nezin, not far from Kiev) with incomparable connoisseurs of Greek and Latin such as August Nauck, produced educators. The dozen or so established Universities had chairs for classical philology, ancient history and archaeology. There were philological, historical, and archaeological societies and special journals in addition to the university series, as well as rich and up-to-date libraries.

After the October Revolution (1917, not 1993) this system of classical studies and, above all, the personnel and infrastructure of classical education were mercilessly destroyed. Fortunately, among the many illusions of communists was the belief that communism was scientifically based and proved, which led to their conviction that all science and erudition only affirms Marxism-Leninism and Marxism-Leninism alone produces scholarship. The consequence of this epistemological narcissism was that the Bolsheviks allowed some academic assets to survive—naturally in a drastically reduced form.

During the period of the so-called "thaw" under Khruschev, the old scholars educated before 1917, many of whom had just returned from labor camps and/or exile, imbued the younger generation with new aspirations in an atmosphere of relative personal (not political) freedom. These two generations—grandfathers and grandsons—contrived to preserve some basic professional knowledge together with basic principles of scientific method. By the onset of "perestroika" the older generation had disappeared. It now seemed very probable that some classical scholars might be permitted to do their personal work; but for future generations classical studies were doomed.

The paths of tradition are not, however, necessarily trivial. Witness the facts: with society's more or less peaceful upheaval the situation was quickly polarized. New opportunities surfaced which had never been dreamt of under Soviet rule. The First Classical Gymnasium was founded on our own initiative in St. Petersburg. The Cultural Fund of St. Petersburg created the Institutum Classicum with somewhat vague, but well-meant aims. Thus far the good news. At the same time the bad news came. The situation of the Academy of Sciences in Moscow, St. Petersburg and other centers has worsened decisively, and the motivation of students of all generations is undergoing very unfavorable changes. The imminent commercialization of science is putting scholarship through trials for which we are ill-prepared. We wanted to break free from bondage. But we have become so free that the very bonds which bind academic life and society are now becoming brittle and breaking.

These remarks on the present situation and historical background of classical studies in my country and especially in St. Petersburg will account, I hope, for my plans for the use of the NEW EUROPE PRIZE. As a result of ten months of networking I am now able to produce a plan, which seems to me both appropriate to the aims of the founders of the NEW EUROPE PRIZE and practicable under present circumstances in Russia. The most acute problem of classical scholars in St. Petersburg is, in my view, the absence of publications devoted exclusively to their studies. Given the prospect of using the NEW EUROPE PRIZE for this purpose, I propose founding two differently oriented classical journals in St. Petersburg. The first one is intended to be specifically classicist and will be called *Hyperboreas*. This journal is intended to serve as an outlet, though not exclusively, for studies carried out in St. Petersburg. The articles will be published in any language commonly used in classical studies; detailed summaries will be written in English, German or French for Russian articles, and vice versa. This journal should appear twice a year.

The second journal will be humanistically oriented. The title: *The Ancient World and Us*. It should appear once a year, with material pertaining to the history of education and learning from the time of antiquity to the annals of the First Classical Gymnasium and the enterprises of the Institutum Classicum. The main concern will be the history of humanistic tradition and demonstration of its values.

Besides publications which are compact, easy to read and not devoid of style, the classical community in St. Petersburg badly needs a convenient reference library, including editions of ancient texts and modern equipment for the use of valuable electronic developments such as the Thesaurus Linguae Graecae. It has therefore been decided that such a reference library should be built up through donations and purchases. Both are already underway. For the time being, the room for this new collection is being provided by the First Classical Gymnasium. Together with the editorial boards of both journals, this library has been christened the "Ancient Cabinet." I shall be responsible for running this small but independent institution (the steps for its legal registration, independent account, etc. have been taken and will be completed by the end of this year). The Ancient Cabinet will be very tightly connected with the Gymnasium; both are represented in the Council of Classics along with corresponding departments from the University and the Hermitage.

The endowment of the NEW EUROPE PRIZE will give classical scholars in St. Petersburg a unique opportunity and breathing space to recover to a certain degree from their earlier desolation as well as from severe, unforeseen new hardships. If we manage to make progress on the projects outlined above, we shall be able to revive the crucial parts of the tradition which have not yet been annihilated. Furthermore, we will even be in a position to enhance what remains

of classical learning by investing it with a new solidarity at both local and international level. Though I am loath to exaggerate either the quality of classical studies in Russia or my own organizational skills, I am sure we do have some strengths not to be dismissed. I shall try to use this gift of the West to accomplish something worthy within the general process of building our own new and appropriately European identity. We want to become part of a new Europe, the existence of which is impossible without a scholarly and humanistic devotion to the classical forms of the old Europe.

Wissenschaftskolleg zu Berlin
November 11, 1993

It has come to my attention that many participants in the Dyson Symposium "Around the Dyson Sphere" were unaware that the term Dyson sphere has a technical significance. Since it pains me to contemplate such a learned allusion passing unheeded, I'd like to take this opportunity briefly to explain its meaning.

The idea is that an advanced planetary civilization would not be content to use only the very small portion of the energy radiated by its star which happens to fall on the planet. Rather, it would attempt to capture the bulk of this radiation. It could do so by using the material of a large planet (model: Jupiter) to construct a relatively thin spherical shell completely surrounding the star. The civilization could then re-locate to the inner surface of this "Dyson sphere," making vastly more efficient use of its star.

Dyson proposed that in looking for advanced extraterrestrial civilizations one should look for stars so surrounded. They would appear unusually large for stars, and with a very unusual radiance: for what escapes the Dyson sphere is infrared radiation—"waste heat"—rather than a normal stellar spectrum.

FRANK WILCZEK

ACKNOWLEDGMENTS

The Institute for Advanced Study expresses its deepest appreciation for all gifts and grants to its endowment and capital funds, for annual operating support, and for in-kind contributions. Special gratitude is extended to the following individuals and organizations who were major donors to the Institute during the Fiscal Year 1994.

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THE SCHOOL OF HISTORICAL STUDIES

Faculty

GLEN W. BOWERSOCK
GILES CONSTABLE
OLEG GRABAR
CHRISTIAN HABICHT
IRVING LAVIN
PETER PARET *[Andrew W. Mellon Professor]*

Professors Emeriti

MARSHALL CLAGETT
GEORGE F. KENNAN
KENNETH M. SETTON
HOMER A. THOMPSON
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 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; and Morton White in the history of modern philosophy. 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.

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 founding. The articles and books resulting from their research at the Institute are witness to the quality and productivity of their scholarly activity here.

ACADEMIC ACTIVITIES

FACULTY

During the academic year 1993–1994 GLEN BOWERSOCK published seven scholarly articles (on aspects of the eastern Roman empire). Two books appeared in June 1994: *Le martyre de Pionios* by the late Louis Robert, edited jointly with Professor C.P. Jones (Harvard University), and *Momigliano: Studies on Modern Scholarship,* essays on nineteenth- and twentieth-century scholars by the late classical scholar edited jointly with Dr. T.J. Cornell (University College London).

Two other books are scheduled to be published later in the year: *Fiction as History: Nero to Julian,* Professor Bowersock's Sather Lectures at the University of California, Berkeley, and *Studies on the Eastern Roman Empire,* a substantial selection of Professor Bowersock's papers, to be published in Germany. In addition Professor Bowersock has completed the revised manuscript of his 1993 Wiles Lectures at the Queen's University in Belfast, to be published in 1995 by Cambridge University Press under the title *Martyrdom and Rome.*

Professor Bowersock delivered the 1994 William Kelly Prentice Memorial Lecture ("The Search for Antioch") at Princeton University in April. He gave a noon talk ("The First Metropolis of Caria") for the Program in the History, Archaeology, and Religions of the Ancient World at Princeton University, and again at the University he spoke to Professor Froma Zeitlin's seminar on the Greek novel. Professor Bowersock also lectured at the University of Cincinnati and presented a paper on the work of the nineteenth-century classical scholar Karl Otfried Müller to a colloquium at Bad Homburg in Germany. He organized and chaired a day-long international symposium on Byzantine epigraphy at Dumbarton Oaks in Washington, D.C. in February. In January he served on a committee of three to make recommendations for the future of the Classics Department at Emory University in Atlanta.

Professor Bowersock continued as editor of the series *Revealing Antiquity* for the Harvard University Press and joined his colleague Oleg Grabar and Princeton Professor Peter Brown in planning a new dictionary of late antiquity for Harvard. He also served on the Councils of the American Philosophical Society and the American Numismatic Society, and he joined the Executive Committee of the Metropolitan Opera Guild. In the autumn of 1993 Professor Bowersock served as consultant and witness for the defense in the action against the Marquess of Northampton brought before the State Supreme Court of New York by the governments of Lebanon, Hungary, and Croatia for possession of the "Sevso" silver treasure.

During the academic year 1993–94 GILES CONSTABLE gave the inaugural lecture for the Princeton University Program in Medieval Studies; lectured at Rice University, Arizona State University, the Catholic University of America, and the Westfälische Wilhelms-Universität; spoke at conferences in Houston and Brescia, at a memorial service for Kurt Weitzmann, and at a ceremony in honor of Luigi Prosdocimi; and attended meetings in Princeton, New Brunswick, Trenton, and Kalamazoo. He also organized a meeting of the Delaware Valley Medieval Association at the Institute for Advanced Study. He completed and submitted for publication his *Three Studies in Medieval Religious and Social Thought* and published an article in the *Miscellanea* for Luigi Prosdocimi (Rome, 1994).

During the academic year 1993–94, OLEG GRABAR completed a video on the computerization of Jerusalem's medieval history; gave lectures and seminars on medieval Jerusalem and on textiles at the University of Victoria and Mt. Holyoke College, four seminars in Paris at L'Ecole des Hautes Études en Sciences; delivered a paper on Court Culture in the 10–12th centuries for the Dumbarton Oaks Symposium; participated in panel meetings of the College Art Association and the Society of Architectural Historians; served as President of the American Research Institute in Syria and as member of the Scientific Committee of the Max van Berchem Foundation in Geneva; directed a Ph.D. thesis at Harvard University; and served on two committees of the American Philosophical Society.

Professor Grabar's publications for the year included: "Classical forms in Islamic Art and Some Implications," *Künstlerischer Austausch, Artistic Exchange, Akten des XXVIII. Internationalen Kongresses für Kunstgeschichte*, Berlin 15–20 1992, herausgegeben von Thomas W. Gaehtgens. "Foreword" to *The Persian Bazaar* (Washington, 1993), pp. 11–13. "La Syrie dans l'Histoire Islamique," *Syrie, Mémoire et Civilisation* (Paris, 1993), pp. 362–365. "The Mission and its People" in James Steele ed., *Architecture for Islamic Societies Today* (London, 1994), pp. 6–11. "Umayyad Palaces Reconsidered," *Ars Orientalis* 23 (1993), pp. 93–108. "From Holy Writ to Art Book," *The Times Literary Supplement*, March 25, 1994, #4747, pp. 16–17. "The Intellectual Implications of Electronic Information," LEONARDO, Vol. 27, No. 2, pp. 135–142, 1994.

CHRISTIAN HABICHT continued work on his general history of Athens from the time of Alexander the Great to that of Augustus. He submitted the draft of the book in the spring of 1994; publication is scheduled for the summer of 1995. He prepared a series of six lectures and seminars and delivered these, under the title "Hellenistic Athens and Rome," as the Nellie Wallace Lectures at Oxford University during the Trinity term of 1994. He also read proofs for a volume of collected essays which was published in May 1994. In March, he delivered one of the Faculty Lectures, "Athens and Rome in the Second Century B.C."

He was elected to a three-member Committee to supervise the work of *Inscriptiones Graecae* of the Berlin-Brandenburgische Akademie der Wissenschaften and participated in its meeting on May 16 in Berlin. He continued to serve on editorial boards and was appointed to serve for another term on the Committee on Membership of the American Philosophical Society. He was invited to be a Visiting Professor at the University of Hamburg in the summer term of 1995 (April to July) and to participate, in September 1994, in an international Symposium in memory of H. G. Lolling (d. 1894), sponsored by the German Archaeological Institute in Athens.

He published *Athen in hellenistischer Zeit. Gesammelte Aufsätze* (Munich, Beck, 379 pp.) as well as six papers, including one in the Russian Journal *Vestnik Drevnei Istorii*.

IRVING LAVIN lectured at Brown University and the Center for Advanced Studies in the Visual Arts at the National Gallery in Washington, DC. In September 1993, he participated in a colloquium sponsored by the International Committee for the History of Art at Zacatecas, Mexico, and in January 1994 he was a delegate and panelist at the World Economic Forum in Davos, Switzerland. Professor Lavin organized the symposium "Meaning in the Visual Arts: Views from the Outside: A Centennial Commemoration of Erwin Panofsky (1892–1968)," held at the Institute October 1–3, 1993. The symposium featured speakers on anthropology, history, literature, science, music and film. He also organized and hosted the series of colloquia in the history of art sponsored by the School of Historical Studies. Professor Lavin continued his service as chairman of the U.S. National Committee for the History of Art and as a member of the executive committee of the International Committee for the History of Art. He also serves on the Board of Directors of the College Art Association and as a Trustee of the Canadian Centre for Architecture, as well as on the advisory boards of several scholarly journals.

Professor Lavin's publications during 1993–1994 included "Panofsky's Humor," in E. Panofsky, *Die Ideologischen Vorläufer des Rolls-Royce Kühlers & Stil und Medium im Film. Mit Beiträgen von Irving Lavin und William S. Heckscher*, Frankfurt-New York, 1993; "Pisanello and the Invention of the Renaissance Medal," in J. Poeschke, ed., *Italienische Frührenaissance und nordeuropäisches Mittelalter. Kunst der frühen Neuzeit im europäischen Zusammenhang*, Munich, 1993; "Picasso's Bull(s): Art History in Reverse," in *Art in America*, LXXXI, 1993; and "Bernini's Portraits of No-Body," in A. Gentili, *et al.*, eds., *Il ritratto e la memoria. Materiali 3*, Rome, 1993.

PETER PARET edited the proceedings of a conference on "The History of War as Part of General History," which he had chaired in 1993 at the Institute, in a special issue of the *Journal of Military History*. The proceedings include his essay on the ambiguities of the obligation of military service in European history. He also published four essays and chapters in books on subjects of cultural and political history. Among his book reviews was a series of reviews of works on cultural history and on the history of art in the *Frankfurter Allgemeine Zeitung*. He taught a graduate directed reading course in the Department of History at Princeton University, and served on two graduate examination committees of the department. He gave a number of lectures and seminars at the Rutgers University Center for Historical Analysis, where he was appointed a Senior Fellow.

Among his other lectures were the annual Reckford Lecture in the Humanities at the University of North Carolina at Chapel Hill, the keynote address at a conference on art and literature during the First World War at the *Historische Kolleg* in Munich, and a lecture at a conference in Weimar on the work of his grand-uncle, the philosopher Ernst Cassirer. In June he chaired a two-day conference at the Institute to initiate the Institute Seminar on Force in History, which is supported by grants from the Harry F. Guggenheim Foundation and from J. Richardson Dilworth, Chairman Emeritus of the Institute's Board of Trustees.

During the year Professor Paret was elected to a second three-year term on the Council of the American Philosophical Society, and continued to serve as chairman or member of committees of the Society, of other scholarly institutions, and of the joint committee of the city of Berlin and the State of Brandenburg on the future of historical research in Berlin.

PROFESSORS EMERITI

MARSHALL CLAGETT's Volume II of his *Ancient Egyptian Science* has been accepted for publication by the American Philosophical Press and will appear late in 1994. Professor Clagett began work on Volume III in London in February 1994.

GEORGE KENNAN's work in the field of diplomatic history was restricted by the many demands for appearances and statements in connection with matters of more contemporary significance. He did, however, write an introduction, separately published in the New York Review of Books, to the report published by the Carnegie Endowment of International Peace, of a commission sent to the Balkans in 1913 to cover the second of the two Balkan wars of that time. He gave in New York a talk on the Slavic collections of the New York Public Library, soon to be published in one of the Library's publications. A foreword was also written for a forthcoming book on Stalin and the (Tsarist) Okhrana. He twice conducted seminars with advanced students of public affairs at West Point. And he spent a morning lecturing to a combined meeting of the students of the National War College and other parts of the National Defense University.

Responses to demands of another character produced a piece for the New York Times Op-ed page on the origins of the Somalia involvement, interviews for public television with Robert MacNeil and Charlie Rose, an evening talk to the Friends of the Institute for Advanced Study, and a talk largely on American foreign policy delivered at a dinner given in his honor by the Council on Foreign Relations in New York. Honors received during this year included the Distinguished Service Award of the Department of State and the Ambassador Book Award of the English-Speaking Union for his *Around the Cragged Hill*.

KENNETH M. SETTON is writing a book entitled *Diplomatic Reports from Istanbul in the Eighteenth Century*. He began this volume early last summer and returned to Venice to research the archival chronicles pertaining to this period. Supplementary research and revisions continued through 1993–94. Publication will be assumed by the American Philosophical Society, going to press later this year.

HOMER A. THOMPSON devoted much of his time this year to problems regarding the meeting place of the Athenian assembly on the Pnyx south of the Acropolis. Through his first excavations in Athens (1930–1931) Professor Thompson had established the existence of three periods in the history of the assembly place. In publishing the results of the excavation in 1932 he proposed restorations of the form of the meeting place in each of its periods and sketched its history from the Archaic to the Roman period. Since then various changes have been proposed regarding both form and history, and this both by the excavator and by other scholars.

The celebration this past year of the 2500th anniversary of the reforms of Kleisthenes that led to the birth of Athenian democracy naturally attracted attention to the Pnyx as the seat of the most powerful element in the new government. The result has been the organization of an international symposium to be held in Athens in October 1994 for the consideration of new evidence and new ideas.

Another theme that has called for a good deal of attention has been the definitive publication of the Eleusinion, the principal sanctuary of Demeter in Athens, excavated in the Agora in the 1930s and 1950s. The manuscript prepared by Professor Margaret M. Miles has now been accepted for publication by the American School of Classical Studies. Massive manuscripts on the red-figured and Hellenistic pottery from the Agora have also been accepted. The year has seen the appearance in the Athenian Agora series of the long awaited volume by Professor John H. Kroll on the coins of the Greek cities found in the Agora, as also a picture book prepared by Professor Mabel Lang: *Life, Death and Litigation in the Athenian Agora*.

MORTON WHITE's book *The Question of Free Will: A Holistic View* was published by the Princeton University Press on November 1, 1993; plans are now under way to translate it into Japanese.

THE SCHOOL OF HISTORICAL STUDIES

MEMBERS, VISITORS AND RESEARCH STAFF

RUTHERFORD ARIS
Palaeography, Mathematical Modeling
University of Minnesota · *s*

STEVEN BELLER
Central European History
Georgetown University, Washington, DC

GERHARD BÖWERING
Islamic Studies
Yale University · *vs*

KLAUS BRINGMANN
Ancient History
Universität Frankfurt

JAMSHEED K. CHOKSY
Near Eastern Civilization and Islamic Culture
Indiana University

JONATHAN CRARY
Art and Cultural History
Columbia University · *f*

FLORENS DEUCHLER
Medieval and Modern Art
Swiss Institute in Rome · *vs*

LOUIS H. FELDMAN
Hellenistic Judaism
Yeshiva University, New York · *s*

JEAN-LOUIS FERRARY
Ancient History
École Pratique des Hautes Études, Paris · *f*

GARY FORSYTHE
Roman Republican History and Historiography
The University of Chicago

DAVID FRANKFURTER
Religions of Graeco-Roman Egypt
College of Charleston, South Carolina

DOROTHEA FREDE
Ancient Philosophy
Universität Hamburg

MARC FUMAROLI
History of French Language: 16th and
17th Centuries
Collège de France · *vf*

ANDREAS GRAESER
Classical Philology and Philosophy
Universität Bern · *s*

JEFFREY HAMBURGER
Medieval and Northern Renaissance Art
Oberlin College

SARAH HANLEY
Early Modern France
The University of Iowa · *v*

WOLFGANG HARDTWIG
Social, Political, Cultural History
Humboldt-Universität zu Berlin · *f*

HERMANN HUNGER
Assyriology
University of Vienna · *f*

HOWARD JACOBSON
Graeco-Roman Literature and Judaica
University of Illinois, Urbana

MARK JARZOMBEK
History of Architecture
Cornell University · *f* · *vs*

BABER JOHANSEN
History of Islamic Law
Freie Universität Berlin

RUTH MAZO KARRAS
Medieval History
Temple University

NIGEL M. KENNELL
Roman Greece
Memorial University of Newfoundland · *af*

KATRIN KOGMAN-APPEL
Medieval Art History
The Hebrew University of Jerusalem

SACHIKO KUSUKAWA
Renaissance Philosophy
Christ's College, Cambridge

WOLF LIEBESCHUETZ
Late Roman History
University of Nottingham · *f*

f First Term · *s* Second Term

ELIO LO CASCIO
Roman History
Università di Napoli · *f*

ANGELOS P. MATTHEOS
Greek History and Epigraphy
Editor of HOROS, Athens · *a*

LÉOPOLD MIGEOTTE
Greek History and Epigraphy
Université Laval, Québec · *s*

JOHN D. MORGAN
Roman History, Augustan Poetry, Textual Criticism
University of Delaware · *s*

THOMAS F. X. NOBLE
Early Medieval History
University of Virginia · *s*

KNUT W. NÖRR
Medieval Legal History
Universität Tübingen · *f*

ALESSANDRO NOVA
Italian Renaissance Art and Literature ·
Stanford University

ELAINE PAGELS
History of Religion: Early Christianity
Princeton University · *v*

ROBERT R. PALMER
18th Century European History
Princeton · *v*

ROSHDI RASHED
History and Philosophy of Science
Centre National de la Recherche Scientifique, Paris · *f*

ATHANASSIOS RIZAKIS
Epigraphy and History of the Ancient World
The National Hellenic Research Foundation, Athens

JOHN C. G. RÖHL
Modern European History
University of Sussex · *s*

KARIN RÜHRDANZ
Islamic Art and Archaeology
Martin Luther University, Halle

JOHN SCHEID
Roman Religious History
École Pratique des Hautes Études, Paris · *f*

ALDO SCHIAVONE
Roman History and Law
Università di San Marino · *vf*

JOHN SEYLLER
Indian and Islamic Art
The University of Vermont · *f* · *vs*

DANIEL J. SHERMAN
Modern European History
Rice University

PHILIP M. SOERGEL
Early Modern European History
Arizona State University

C. JOHN SOMMERVILLE
English Cultural History
University of Florida

KARL STROBEL
Ancient History
Universität Würzburg

PAUL E. SZARMACH
Anglo-Saxon England
State University of New York at Binghamton

STEPHEN V. TRACY
Greek Epigraphy
The Ohio State University · *vs*

JOHN VAN ENGEN
Medieval History
The University of Notre Dame

LOREN WEBER
Medieval History
Institute for Advanced Study · *a*

HOWARD D. WEINBROT
18th Century British Literature and Contexts
University of Wisconsin

KONSTANTIN ZHUKOV
Ottoman History
Institute of Oriental Studies, Russian Academy of Sciences, St. Petersburg

MICHAEL F. ZIMMERMANN
19th and 20th Century European Art
Zentralinstitut für Kunstgeschichte, Munich · *s*

v Visitor · *a* Research Assistant

THE SCHOOL OF MATHEMATICS

Faculty

ENRICO BOMBIERI *[IBM von Neumann Professor]*
JEAN BOURGAIN
LUIS A. CAFFARELLI
PIERRE DELIGNE
ROBERT P. LANGLANDS *[Hermann Weyl Professor]*
THOMAS SPENCER

Professors Emeriti

ARMAND BOREL
ATLE SELBERG
ANDRÉ WEIL

ACADEMIC ACTIVITIES

The School of Mathematics appointed two professors during the past year. Professor Jean Bourgain joined the Faculty last January. His specialty is harmonic analysis, probability and infinite dimensional Hamiltonian systems. Professor Robert MacPherson was appointed to the Faculty effective September 1994. He is a geometer whose work concerns algebraic geometry, topology, representation theory and the structure of singular spaces.

The special programs this year were in the fields of combinatorics and mathematical aspects of materials sciences. Both of these programs were generously supported by the Alfred P. Sloan Foundation. John Ball (Heriot-Watt University) spent the year here and, in collaboration with Luis Caffarelli, organized activity in the mathematical theory of materials sciences. Members and Visitors in this program included engineers, physicists, numerical analysts as well as pure mathematicians. There was a regular weekly seminar and an intense two-day "Workshop on Material Microstructure" held December 6–7. Noga Alon (Tel Aviv University) and Alexander Razborov (Steklov Mathematical Institute) together with Enrico Bombieri organized a year of activity in combinatorics. This program was formed in cooperation with the Center for Discrete Mathematics and Theoretical Computer Science at Rutgers University. The weekly seminar was a focal point for the combinatorics group here, at NEC and at Princeton University.

This year was the first year of Faculty Lectures in which each Faculty member and the Director delivered a lecture or series of lectures intended for a general mathematical audience. There was general agreement that these lectures were successful, and the series will continue during the 1994–95 academic year.

In addition to the workshop on material microstructure, the School of Mathematics conducted a number of other workshops. Luis Caffarelli organized a workshop entitled "Mathematical Problems in Finance." This was a very well-attended workshop that brought together mathematicians, economists and financiers. The mathematical problems in this field are connected to stochastic partial differential equations, path integrals and free boundary value problems.

There was also an informal three-day conference on problems of turbulence organized by Claude Bardos and Marie Farge. The main theme was the contribution of mathematics and numerical experiments to classical problems of fluid dynamics, especially Kolmogorov spectra and the stability of large scale coherent structures in two dimensions.

During the weeks of May 16 and 23, as part of the IAS/Park City Mathematics Institute, Karen Uhlenbeck and Chuu-Lian Terng organized a workshop entitled "The Mentoring Program for Women Mathematicians." Uhlenbeck gave a series of lectures on classical gauge theory and Terng gave a series on surfaces of constant mean curvature.

The Marston Morse Memorial lectures were presented by Leon Simon (Stanford) on February 18 and 21. The title of his lectures was "Analytic and Measure — Theoretic Methods in the Geometric Calculus of Variations."

The regularly scheduled seminars this year included the "Combinatorics and Complexity Seminar," "PDE Seminar," "Number Theory and Geometry Seminar," "Joint IAS-Princeton University Number Theory and Harmonic Analysis Seminar," "Members Seminar" and the "Applied Math-Math Physics Seminar."

During the month of July the Clavius group, a group of Catholic mathematicians, mainly geometers, visited the Institute for a month of seminars and disussions.

ANDRÉ WEIL was awarded the 1994 Kyoto Prize in "Basic Science," and PIERRE DELIGNE was elected Associate Member of the Royal Belgian Academy.

THE SCHOOL OF MATHEMATICS

MEMBERS AND VISITORS

VICTOR ABRASHKIN
Algebraic number theory; algebraic geometry
Max-Planck-Institut für Mathematik, Germany

CLAUDIO ALBANESE
Mathematical physics
ETH — Hönggerberg, Switzerland · *s*

NOGA ALON
Combinatorics and its applications to theoretical computer science
Tel Aviv University, Israel · *f*

ENRICO ARBARELLO
Algebraic geometry
Università di Roma "La Sapienza," Italy

DIANA NUNZIANTE BAHRI
Partial differential equations
Istituto Universitario Navale, Italy · *v*

ROGER BAKER
Algebraic number theory: sieve methods
Brigham Young University · *f*

JOHN BALL
Mathematical problems in materials sciences
Heriot-Watt University, United Kingdom

STEFAN BAUER
4-manifolds, algebraic geometry
Universität Göttingen, Germany · *f*

MATANIA BEN-ARTZI
Partial differential equations; mathematical physics
Hebrew University of Jerusalem, Israel · *vf*

JEAN-MICHEL BISMUT
Geometry and global analysis
Université de Paris — Sud, France · *s*

SONJA BRENTJES
History of mathematics
Universität Leipzig, Germany · *s*

ROBERT BRYANT
Research into the geometry of conservation laws for partial differential equations
Duke University · *dvf*

ALEXANDRU BUIUM
Diophantine geometry (with methods coming from algebraic differential equations)
Institute of Mathematics of the Romanian Academy, Romania

PIERRE COLLET
Extended dynamical systems; partial differential equations
Ecole Polytechnique, France · *s*

MAURIZIO CORNALBA
Algebraic cycles on the moduli spaces of curves
Università di Pavia, Italy

JOHN D'ANGELO
Several Complex Variables and geometry
University of Illinois at Urbana-Champaign · *f*

PERCY DEIFT
Long time behavior of (integrable) nonlinear wave equations
Courant Institute · *s*

KEQUAN DING
Combinatorics, algorithms, optimizations, algebraic geometry
University of Wisconsin at Madison · *f* · *vs*

WEINAN E
Fluid dynamics; incompressible flows
Courant Institute

PEDRO EMBID
Partial differential equations; applied mathematics
University of New Mexico

ALEX ESKIN
Number theory; automorphic forms; Lie groups; discrete groups; ergodic theory
Princeton University

HÉLÈNE ESNAULT
Algebraic geometry
Universität Gesamthochschule Essen, Germany · *s*

ROSS GEOGHEGAN
Topology — connections between fixed point theory, algebraic K-theory, dynamical systems and geometric group theory
State University of New York at Binghamton · *f*

f First Term · *s* Second Term · *dv* Director's Visitor

VIKTOR GINZBURG
Symplectic and Poisson geometry; Topology: Vassiliev invariants
Stanford University · *f*

ERIC GRINBERG
Integral geometries and geometric analysis
Temple University · *vf*

LUCAS HSU
Differential geometry and calculus of variations
Mathematical Sciences Research Institute, Berkeley · *dra*

SEN HU
Dynamical systems and statistical mechanics
École Polytechnique, France

RICHARD JAMES
Mathematical theory of materials, with particular emphasis on magnetic and martensitic materials
University of Minnesota · *f*

DOMINIC JOYCE
Differential geometry
University of Oxford, United Kingdom

CHRISTOPHER JUDGE
Automorphic forms; Spectrum of Laplace-Beltrami Operator on Finite Volume Surfaces
University of Maryland

VELIMIR JURDJEVIC
Optimal control theory, mechanics and differential geometry
University of Toronto, Canada · *s*

SIVAN KARTHA
Disordered systems, critical phenomena, and central issues in structural phase transitions
Cornell University · *f*

GEORG KELLER
Mathematical physics
Max-Planck-Institut für Physik, Germany

PETER KLEBAN
Conformal Field Theory and hyperbolic geometry
University of Maine at Orono · *vf*

ROBERT KRASNY
Applied mathematics; fluid dynamics; scientific computation
University of Michigan · *s*

RAVI KULKARNI
Differential geometry; Riemann surfaces; discontinuous groups
City University of New York · *s*

YANYAN LI
Nonlinear elliptic equations, applications to Geometry and Physics
Rutgers University · *s*

XIAO-SONG LIN
Low dimensional topology; knot theory
Columbia University

JIAN-GUO LIU
Nonlinear partial differential equations; numerical analysis
Courant Institute · *s*

JIANG-HUA LU
Symplectic and Poisson geometry; quantum groups; Hopf algebras
Massachusetts Institute of Technology

WENZHI LUO
Number theory; Automorphic form
Rutgers University

LING MA
Applied mathematics; numerical analysis for mathematics related to materials sciences
Carnegie Mellon University

GRIGORY MIKHALKIN
Geometric Topology; Real Algebraic Geometry
Michigan State University

CARLOS MOREIRA
Statistical Mechanics
Universidade Federal de Minas Gerais, Brazil · *v*

ROBERT MORELLI
Toric varieties (algebraic geometry); combinatorics of polyhedra
University of Chicago

LAURENT MORET-BAILLY
Algebraic and arithmetic geometry
Université de Rennes I, France · *s*

DAVID MORRISON
Algebraic geometry
Duke University · *f*

v Visitor · *dra* Director's Research Associate

STEFAN MUELLER
Mathematical problems in materials sciences
Universität Bonn, Germany · *f*

NORA MULER
Nonlinear elasticity
Instituto Argentino de Matemática, Argentina

ANDREW NICAS
Algebraic and geometric topology
McMaster University, Canada · *f*

KATE OKIKIOLU
Harmonic analysis — Toeplitz operators
Princeton University

TAMARA OLSON
Mathematical physics; mechanics of solids; partial differential equations
Brigham Young University

ATHANASE PAPADOPOULOS
Geometry and topology
Centre National de la Recherche Scientifique, France

MARIA PEREYRA
Harmonic analysis
Yale University · *s*

HARU PINSON
Mathematical physics
Kansas State University

FLORIAN POP
Algebra and number theory
University of Heidelberg, Germany

JIE QING
Nonlinear analysis in geometry and PDE
University of California, Los Angeles

ALEXANDER RAZBOROV
Combinatorics; theoretical computer science; complexity theory
Steklov Mathematical Institute, Russia

IGOR RIVIN
Hyperbolic geometry; differential geometry; 3-manifolds string theory
Princeton University

RICHARD SCOTT
Differential topology and combinatorial geometry
Massachusetts Institute of Technology

DIANA SHELSTAD
Automorphic representation theory
Rutgers University · *s*

THOMAS SIDERIS
Nonlinear hyperbolic partial differential equations
University of California, Santa Barbara · *f*

YAN SOIBELMAN
Quantum groups, tensor categories, q-D-modules, symplectic geometry, representation theory
Harvard University

ARAVIND SRINIVASAN
Algorithms and Theory of Computation
Cornell University · *f* · *vs*

VLADIMÍR SVERÁK
Partial differential equations
Universität Bonn, Germany · *f*

YUICHIRO TAGUCHI
Arithmetic of Drinfeld modules
Tokyo Metropolitan University, Japan

YOULIANG TIAN
Gauge theory, differential geometry, algebraic geometry and topology
University of New Mexico

CUMRUN VAFA
String theory
Harvard University · *js*

DAQING WAN
Number theory
University of Nevada at Las Vegas

MATTHIAS WINTER
Applied Mathematics: Mathematical Theory of Phase Transitions
Universität Stuttgart, Germany · *v*

ANDREW WOLDAR
Group geometries; algebraic combinatorics; Extremal graph theory
Villanova University · *s*

ZHOUPING XIN
Partial differential equations, applied mathematics, numerical methods
Courant Institute

f First Term · *s* Second Term · *j* Joint Appointment

BAISHENG YAN
Partial differential equations; calculus of variations
University of Minnesota

TONG YANG
Hyperbolic partial differential equations; mathematical theory of shock waves
University of California, Davis

YISONG YANG
Nonlinear elliptic partial differential equations and variational problems arising from theoretical physics
Carnegie Mellon University

DORON ZEILBERGER
Combinatorics, special functions, and computer algebra
Temple University · *f*

YONGCHANG ZHU
Conformal field theory, vertex operator algebras; algebraic number theory
California Institute of Technology

v Visitor

THE SCHOOL OF NATURAL SCIENCES

Faculty

STEPHEN L. ADLER *[New Jersey Albert Einstein Professor]*
JOHN N. BAHCALL
FREEMAN J. DYSON
PIET HUT
FRANK WILCZEK
EDWARD WITTEN

ACADEMIC ACTIVITIES

During the summer of 1993 STEPHEN ADLER completed the final chapter of his book on Quaternionic Quantum Mechanics and Quantum Fields dealing with the possible physical relevance of the methods of the book, with measurement theory issues, and with open questions. Further revisions to the manuscript were made in early fall (facilitated by a two-month visit by Larry Horwitz, who read the remainder of the manuscript and reread some earlier sections), and the manuscript went to the publisher December 1. In May 1994 Professor Adler finished checking the copy-edited manuscript and making further revisions, leaving the project on schedule for publication in January 1995. A number of the topics discussed in the final two chapters also have been written up separately; the paper giving a generalized quantum dynamics based on a trace construction is now out in *Nuclear Physics,* and Professor Adler has submitted for publication a preprint using the quasiparticle methods of the book to set up a composite quark and lepton model, along the lines of the old Harari-Shupe proposal. (This paper grew out of a course of lectures he gave at the Institute during the spring of 1994, covering parts of his book which are relevant to quaternionic field theory.) The composites are identified with three quasiparticle states constructed according to certain postulated rules; the spin 1/2 composites with mixed symmetry wave functions in this scheme consist of *precisely* the three families of quarks and leptons used in the standard model. Over the long term, Professor Adler expects to spend about half of his time working on extensions of these ideas, with the aim of getting a solid dynamical underpinning for the composite quark lepton rules, and of looking for a unification of this type of matter theory with gravitation.

Starting in December 1993 Professor Adler has been spending half of his time on issues relating to computational neuroscience. In November 1993 he was issued a patent (his first) for a neural network architecture based on the summation of phase-coherent alternating current signals. Professor Adler is currently

completing benchmark studies, in collaboration with Institute Member Gyan Bhanot and a graduate student, John Weckel, comparing the "modular" neuron of the patent with the standard McCulloch-Pitts neuron; the results show that the modular neuron is readily trained and gives comparable results to the standard one, and so there will be no problem in using it if the hardware advantages of the capacitive coupling scheme of the patent can be realized. He has also started a new project dealing with eliminating invariance groups in pattern recognition, and will report further on this and related work next year.

Professor Adler completed a three-year term on the Panel On Public Affairs (POPA) of the American Physical Society at the end of 1993, and has now started a three-year term as a member of the Commission on Physical Sciences, Mathematics, and Applications of the National Research Council. He is also serving on the editorial board of the *Journal of Mathematical Physics,* which is being successfully rejuvenated under a new management directed by Roger Newton.

JOHN BAHCALL's work in 1993–94 was focused on the solar neutrino problem and on using the repaired Hubble Space Telescope.

Analyzing the results of the four solar neutrino experiments performed so far, Professor Bahcall showed that at least three of the four experiments must be incorrect if standard electroweak theory is correct and the flux of the ^{7}Be solar neutrinos is correctly predicted by the standard solar model (theoretical uncertainty about 10%, observed discrepancy about a factor of 2). This analysis is independent of uncertainties in the most difficult-to-calculate neutrino flux (from ^{8}B neutrinos). The preferred interpretation is that the experiments are correct and standard electroweak theory has to be modified slightly to take account of small neutrino masses (the MSW effect). Together wth collaborators at the Institute, at other U.S. institutions, and in Israel, Professor Bahcall also calculated the effects of pre-main sequence evolution on the predicted event rates in solar neutrino experiments, the electromagnetic corrections to nuclear reaction rates in the sun, and the radiative corrections for neutrino-electron scattering cross sections in solar neutrino experiments.

Working with a group of collaborators at the Institute, Professor Bahcall used the newly repaired Hubble Space Telescope to find new results about the mass of stars in the Galaxy and about the context in which quasars occur. The HST observations of stars showed that there are very few low-mass red stars, proving that the missing mass in the Galaxy cannot be in the form of faint red stars. Most surprising was the discovery that quasars, the most luminous objects in the universe, do not occur in bright galaxies. The discovery of the presumed bright galaxies in which the quasars were believed to occur was one of the design goals of the Hubble Telescope, but the first observations with the telescope did not show the presence of any bright galaxies. Candidate faint galaxies were

detected around a few of the first quasars observed; tests will have to be performed in the next year to determine if these candidate galaxies are real or are caused by instrumental effects that are being investigated.

This was FREEMAN DYSON's last year before retirement. He divided his time between two principal activities. 1) Preparing a set of narrative introductions to a forthcoming volume of "Selected Papers with Commentary" to be published by International Press, with editorial supervision by Professors S.T. Yau and Elliott Lieb. The volume will contain about 50 technical papers dating from 1944 to 1990. The style of the commentaries is modeled on the similar volume published under the title "Selected Papers with Commentary" by Professor C.N. Yang in 1983. Yang used that volume as an opportunity to write his intellectual autobiography. 2) Continuing to work with Institute Member Pavel Bleher on research problems connected with the statistics of eigenvalues in classically integrable systems. Out of this work came two papers published in *Communications in Mathematical Physics,* with more to come. Besides this technical research work, Professor Dyson also presented lectures for various public occasions, including the annual meeting of AMIAS (Association of Members of the Institute for Advanced Study) in May 1994.

PIET HUT has studied several topics in the general area of dense stellar systems, using a variety of analytical and numerical techniques. During the summer of 1993, he visited the Yukawa Institute for Fundamental Physics at Kyoto University. There he collaborated with Masataka Fukugita on a project to determine cross sections for merging encounters between galaxies, in order to determine the rate of galaxy merging in rich groups of galaxies.

During the fall of 1993 Professor Hut took part in a program at the Institute for Theoretical Physics in Santa Barbara, entitled "Dynamics of Dense Stellar Systems." During this workshop, he developed a novel algorithm for accurate orbit integrations in the gravitational many-body problem, in collaboration with Jun Makino from Tokyo University and Steve McMillan from Drexel University. Given any existing integration scheme, this new algorithm provides a prescription for iterative time symmetrization of the time step length. Even with only one iteration, this meta-algorithm typically gives an accuracy significantly higher than the original algorithm could provide for the same amount of computer time.

Another project, started at the workshop in Santa Barbara, involves a detailed study of three-body scattering processes for strongly unequal masses. The main applications are in star clusters, where double stars composed of relatively light main sequence stars may encounter neutron stars and black holes. Together with

Steve McMillan and Douglas Heggie from the University of Edinburgh, Professor Hut completed the first general survey of unequal mass three-body scattering, presenting analytical expressions based on phase-space arguments together with numerical results to determine the overall scaling factors. Other applications of these scattering experiments were made in collaboration with Member Fred Rasio, a Member in the School of Natural Sciences, by providing formation scenarios of triple star systems in globular clusters, following recent observational evidence in that direction.

In collaboration with a group in the astronomy department at the University of Tokyo led by Daiichiro Sugimoto, Professor Hut continued the research projects using the special-purpose computers constructed in Tokyo. One of the first applications, in collaboration with Jun Makino, was a detailed survey of encounters between galaxies, to determine the merging criteria for a variety of models for galactic structure. Another ongoing project, which will use the higher-precision special-purpose hardware which is expected to become available next year, involves the development of orbit integration software using the new algorithm mentioned above.

FRANK WILCZEK's research in academic year 1993–94 continued themes initiated in the past few years.

In the area of condensed matter, Professor Wilczek continues to develop applications of the ideas of fractional quantum numbers and statistical transmutation. The most well-developed applications are in the complex of states of matter referred to as the quantum Hall effect, and this continues to be a source of new ideas, partly stimulated by new experimental developments. Professor Wilczek has been especially interested in a qualitatively new state (technically, the $\nu = 1/2$ state) where these effects appear to be particularly dramatically realized, in that due to the effect of statistical transmutation, charged particles moving in a very large magnetic field, which ordinarily would be expected to move in tight circles, instead propagate in straight lines. Understanding the details of this motion, in particular its speed as a function of the energy of the particle, is a real challenge, and Professor Wilczek thinks he and his student, Chetan Nayak, have made important progress on it. Understanding this problem is a major necessary step toward making ideas Professor Wilczek has been considering for the description of high-temperature superconductors more useful and testable. Professor Wilczek also has had some fun considering how some of his old ideas regarding fractional quantum numbers are realized, with some new twists, in these new states of matter. Finally, thanks to some new ideas (related to the observation of straight-line propagation alluded to above), Professor Wilczek, after ten years of taking for granted the notion that fractional charge and statistics would only be observable rather indirectly, is optimistic that they can suggest fairly direct, concrete experimental tests.

Professor Wilczek's other main recent fascination has been with quantum aspects of black hole physics. He has been quite interested in trying to elucidate the meaning of entropy that appears in this theory. In work with Curt Callan from Princeton University and several students, Professor Wilczek has satisfied himself that it really parametrizes a peculiar quantum effect that also occurs in flat space. In quantum field theory, which he believes they have now understood rather completely in this regard, the entropy is actually infinite when contributions due to short-distance fluctuations in the fields are taken into account. Professor Wilczek would very much like to calculate how (and if!) this infinity is resolved in string theory, but so far despite much effort he has not succeeded. With his student, Per Kraus, he has succeeded in solving a different aspect of the problem. They have calculated the effect of the self-gravity of particles on the rate of their emission by black holes. Professor Wilczek believes this is the first significant concrete advance on Hawking's original calculations of over 20 years ago. The techniques Professor Wilczek and his colleagues use have the potential for considerable development.

Most of EDWARD WITTEN's activity in 1993–94 involved four dimensional supersymmetric gauge theories.

On the one hand, Professor Witten was able to use the properties of $N=2$ and $N=1$ supersymmetric gauge theories to make predictions concerning the Donaldson invariants of Kahler manifolds. The properties of the field theory that enter are fairly subtle (the mass gap and chiral symmetry breaking). The success of these predictions sheds light on both Donaldson theory and the field theories.

More recently, his main interest was in the following direction. There have been many recent developments involving symmetry or duality between electric and magnetic charge in string theory and in supersymmetric gauge theories. Professor Witten has been investigating some of these phenomena for $N=2$ supersymmetric gauge theories (with N. Seiberg, who will be at the Institute during 1994–95) and for $N=4$ with C. Vafa (who visited in spring 1994). For $N=2$ Seiberg and Professor Witten obtained an attractive description of the vacuum structure — which also should have implications for Donaldson theory. For $N=4$ Vafa and Professor Witten obtained for the first time a test of Olive-Montonen duality that is not limited in any way to weak coupling.

THE SCHOOL OF NATURAL SCIENCES

MEMBERS AND VISITORS

PHILIP ARGYRES
String Theory
Massachusetts Institute of Technology

PAUL ASPINWALL
Particle Physics
Institute for Advanced Study

PER BERGLUND
String Theory
University of Texas, Austin

EDMUND BERTSCHINGER
Cosmology
Massachusetts Institute of Technology · *f*

GYAN BHANOT
Computational Physics
Thinking Machines Corporation

JULIAN BIGELOW
Applied Mathematics
Institute for Advanced Study · *m*

PAVEL BLEHER
Particle Physics
Tel Aviv University · *f*

FRANKLIN BRIGGS
Astrophysics
University of Pittsburgh · *s*

MARTIN BUCHER
Particle Physics
Institute for Advanced Study

CURTIS CALLAN
Particle Physics
Princeton University

YONGMIN CHO
Particle Physics
Seoul National University

XENIA DE LA OSSA
String Theory
University de Neuchatel

STANLEY DESER
Particle Physics
Brandeis University · *f*

ALON FARAGGI
String Model Building
Weizmann Institute

MASATAKA FUKUGITA
Astrophysics
Kyoto University · *v*

BRIAN GREENE
Mathematical Physics
Cornell University · *f*

ZACHARY HA
Condensed Matter
Princeton University

MANS HENNINGSON
Particle Physics
University of Göteborg

LAWRENCE HORWITZ
Particle Physics
Tel Aviv University · *v*

TERENCE HWA
Condensed Matter
Harvard University · *m*

BUELL JANNUZI
Observational Cosmology
Institute for Advanced Study

CLIFFORD JOHNSON
Mathematical Physics
University of Southampton

RANDY KAMIEN
Statistical Mechanics/Field Theory
Harvard University

MARC KAMIONKOWSKI
Particle Physics/Cosmology
Institute for Advanced Study

ARI LAOR
Astrophysics
Institute for Advanced Study · *v*

KEKE LI
Particle/Mathematical Physics
California Institute of Technology · *m*

v Visitor · *m* Member with Long Term Appointment

JORDI MIRALDA-ESCUDÉ
Astrophysics
Institute of Astronomy,
Cambridge University · *m*

CHIARA NAPPI
Particle Physics
Institute for Advanced Study · *m*

RAJAMANI NARAYANAN
Particle Physics
Rutgers University

Y. JACK NG
Particle Physics
University of North Carolina · *s*

M. RONEN PLESSER
String Theory
Yale University · *m*

ELIEZER RABINOVICI
Particle Physics
Hebrew University · *v*

FREDERIC RASIO
Astrophysics
Cornell University

T. ANDREAS REISENEGGER
Astrophysics
California Institute of Technology

HANS-WALTER RIX
Observational Cosmology
Institute for Advanced Study

HERB ROOD
Astrophysics
Institute for Advanced Study · *v*

PENNY SACKETT
Astrophysics
University of Pittsburgh

DONALD SCHNEIDER
Observational Cosmology
Institute for Advanced Study · *m*

NATHAN SEILBERG
String Theory
Rutgers University · *v*

SAMSON SHATASHVILI
Mathematical Physics
Institute for Advanced Study

LINDA SPARKE
Astrophysics
University of Wisconsin · *s*

MICHAEL STRAUSS
Astrophysics
Institute for Advanced Study · *m*

CLAUDIO TEITELBOIM
Particle Physics
Centro de Estudios Científicos de Santiago · *m*

ANNE THOUL
Astrophysics
Cornell University

CUMRUN VAFA
String Theory
Harvard University · *js*

ELI WAXMAN
Astrophysics
Nuclear Research Center Negev · *m*

DAVID WEINBERG
Astrophysics
Institute for Advanced Study · *m*

BRIAN YANNY
Astrophysics
Institute for Advanced Study · *v*

ZHOU ZOU
Condensed Matter
Institute for Advanced Study · *m*

f First Term · *s* Second Term · *j* Joint Appointment

THE SCHOOL OF SOCIAL SCIENCE

Faculty

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

Professor Emeritus
ALBERT O. HIRSCHMAN

INTERPRETIVE SOCIAL SCIENCE

Since its inception, the School has been committed to broadly humanistic, "interpretive" approaches to the social sciences. Interpretive social science embraces all the ways in which scholars make sense of the social world through empirical study, discussion within and across disciplinary communities, and the critical revision of accepted conceptions. The School is interested in cultural concepts as they shape the disciplines and, more generally, as they organize all forms of social activity. From this perspective "interpretive social science" is the study of the ways in which human beings create their societies and make life within them meaningful.

With a faculty of four members, the School can hardly hope to cover all the relevant academic disciplines. Yet the presence of a permanent faculty provides continuity and coherence for the program of the School over the years and in any single year. Faculty members have participated actively in the most important contemporary debates about the centrality of culture, language, ritual, and moral and aesthetic understandings in the study of society. And although each is rooted in his or her own discipline, all do work that cuts across disciplinary boundaries. It is the common interest in interpretation and in the construction of meaning that lends coherence to the School's program. The School is committed to bring to the Institute each year scholars who address issues of culture and meaning through concrete study and from different disciplinary backgrounds, as well as scholars who work in the same discipline as one or another faculty member but differ in intellectual perspective. This results in a wide-ranging Membership that represents in any given year a more or less coherent set of arguments — the arguments through which, at that moment, the shape of scholarly work is being decided.

ACADEMIC ACTIVITIES

Eighteen scholars from the United States and abroad were invited to be part of the School's scholarly community as Members and visitors for the 1993–94 academic year — from a pool of 276 individuals who applied for membership. Two research assistants also participated in the year's activities. Mellon Foundation funds provided support for four of the Members; the National Endowment for the Humanities partially funded five Members.

Of the group of twenty scholars from Austria, Germany, Israel, Poland, Russia, and the United States, ten were women. Fields of inquiry of the group included anthropology, one; economics, one; history, four; literature, two; political science, nine; and sociology, three.

The 1993–94 academic year marked the beginning of a four-year project on "Transitions": the change from authoritarian regimes to democratic ones, from planned economies to free markets, from racist or sexist political and economic arrangements to more egalitarian arrangements, from religious to secular cultures, from national to international science and technology. This first year focused on attempts to move from one political regime to another — from authoritarian to democratic politics, and, for comparative purposes, changes the other way, that is, military coups, religious revolutions, and the establishment of populist dictatorships.

PROFESSOR CLIFFORD GEERTZ was on sabbatical leave during 1993–94. He spent the fall as a guest of the Rektor of the Wissenschaftskolleg zu Berlin in Berlin, Germany. While there he lectured at Frankfurt, Bielefeld, and, in Berlin, at the Free University and Humboldt University. He also journeyed to Budapest where he lectured at the Collegium Budapest, as well as at the Central European University and the Hungarian National University. During the winter he was a Visiting Professor at the European University Institute in Florence, Italy, where he gave a series of seminars on his work and lectured at the University of Siena and the University of Milan. In the spring Professor Geertz was a visitor at the École des Hautes Études en Sciences Sociales in Paris where he gave a series of lectures and also participated in a symposium marking the fiftieth anniversary of Marc Bloch's death, "Marc Bloch et le Temps Present." He also traveled to Amsterdam in the Netherlands to participate in the Erasmus Ascension Symposium on "The Limits of Pluralism: Neo-Absolutisms and Relativism."

During the year Professor Geertz became a Contributing Editor of the *American Anthropologist,* and completed his book, *After the Fact: Two Countries, Four Decades, One Anthropologist,* which will appear from Harvard University Press either later this year or early next year.

PROFESSOR EMERITUS ALBERT O. HIRSCHMAN published three articles: "The Rhetoric of Reaction — Two Years Later," in *Government and Opposition* 28 (3), Summer 1993; "The On-and-Off Connection between Political and Economic Progress," in *American Economic Review* 84, May 1994 (Papers and Proceedings); and "Social Conflicts as Pillars of Democratic Market Society," in *Political Theory* 22 (2), May 1994. A German version of this paper was published in the journal *Leviathan,* (2), 1994, and also, in shortened form, in the *Frankfurter Rundschau* (daily) of June 25, 1994.

The latter paper was originally commissioned to be written under the title "How Much Community Spirit Is Required in a Democracy?" for a colloquium held at Dresden in November 1993, attended by some thirty leading German policymakers and intellectuals and organized by the Körber Foundation of Hamburg.

The Brookings Institution, which had sponsored the research Professor Hirschman conducted in 1964–66 to evaluate selected investment projects of the World Bank and which published the resulting book *Development Projects Observed* (1967), decided to republish this work. Professor Hirschman wrote a new preface under the title "A Hidden Ambition."

Professor Hirschman lectured at Rutgers University, at Harvard University, and at the University of Chicago. He participated in a conference held in Berkeley in March 1994 on the interrelation between economic development and democracy, and in a conference at the University of Sheffield (England) in April 1994 on "Ideas, Rhetoric and Policy in Postwar Britain," which Professor David Marquand, Director of the University's Political Economy Research Center, organized to discuss the relevance of Hirschman's books *Shifting Involvements* and *The Rhetoric of Reaction* to post-war British politics. Professor Hirschman wrote the introductory paper.

During May and June he returned to the Wissenschaftskolleg in Berlin where he prepared a new book of essays to be published in 1995 by Harvard University Press.

Professor Hirschman received an honorary degree from Williams College on the occasion of its Bicentennial Convocation. The German version of his paper "Exit, Voice, and the Fall of the German Democratic Republic" (*World Politics,* January 1993) received the prize for the best social science article published in Germany in 1992 (the German version appeared in *Leviathan,* September 1992).

PROFESSOR JOAN WALLACH SCOTT presented a paper at a conference on the history of women's suffrage at the University of Lausanne. She served as the Walker-Ames Professor at the University of Washington, giving a series of seminars and lectures on the theme of "rewriting the history of feminism," based

on her forthcoming book. Professor Scott was the O. Meredith Wilson Lecturer in History at the University of Utah, where she lectured on the history of feminism in France. During 1993–94, the English-language version of her essay on "The Woman Worker in the Nineteenth Century" appeared in volume four of *The History of Women,* edited by Michelle Perrot and Georges Duby (Harvard University Press). Professor Scott's essay "The Campaign against Political Correctness: What's Really at Stake?" appeared in Japanese translation. "The Rhetoric of Crisis in Higher Education" will be published shortly in *The Crisis in Higher Education,* edited by Michael Bérube and Cary Nelson (Routledge).

During the academic year 1993–94, PROFESSOR MICHAEL WALZER gave the William James lecture at the Harvard Divinity School. He also lectured at the Universities of Illinois, Toronto, and Wisconsin, at the Catholic Theological Union in Chicago, and at Kalamazoo College, where he received an honorary degree. He attended and spoke at a conference held at the University of Amsterdam in October 1993 to mark the tenth anniversary of the publication of *Spheres of Justice.* While in Holland, he gave talks at Leiden University and the Catholic University in Nijmegen. Later in the year, he lectured at the Universities of Palermo and Florence. A number of his books appeared in new translations: *Spheres of Justice* in Swedish and Spanish; *Company of Critics* in Lithuanian and Spanish; *Obligations* in Japanese. Here in Princeton, he continued to work on questions relating to nationalism, ethnicity, multi-culturalism (the subject of a Faculty Lecture at the Institute for Advanced Study), toleration, and civil society; also on a book on "biblical politics" and a collaborative project on Jewish political thought (partially funded for 1994–95 by a NEH grant awarded this year).

THE SCHOOL OF SOCIAL SCIENCE

MEMBERS, VISITORS AND RESEARCH STAFF

FELIPE AGÜERO
Political Science
Ohio State University

LISA ANDERSON
Political Science
Columbia University

AVA BARON
Sociology
Rider College

MITCHELL COHEN
Political Science
The Graduate School and Baruch College
of the City University of New York

MICHELA DE GIORGIO
History
Istituto Gramsci, Rome · *v*

MARIA PIA DI BELLA
Anthropology
Centre National de la Recherche Scientifique,
Paris · *v*

MIROSLAWA GRABOWSKA
Political Science
Warsaw University

LINDA GREGERSON
Literature
University of Michigan

OTTO KALLSCHEUER
Political Science
Institute for Human Sciences, Vienna

JEROME KARABEL
Sociology
University of California, Berkeley

SUSAN KENT
History
University of Colorado

BARUCH KNEI-PAZ
Political Science
Hebrew University of Jerusalem

BARBARA KRUG
Political Science
University of Saarland

YAIR LORBERBAUM
Political Science
Shalom Hartman Institute, Jerusalem · *a*

KRISTIE MACRAKIS
History of Science
Michigan State University

VEDAT MILOR
Sociology
Brown University

STEVEN MULLANEY
Literature
University of Michigan

CONSTANTINE PLESHAKOV
Political Science
Institute of U.S. and Canada Studies, Moscow

DAVID WEIMAN
Economics
Yale University

SUSAN WHITNEY
History
Rutgers University · *a*

v Visitor · *a* Research Assistant

Nineteen ninety-two was the centennial of the birth of Erwin Panofsky, professor at the Institute for Advanced Study after he immigrated to America in 1933. A symposium commemorating the occasion took place at the Institute October 1–3, 1993.

The main purpose of the gathering was to explore the phenomenal explosion since World War II of interest in the visual arts, and especially the history of art, among professionals in other fields of the humanities and social sciences. Art history was formerly an elite subject of no more than dilettantish interest to "serious" historians in other fields, whereas by now few serious historians or social scientists neglect to consider visual culture in one form or another. This profound change is partly due to the enormous influence of Panofsky, and in particular to his own method of explicating works of art by reference to other domains, such as philosophy, literature, theology, and science. In this way, he showed that works of art are in turn relevant to those fields as well.

The symposium was devoted to "Meaning in the Visual Arts," the title of a famous volume of essays by Panofsky, in which he sought to define how the visual arts convey meaning—intellectual sense, not just aesthetic pleasure—as no one had done before. The symposium sought to strike a balance between theoretical approaches and actual exemplification of the subject, providing a fitting commemoration for one of the most innovative—and quintessentially interdisciplinary—historians of our time.

IRVING LAVIN

THE LIBRARIES

The *Historical Studies-Social Science Library* [Dr. Elliott Shore, Librarian] contains about 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 offprint collection that includes offprints received by Professors Kurt Gödel, Ernst H. Kantorowicz, Elias Avery Lowe, Millard Meiss and Erwin Panofsky and former Member Walter 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 (including bound periodicals and monographs) plus subscriptions to nearly 200 journals. Its collection of older periodicals (prior to 1940) is housed in compact shelving on the lower level of the Historical Studies-Social Science Library. The areas covered by this collection are pure and applied mathematics, astrophysics, and theoretical, particle and mathematical physics.

Both of the Institute's libraries participate in the shared cataloguing system of the Research Libraries Group, which gives Institute scholars computerized access to a database that contains more than fourteen million records. Searches of this database retrieve bibliographic information and identify the location of materials in all participating libraries. Scholars who use the Historical Studies-Social Science Library can also conduct computerized searches in the Avery Art Index, the Eighteenth Century Short Title Catalogue and such indexes as the Art Index, the Humanities Index and the Social Science Index. The Mathematics-Natural Sciences Library has access to the Math-Sci Online database.

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, the faculties and the visiting scholars of all four Schools at the Institute warmly appreciate gifts, too numerous to mention here, of books and articles from former and current Members of the Institute.

RECORD OF EVENTS

What follows is a calendar of events sponsored by the Schools of Historical Studies, Mathematics, Natural Sciences and Social Science and by the Office of the Director

Academic Year 1993–1994

September 7
School of Natural Sciences
Astronomy Seminar: Weekly Astronomy Seminars serve as a clearinghouse for new ideas in the world of science.
JOHN N. BAHCALL, *IAS*, moderator

September 10
School of Natural Sciences
Lunchtime Seminar: "Black Hole Complementarity"
LEONARD SUSSKIND, *Stanford University*

September 13
School of Natural Sciences
Theoretical Physics Seminar: "Kodaira-Spencer Theory of Gravity & Exact Quantum String Amplitudes"
CUMRUN VAFA, *Harvard University*

September 22
School of Natural Sciences
Theoretical Physics Seminar: "The Nambu Jona-Lasino Model on the Lattice, An Effective Theory of QCD"
PAVLOS VRANAS, *Florida State University*

School of Social Science
Interdisciplinary Work in the Social Sciences/ Humanities: Organizational Meeting
JOAN SCOTT, *IAS*

September 24
School of Natural Sciences
Lunchtime Seminar: "Supersymmetric Yang-Mills Theory on a 4-Manifold"
EDWARD WITTEN, *IAS*

September 27
School of Natural Sciences
Theoretical Physics Seminar: "Kahler Manifolds with Positive First Chern Class & Mirror Symmetry"
ROLF SCHIMMRIGK, *University of California, Santa Barbara*

October 4
School of Mathematics
Combinatorics and Complexity Seminar: "An Algebraic Approach to Graph Coloring Problems"
NOGA ALON, *IAS*

Geometric-Analysis Seminar: "The Status of the Affine Holonomy Problem"
ROBERT BRYANT, *IAS*

Members Seminar: "Understanding the Microstructure of Crystals"
JOHN BALL, *IAS*

October 5
School of Mathematics
PDE Seminar: "Long Time Behavior of Three-dimensional Fluids"
THOMAS SIDERIS, *IAS*

Mirror Symmetry Seminar: "Mirror Symmetry and Conifold Transitions"
DAVID MORRISON, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Fermion Doubling on Random Lattices"
TIEN KIEU, *University of Melbourne*

October 6
School of Mathematics
Number Theory and Geometry Seminar: "Differential Field Methods for Diophantine Equations"
ALEXANDRU BUIUM, *IAS*

School of Social Science
Political Transitions Seminar: Organizational Meeting
MICHAEL WALZER, *IAS*

October 7
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "The Distribution of Zeros of Linear Combinations of Euler Products"
ENRICO BOMBIERI, *IAS*

School of Social Science
Luncheon Seminar: "Social Conflicts as Pillars of Liberal Democracy"
ALBERT O. HIRSCHMAN, *IAS*

October 8
School of Mathematics
Applied Math-Math Physics Seminar: "Uniform Methodology to Quantify Morphology and Properties of Heterogeneous Materials"
SALVATORE TORQUATO, *Princeton University*

School of Natural Sciences
Lunchtime Seminar: "Generalized Quantum Dynamics or Can One Have Quantum Mechanics without First Having Classical Mechanics?"
STEVE ADLER, *IAS*

October 11
School of Mathematics
Members Seminar: "Expanders"
NOGA ALON, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Baryogensis in the Minimal Standard Model"
GLENNYS FARRAR, *Rutgers University*

October 12
School of Historical Studies
Medieval Seminar: "Ennodius and His Editors"
STEFANIE KENNELL, *Newfoundland*

October 13
School of Natural Sciences
Condensed Matter Seminar: "Supercooling a Nematic Liquid Crystal"
ROBERT PELCOVITS, *Brown University*

Sackler Colloquia Series: "Observing Machos"
CHARLES ALCOCK, *Lawrence Livermore Laboratory*

School of Social Science
Interdisciplinary Seminar: Discussion of Samuel Weber, Chapter 2: "Limits of Professionalism," and Chapter 3, "The Debt of Criticism," in *Institution and Interpretation*
JOAN SCOTT, *IAS*

IAS Friends' Forum
"Free Exercise! Seven Stages in the Life of a Constitutional Ideal"
JOHN T. NOONAN, JR., *Judge, U.S. Court of Appeals for the Ninth Circuit*

October 14
School of Social Science
Luncheon Seminar: "Statehood and Toleration in a Multi-Cultural World"
MICHAEL WALZER, *IAS*

October 18
School of Mathematics
Combinatorics and Complexity Seminar: "On Representations by Low-Degree Polynomials"
ROMAN SMOLENSKY, *Hebrew University*

Geometric-Analysis Seminar: "Construction of Compact Riemannian 7-Manifolds with Holonomy Group G(2)"
DOMINIC JOYCE, *IAS*

Members Seminar: "Geometry of Polyhedral Surfaces"
IGOR RIVIN, *IAS*

October 19
School of Mathematics
PDE Seminar: "Minima of Some Mean-Coercive Variational Functionals"
ADAM LUTOBORSKI, *Syracuse University*

October 20
School of Mathematics
Number Theory and Geometry Seminar: "Differential Field Methods for Diophantine Equations" (continued)
ALEXANDRU BUIUM, *IAS*

School of Social Science
Political Transitions Seminar: Discussion of Ian Shapiro, "Democratic Innovation: South Africa in Comparative Context"
MICHAEL WALZER, *IAS*

October 21
School of Historical Studies
Art History Colloquium: "Recycled Images: Overpainting in Early Mughal Art"
JOHN SEYLLER, *IAS*

School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "On Nonvanishing of Rankin Selberg L-Functions with Applications to Cusp Forms"
W. J. LUO, *IAS*

School of Social Science
Luncheon Seminar: "Love and Death: Sexualizing the Great War"
SUSAN KENT, *IAS*

October 22
School of Mathematics
Applied Math-Math Physics Seminar: "Defect Dynamics in Nematic Liquid Crystals"
BERNARD YURKE, *AT&T Bell Labs*

Special Seminar: "Flag Varieties and Quantum Groups"
VICTOR GINZBURG, *University of Chicago*

School of Natural Sciences
Lunchtime Seminar: "Construction of Realistic Superstring Standard-Like Models"
ALON FARAGGI, *IAS*

October 25
School of Mathematics
Combinatorics and Complexity Seminar: "A Combinatorist's View of the Lace Expansion"
DORON ZEILBERGER, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Background Independence of Closed String Field Theory at the Quantum Level"
BARTON ZWIEBACH, *MIT*

October 26
School of Historical Studies
Medieval Seminar: "Theory and Praxis in the Artistic Patronage of the Franciscan Observants"
ALESSANDRO NOVA, *IAS*

School of Mathematics
PDE Seminar: "Univalent Minimizers of Polyconvex Functionals from Nonlinear Elasticity"
PATTI BAUMAN, *Purdue University*

October 27
School of Mathematics
Number Theory and Geometry Seminar: "Differential Field Methods for Diophantine Equations" (continued)
ALEXANDRU BUIUM, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Chiral Symmetry Breaking and Pattern Formation in Complex Fluids"
JONATHAN SELINGER, *Naval Research Laboratory*

October 28
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Remarks on the Sixth Moment of the Zeta Function"
B. CONREY, *Oklahoma State University*

School of Social Science
Luncheon Seminar: "Passions and Interests in Pre-industrial Welfare States: The Prospects of Liberalism in Arab Politics"
LISA ANDERSON, *IAS*

October 29
Institute Lecture Series
"What is the Appropriate Governmental Role in Science and Technology?"
PHILLIP A. GRIFFITHS, *IAS*

School of Mathematics
Applied Math-Math Physics Seminar: "Dynamic Metastability, Exponentially Small Eigenvalues and Singular Perturbations"
LUIS REYNA, *T. J. Watson Research Center*

November 1
School of Mathematics
Combinatorics and Complexity Seminar: "The Shrinkage Constant is 2"
JOHAN HASTAD, *Royal Institute of Technology, Sweden*

Geometric-Analysis Seminar: "SU(n)-instanton Moduli Spaces and the Atiyah-Jones Conjecture"
TIAN YOULIANG, *IAS*

Members Seminar: "Quantum Knizhnik-Zamolodchikov Equations, Monoidal Categories and Elliptic Curves"
YAN SOIBELMAN, *IAS*

November 2
School of Historical Studies
Medieval Seminar: "The Fraticelli and the Turks: A New Interpretation of Berkludje Mustafa's Uprising in Anatolia (ca. 1415)"
KONSTANTIN ZHUKOV, *IAS*

School of Mathematics
PDE Seminar: "Problems on Phase Transitions and Materials Instabilities"
IRENE FONSECA, *Carnegie Mellon University*

Mirror Symmetry Seminar: "Hodge Theoretic Aspects of Mirror Symmetry"
DAVID MORRISON, *IAS*

November 3
School of Mathematics
Number Theory and Geometry Seminar: "Spectral Mean-values of Automorphic L-functions"
WENZHI LUO, *IAS*

School of Social Science
Political Transitions Seminar: Discussion of Charles S. Maier, "Why Did Communism Collapse in 1989?"; David Lipton and Jeffrey Sachs, "Creating a Market Economy in Eastern Europe: The Case of Poland"; and Andreas Pickel, "The Survival and Revival of Entrepreneurship in the GDR"
MICHAEL WALZER, *IAS*

November 4
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Counting Lattice Points in Different Shapes"
JOZSEF BECK, *Rutgers University*

School of Social Science
Luncheon Seminar: "A Postcommunist Society: Misguidances, Disenchantments and Uncertain Chances"
MIROSLAWA GRABOWSKA, *IAS*

November 5
School of Mathematics
Applied Math-Math Physics Seminar: "Random Schrödinger Operators — Lifshitz Tail and Mobility Edge"
THOMAS SPENCER, *IAS*

School of Natural Sciences
Lunchtime Seminar: "Mirror Symmetry in Two-Parameter Examples"
P. CANDELAS, *University of Texas at Austin*

November 8
School of Mathematics
Combinatorics and Complexity Seminar: "Around Freiman's Theorem on Set Addition"
IMRE RUZSA, *Hungarian Academy of Sciences*

Geometric-Analysis Seminar: "On Accessible Points and Closed Trajectories of Mechanical Systems"
VIKTOR GINZBURG, *IAS*

Members Seminar: "Higher Order Lefschetz Trace Formulae and Euler Characteristics"
ROSS GEOGHEGAN, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Dynamical SUSY Breaking — Naturalness vs. Non-Renormalization"
NATHAN SEIBERG, *Rutgers University*

November 9
School of Mathematics
PDE Seminar: "Vortices in Nonlinear Heat Flow"
DAN PHILLIPS, *Purdue University*

Combinatorics and Complexity Seminar: "Complexity in Computer Sparse Algebra"
DIMA GRIGORIEV, *Pennsylvania State University*

November 10
School of Mathematics
Number Theory and Geometry Seminar: "Harman's Sieve"
ROGER BAKER, *IAS*

School of Natural Sciences
Sackler Colloquia Series: "Cosmic Gamma Ray Bursts: An Update"
BOHDAN PACZYNSKI, *Princeton University*

November 11
School of Historical Studies
Art History Colloquium: "Nuns as Artists in Fifteenth-Century Franconia: Devotional Drawings from the Convent of St. Walburg at Eichstätt"
JEFFREY HAMBURGER, *IAS*

School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Cubic Forms over Number Fields"
C. SKINNER, *Princeton University*

School of Social Science
Interdisciplinary Seminar: Discussion of Steven Mullaney, "Mourning and Mysogyny: *Hamlet, The Revenger's Tragedy*, and the Final Progress of Elizabeth I, 1600–1607"
STEVEN MULLANEY, *IAS*

Luncheon Seminar: "Moral Disagreement and Democracy"
AMY GUTMANN, *Princeton University*

November 12
School of Mathematics
Applied Math-Math Physics Seminar: "Dissipation Induced Instabilities and Brockett's Double Bracket Equation"
J. E. MARSDEN, *Berkeley*

School of Natural Sciences
Theoretical Physics Seminar: "Chiral Perturbation Theory for the Quenched Approximation of QCD"
MAARTEN GOLTERMAN, *Washington University*

November 15
School of Mathematics
Combinatorics and Complexity Seminar: "Random Matchings"
JEFF KAHN, *Rutgers University*

Geometric-Analysis Seminar: "Strongly Inhomogeneous Einstein Metrics with 3-Sasakian Structure"
KRIS GALICKI, *University of New Mexico*

Members Seminar: "On the Arithmetic of Drinfel'd Modules"
YUICHIRO TAGUCHI, *IAS*

November 16
School of Mathematics
PDE Seminar: "Geometric Compatibility and the Metastability of Elastic Crystals"
R. D. JAMES, *IAS*

Mirror Symmetry Seminar: "Cubics, Integrable Systems and Calabi-Yau 3 Folds"
RON DONAGI, *University of Pennsylvania*

November 17
Institute Lecture Series
"Multiculturalism and Individualism"
MICHAEL WALZER, *IAS*

School of Mathematics
Special Lecture Series: "Introduction to Statistical Mechanics and Random Media"
THOMAS SPENCER, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Field Theory of Self Organized Criticality"
MAYA PACZUSKI, *Brookhaven National Laboratory*

School of Social Science
Political Transitions Seminar: Discussion of Barbara Krug, "Foresight versus Insight: The Economic Explanation of the Transformation in China" and "Blood, Sweat, or Cheating: Politics and the Transformation of Socialist Economies in China, the USSR, and Eastern Europe"; and Kung-chia Yeh, "Economic Reform: An Overview"
BARBARA KRUG, *IAS*

November 18
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "On the Relative Distribution of Primes"
PETER SARNAK, *Princeton University*

School of Social Science
Luncheon Seminar: "The Quest for the 'Right' Principal: Ownership Reforms in Poland and the Czech Republic"
VEDAT MILOR, *IAS*

November 19
School of Mathematics
Applied Math-Math Physics Seminar: "Pretransitional Tweed Microstructures in Martensitic Materials"
SIVAN KARTHA, *IAS*

School of Natural Sciences
Lunchtime Seminar: "Gauged & Ungauged WZW Models & Duality"
C. NAPPI, *IAS*

November 22
School of Mathematics
Combinatorics and Complexity Seminar: "On a Curious Problem Ramsey and Poincare Might Have Liked"
PETER WINKLER, *Bellcore*

Geometric-Analysis Seminar: "Cohomology Rings of Symplectic Quotients and Moduli Spaces of Vector Bundles on Riemann Surfaces"
LISA JEFFREY, *Princeton University*

Members Seminar: "Blow-ups of Smooth Manifolds"
GRIGORY MIKHALKIN, *IAS*

November 23
School of Mathematics
PDE Seminar: "Global Solutions of 2-D Navier-Stokes and Euler Equations"
MATANIA BEN-ARTZI, *IAS*

School of Historical Studies
Medieval Seminar: "Research in the History of Mathematics"
ROSHDI RASHED, *IAS*

November 29
School of Mathematics
Members Seminar: "Holomorphic Rational Mappings from S^{2n-1} to S^{2N-1}"
JOHN D'ANGELO, *IAS*

December 1
School of Social Science
Political Transitions Seminar: Discussion of David Weiman, "Planning the Bell System, 1888–1914: The Cumulative Dynamics of Network and Urban Regional Development"
DAVID WEIMAN, *IAS*

IAS Friends' Forum
"Policy Toward Russia and Eastern Europe"
GEORGE F. KENNAN, *IAS*

December 2
School of Historical Studies
Art History Colloquium: "The Shadow of Historiography: the Unknowing of History"
MARK JARZOMBEK, *IAS*

School of Social Science
Luncheon Seminar: "Women Who Have Only Paradoxes to Offer: French Feminists 1789–1945"
JOAN SCOTT, *IAS*

December 3
School of Natural Sciences
Lunchtime Seminar: "Fundamental Aspects of Geometric Entropy"
FRANK WILCZEK, *IAS*

December 4
School of Historical Studies
Delaware Valley Medieval Association Annual Meeting: "Law and Religion: On Three Intersecting Points in the Law of the Medieval Church"
KNUT NÖRR, *IAS*
"Transvestites: Saintly and Secular"
PAUL SZARMACH, *IAS*
"Studying Scripture in the Early University"
JOHN VAN ENGEN, *IAS*

December 6
IAS Concert Series
THE ST. LAWRENCE QUARTET

School of Mathematics
Workshop on Material Microstructure: "Shift Relaxation in Gold-cadmium and Other Alloys"
R. D. JAMES, *IAS*
"Laminate Structures in Giant Magnetostrictive Materials"
D. KINDERLEHRER, *Carnegie Mellon University*
"Remarks on Multiwell Problems"
KEWEI ZHANG, *Macquarie, Australia*
"Relationship between Atomic and Continuum Elastic Properties of Heterogeneous Solids"
J. L. BASSANI, *University of Pennsylvania*
"Interfacial Pattern Formation and the Biot-Savart Law"
R. E. GOLDSTEIN, *Physics and Materials Institute, Princeton*
"Dynamics as a Mechanism Preventing the Formation of Microstructure"
G. FRIESECKE, *Carnegie Mellon University*
"Texture and Yield in Polycrystals"
T. OLSON, *IAS*
"Microstructures in Magnetized Solids"
A. DE SIMONE, *Carnegie Mellon University*
"Recent Experiments on CuAlNi Single Crystals — Biaxial and Shear"
C. CHU, *University of Minnesota*
"The Dynamics of Pattern Formation at Elastic Phase Transitions"
R. J. GOODING, *Queen's University, Ontario*

Combinatorics and Complexity Seminar: "The Four-colour Theorem"
PAUL SEYMOUR, *Bellcore*

Geometric-Analysis Seminar: "Gauss Maps and Second Fundamental Forms of Projective Varieties"
JOSEPH LANDSBERG, *University of Pennsylvania*

December 7
School of Mathematics
Workshop on Material Microstructure: "On the Problem of Two Wells"
V. SVERAK, *IAS*
"Microstructures with Finite Surface Energy"
S. MULLER, *IAS*
"Vortices in Superconductors"
WEINAN E, *IAS*
"Computational Modeling of the Martensitic Transformation"
M. LUSKIN, *University of Minnesota*
"The Computation of Hysteresis for Materials with Microstructure"
L. MA, *IAS*
"Designing Effective Piezocomposites for Hydrophones and Medical Imaging Devices"
P. J. SWART, *Courant Institute*
"Wrinkling of Thin Film Blisters"
M. ORTIZ, *Brown University*
"Energy Minimization and the Recoverable Strain of Polycrystalline Shape-memory Materials"
R. V. KOHN, *Courant Institute*

December 8
School of Mathematics
Special Seminar: "Quadratic Microlocal Measures: H-measures, Semi-classical or Wigner Measures. What Are They Good For?"
LUC TARTAR, *Carnegie Mellon University*

Number Theory and Geometry Seminar: "Perturbation of the Laplace Spectrum of Non-compact Hyperbolic Surfaces" (continued)
CHRIS JUDGE, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Columnar-defect Induced Vortex Trapping and Flux Lock-in Transitions in Epitaxial Films of T1-Cuprates"
R. C. BUDHANI, *Brookhaven National Laboratory*

December 9
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Diophantine Approximations and Exponential Sums"
ROGER BAKER, *IAS*

School of Social Science
Interdisciplinary Seminar: Discussion of excerpts from Sarah Hanley, *State Building in Early Modern France: Law, Litigation, and Local Knowledge*
SARAH HANLEY, *University of Iowa*

Luncheon Seminar: "Post-Imperial Russian National Identity"
CONSTANTINE PLESHAKOV, *IAS*

December 10
School of Mathematics
Applied Math-Math Physics Seminar: "Conformal Field Theory, Hyperbolic Geometry and Phase Transitions"
PETER KLEBAN, *IAS*

December 13
School of Mathematics
Combinatorics and Complexity Seminar: "Graph Embeddings"
ENDRE SZEMEREDI, *Rutgers University*

Geometric-Analysis Seminar: "Positive Quaternionic-Kahler Manifolds and Contact Fano Manifolds"
YUNGANG YE, *SUNY at Stony Brook*

Members Seminar: "Spin Polynomial Invariants for Dolgachev Surfaces"
STEFAN BAUER, *IAS*

December 14
School of Historical Studies
Medieval Seminar: "The Use of Classical Mythology in the Christian Roman Empire"
WOLF LIEBESCHUETZ, *IAS*

School of Mathematics
PDE Seminar: "Compensated Compactness under Critical Growth Condition"
KEWEI ZHANG, *Macquarie, Australia*

Applied Math-Math Physics Seminar: "The $T_c - T^*$ Problem for Nematic-isotropic Phase Transition"
PING SHENG, *Exxon*

School of Natural Sciences
Condensed Matter Seminar: "Anderson Localisation on a Cayley Tree"
JEFF MILLER, *CEN Saclay*

December 15
School of Mathematics
Special Lecture Series: "Toward a Geometry of Differential Equations"
PHILLIP A. GRIFFITHS, *IAS*

School of Social Science
Political Transitions Seminar: Discussion of Michael Burawoy and Pavel Krotov, "The Economic Basis of Russia's Political Crisis"; and Vedat Milor, "Changing Political Economies: Privatization in Post-Communist and Reforming Communist States"
VEDAT MILOR, *IAS*

December 16
School of Historical Studies
Art History Colloquium: "Teofilo Folengo and Girolamo Romanino: the 'questione della lingua' and its eccentric trends in literature and the arts"
ALESSANDRO NOVA, *IAS*

School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Some Combinatoric Applications of Additive Number Theory"
NOGA ALON, *IAS*

School of Social Science
Luncheon Seminar: "Discursive Forums, Cultural Practices: History and Anthropology in Literary Studies"
STEVEN MULLANEY, *IAS*

December 17
School of Mathematics
Special Lecture Series: "Toward a Geometry of Differential Equations" (conclusion)
PHILLIP A. GRIFFITHS, *IAS*

Geometric Inequalities and Integral Geometry Seminar
ERIC GRINBERG, *IAS*, organizer

School of Natural Sciences
Lunchtime Seminar: "Chiral Fermions on the Lattice"
R. NARAYANAN, *IAS*

January 4
School of Historical Studies
Medieval Seminar: "Secular and Sacred Heroes: Ermolao Barbaro on Worldly Honor"
PATRICIA LABALME, *IAS*

January 12
School of Natural Sciences
Condensed Matter Seminar: "Matrix Models, One-Dimensional Fermions, and Quantum Chaos"
BEN SIMONS, *MIT*

School of Social Science
Political Transitions Seminar: Discussion of Miroslawa Grabowska, "After the Victory: A Cultural Landscape"; and George Konrad and Ivan Szelenyi, "Intellectuals and Domination in Post-Communist Societies"
MIROSLAWA GRABOWSKA, *IAS*

January 13
School of Social Science
Luncheon Seminar: "Can Historical Consequences Falsify Ideas? Or: Karl Marx after the Collapse of the Soviet Union"
BARUCH KNEI-PAZ, *IAS*

January 14
School of Mathematics
Applied Math-Math Physics Seminar: "Spiral Formation in the Kelvin-Helmholtz Problem"
ROBERT KRASNY, *IAS*

School of Natural Sciences
Lunchtime Seminar: "On the Problems with Background Independence — Open Strings"
S. SHATASHVILI, *IAS*

January 17
School of Mathematics
Combinatorics and Complexity Seminar: "Geometry and Combinatorics of Convex Polyhedra Inscribed in the Sphere"
IGOR RIVIN, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Complex Time Solutions & Multiparticle Production in Yang-Mills Theory"
ERICH POPPITZ, *The Johns Hopkins University*

January 18
School of Historical Studies
Medieval Seminar: "Notions of 'Christianitas' in the Roman Empire"
JOHN VAN ENGEN, *IAS*

School of Mathematics
PDE Seminar: "On the Uniqueness and Continuous Dependence of Weak Solutions for Systems of Conservation Laws"
ZHOUPING XIN, *IAS*

January 19
IAS Concert Series
ALEXANDER SLOBODYANIK, *Piano*

Institute Lecture Series
"What Type of Quantum Mechanics Underlies the Structure of the Universe?"
STEPHEN ADLER, *IAS*

School of Mathematics
Special Lecture Series: "The Bethe Ansatz and the Lefschetz Trace Formula"
ROBERT P. LANGLANDS, *IAS*

Number Theory and Geometry Seminar: "The Fields of Totally S-adic Elements and their Galois Theory"
FLORIAN POP, *IAS*

January 20
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Dirichlet Polynomial Approximations and the Complexity of L-Functions"
ENRICO BOMBIERI, *IAS*

School of Social Science
Interdisciplinary Seminar: Discussion of Linda Gregerson, "Fault Lines: Milton's Mirror of Desire"
LINDA GREGERSON, *IAS*

Luncheon Seminar: "Revolt of the Intellectuals: The Prague Spring and the Politics of Reform Communism"
JEROME KARABEL, *IAS*

January 21
School of Mathematics
Applied Math-Math Physics Seminar: "Analysis and Computation of Ginzburg-Landau Models of Superconductivity"
QIANG DU, *Michigan State University*

January 24
School of Mathematics
Combinatorics and Complexity Seminar: "Weight-reduction in Threshold Circuits and Uniform Sets in Arithmetic Progressions"
ALEXANDER RAZBOROV, *IAS*

Geometric Analysis Seminar: "Riemann-Roch for Flat Vector Bundles"
JEAN-MICHEL BISMUT, *IAS*

Members Seminar: "Kodaira-Spencer Theory of Gravity and Counting Curves in Calabi-Yau Manifolds"
CUMRUN VAFA, *IAS*

January 25
School of Mathematics
PDE Seminar: "On the Long-time Behavior of Integrable Systems"
PERCY DEIFT, *IAS*

January 26
School of Mathematics
Special Lecture Series: "The Bethe Ansatz and the Lefschetz Trace Formula" (continued)
ROBERT P. LANGLANDS, *IAS*

Number Theory and Geometry Seminar: "The Fields of Totally S-adic Elements and their Galois Theory" (continued)
FLORIAN POP, *IAS*

School of Natural Sciences
Sackler Colloquia Series: "Strings and the New Physics"
CUMRUN VAFA, *IAS*

Condensed Matter Seminar: "One-Dimensional Models with $1/r^2$ Interactions: The 'Ideal Gas with Fractional Statistics'"
DUNCAN HALDANE, *Princeton University*

School of Social Science
Political Transitions Seminar: Discussion of Steven Beller, "Reinventing Central Europe"; and Tony Judt, "The Past is Another Country: Myth and Memory in Postwar Europe"
STEVEN BELLER, *IAS*

IAS Friends' Forum
"New Ventures in Astronomy"
FREEMAN J. DYSON, *IAS*

January 27
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Roots of Quadratic Congruences Modulo Primes"
HENRYK IWANIEC, *Rutgers University*

School of Social Science
Luncheon Seminar: "Modernity and Identity in Central Europe Before 1989 and After"
STEVEN BELLER, *IAS*

January 28
School of Mathematics
Applied Math-Math Physics Seminar: "Low Temperature Expansions as a Problem in KAM Theory: A Quantum Extension of a Theorem by Pirogov and Sinai"
CLAUDIO ALBANESE, *IAS*

School of Natural Sciences
Lunchtime Seminar: "A Topological Landau-Ginzburg Formulation of 2D String Theory"
R. PLESSER, *IAS*

January 31
School of Mathematics
Combinatorics and Complexity Seminar: "Decompositions into Convex Sets"
MENACHEM KOJMAN, *Carnegie Mellon University*

Geometric Analysis Seminar: "Lipschitz Domain and Free Boundary Value Problems"
LUIS CAFFARELLI, *IAS*

Members Seminar: "Self-dual Vortices in Gauge Theory and Two-dimensional Nonlinear Elliptic PDE's"
YISONG YANG, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Finite Quantum Physics & Noncommutative Geometry"
PAULO TEOTONIO-SOBRINHO, *Syracuse University*

February 1
School of Historical Studies
Medieval Seminar: "Equality Amidst Hierarchies: The Commercial and Social Exchange in Muslim Sunni Law, Tenth-Twelfth Centuries"
BABER JOHANSEN, *IAS*

School of Mathematics
PDE Seminar: "Viscosity Method and Conservation Laws"
GUI-QIANG CHEN, *University of Chicago*

Complex Geometry Seminar: "Super Connections and Quillen Metrics"
JEAN-MICHEL BISMUT, *IAS*

February 2
School of Mathematics
Special Lecture Series: "The Bethe Ansatz and the Lefschetz Trace Formula" (continued)
ROBERT P. LANGLANDS, *IAS*

Number Theory and Geometry Seminar: "The Fields of Totally S-adic Elements and their Galois Theory" (continued)
FLORIAN POP, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Topological Glass Transitions"
MICHAEL RUBINSTEIN, *Kodak Corporate Research* and *University of Rochester*

February 3
School of Mathematics
Special Seminar: "A Homotopy Method for Discussing Travelling Waves"
BRYCE MCLEOD, *University of Pittsburgh*

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Counting Lattice Points on Homogeneous Varieties"
ALEX ESKIN, *IAS*

School of Social Science
Luncheon Seminar: "Radical Transformations: Science, the Universities and Power in Germany, 1989–93"
KRISTIE MACRAKIS, *IAS*

February 4
School of Mathematics
Applied Math-Math Physics Seminar: "Stability of Solitary Waves"
ROBERT PEGO, *University of Maryland*

February 7
School of Mathematics
Combinatorics and Complexity Seminar: "The Digital Envelope — A Crash Course in Modern Cryptography"
AVI WIGDERSON, *Hebrew University*

Geometric Analysis Seminar: "The Cauchy Problem for KdV-type Equations"
JEAN BOURGAIN, *IAS*

Members Seminar: "Mathematical and Physical Aspects of Some Parabolic Nonlinear PDE"
PIERRE COLLET, *IAS*

February 8
School of Mathematics
PDE Seminar: "Relativistic, Self Gravitating Fluids"
DEMETRIOS CHRISTODOULOU, *Princeton University*

Complex Geometry Seminar: "Super Connections and Quillen Metrics" (continued)
JEAN-MICHEL BISMUT, *IAS*

February 9
School of Natural Sciences
Condensed Matter Seminar: "Microscopic Formulation of the Hierarchy of Quantized Hall States"
MARTIN GREITER, *CERN*

School of Social Science
Political Transitions Seminar: Discussion of Jerome Karabel, "Polish Intellectuals and the Origins of Solidarity: The Making of an Oppositional Alliance"; and Michael D. Kennedy, "The Intelligentsia in the Constitution of Civil Societies and Post-Communist Regimes in Hungary and Poland"
JEROME KARABEL, *IAS*

February 10
School of Mathematics
Number Theory and Geometry Seminar: "Roots of Quadratic Congruences Modulo Primes: Spectral Theory"
WILLIAM DUKE, *Rutgers University*

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Modular Forms and Elliptic Curves"
ANDREW WILES, *Princeton University*

School of Social Science
Interdisciplinary Seminar: Discussion of Maria Pia Di Bella, "Limits and Transgressions of the 'Franca Viola' Case"
MARIA PIA DI BELLA, *IAS*

Luncheon Seminar: "Serendipity as a Way of Life: The Economics of Discrimination against Women in Europe"
BARBARA KRUG, *IAS*

February 11
School of Mathematics
Applied Math-Math Physics Seminar: "A Rigorous Analysis of the Hartree-Fock Approximation of the Hubbard Model"
JAN PHILIP SOLOVEJ, *Princeton University*

School of Natural Sciences
Lunchtime Seminar: "Integrability & Chern-Simons Theory"
A. ALEKSEEV, *LOMI* and *Uppsala Universitet*

February 14
School of Mathematics
Combinatorics and Complexity Seminar: "Improved Algorithms via Approximations of Probability Distributions"
ARAVIND SRINIVASAN, *IAS*

Geometric Analysis Seminar: "The Weyl Problem with Non-negative Gauss Curvatures"
YANYAN LI, *IAS*

Members Seminar: "Towards Two Conjectures of Grothendieck's Anabelian Geometry"
FLORIAN POP, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Modular Invariance, Misaligned Supersymmetry & the Cosmological Constant"
K. DIENES, *McGill University*

February 15
School of Historical Studies
Medieval Seminar: "Two Models, Two Standards: Moral Teaching and Sexual Mores in Fifteenth-Century England"
RUTH KARRAS, *IAS*

School of Mathematics
PDE Seminar: "Homogenization of Dirichlet Problems with Small Holes and a Measure as Right-hand Side"
FRANCOIS MURAT, *Paris VI*

Complex Geometry Seminar: "Super Connections and Quillen Metrics" (continued)
JEAN-MICHEL BISMUT, *IAS*

February 16
School of Mathematics
Special Lecture Series: "Star Products, after Fedosov and Lecomte-de Wilde"
PIERRE DELIGNE, *IAS*

Number Theory and Geometry Seminar: "Roots of Quadratic Congruences Modulo Primes: Sieves Techniques"
HENRYK IWANIEC, *Rutgers University*

IAS Friends' Forum
"'The Dilemma of Difference' and Arguments about Equality for Women"
JOAN SCOTT, *IAS*

February 17
School of Mathematics
Special Seminar: "Quasilinear Hyperbolic-parabolic Problems of Visco-elasticity"
STUART ANTMAN, *University of Maryland*

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "L-adic Representations Associated to Modular Forms over Imaginary Quadratic Fields"
RICHARD TAYLOR, *Cambridge University*

School of Social Science
Luncheon Seminar: "From Georg Lukacs to Lucien Goldmann"
MITCHELL COHEN, *IAS*

February 18
School of Mathematics
Marston Morse Memorial Lectures: "Analytic and Measure-theoretic Methods in the Geometric Calculus of Variations"
LEON SIMON, *Stanford University*

Applied Math-Math Physics Seminar: "Classical Versus Quantum Coulomb Gas: The Long Distance Decay of Correlation Functions"
GEORG KELLER, *IAS*

Special Complex Geometry Seminar: "Complex Hyperbolic Surfaces Homotopy-equivalent to Riemann Surfaces"
BILL GOLDMAN, *University of Maryland*

School of Natural Sciences
Lunchtime Seminar: "Anyon Superconductivity in the t-J Model"
A. TIKOFSKY, *Stanford University*

February 21
School of Mathematics
Combinatorics and Complexity Seminar: "A Generalization of Planarity"
MARIO SZEGEDY, *AT&T Bell Labs*

Geometric Analysis Seminar: "The Cauchy Problem for KdV-type Equations" (continued)
JEAN BOURGAIN, *IAS*

Marston Morse Memorial Lectures: "Analytic and Measure-theoretic Methods in the Geometric Calculus of Variations"
LEON SIMON, *Stanford University*

February 22
School of Mathematics
Complex Geometry Seminar: "Super Connections and Quillen Metrics" (continued)
JEAN-MICHEL BISMUT, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Quantum Moduli Spaces of Supersymmetric Gauge Theories"
NATTI SEIBERG, *IAS*

Condensed Matter Seminar: "Self-organized Critical Model of Biological Evolution"
H. F. CHAU, *University of Illinois at Champaign-Urbana*

February 23
School of Mathematics
Special Lecture Series: "Star Products, after Fedosov and Lecomte-de Wilde" (continued)
PIERRE DELIGNE, *IAS*

School of Social Science
Political Transitions Seminar: Discussion of Baruch Knei-Paz, "[Eleven] Theses on Post-Communism (Being Some Random Reflections, Some Quite Inconclusive, on the Trials and Tribulations of Transition, . . . , and Concluding with Two Sobering Afterthoughts)"
BARUCH KNEI-PAZ, *IAS*

February 24
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Small Values of $\alpha n^2 \bmod 1$"
A. ZAHARESCU, *Princeton University*

School of Social Science
Luncheon Seminar: "Catholicism and Liberalism"
OTTO KALLSCHEUER, *IAS*

February 25
School of Mathematics
Applied Math-Math Physics Seminar: "On the Nature of Configurational Forces"
MORTON GURTIN, *Carnegie Mellon University*

February 28
School of Mathematics
Combinatorics and Complexity Seminar: "Non-recursive Functions, Knots 'With Thick Ropes' and Geometry of the Space of Triangulations"
ALEXANDER NABUTOVSKY, *Courant/University of Toronto*

Members Seminar: "Optimal Control Theory, Geometry and Mechanics"
VELIMIR JURDJEVIC, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Disoriented Chiral Condensates at the Tevatron?"
CYRUS TAYLOR, *Case Western Reserve University*

March 1
School of Historical Studies
Medieval Seminar: "Texts vs. Images in Context: The Literature of Female Spirituality from an Art Historian's Perspective"
JEFFREY HAMBURGER, *IAS*

School of Mathematics
PDE Seminar: "Extensions of Wiener's Theorem for the Spectral Asymptotics of Measures with Applications to Image Processing"
N. D. FIROOZYA, *Courant Institute*

Complex Geometry Seminar: "Super Connections and Quillen Metrics" (continued)
JEAN-MICHEL BISMUT, *IAS*

March 2
School of Mathematics
Special Lecture Series: "Star Products, after Fedosov and Lecomte-de Wilde" (continued)
PIERRE DELIGNE, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Boson Localization and Controlled Entanglement of Vortex Filaments"
DAVID NELSON, *Harvard University*

March 3
School of Historical Studies
Art History Colloquium: "The Second Nuremberg Haggadah: The Evidence for a Jewish Workshop in Late Medieval Germany"
KATRIN KOGMAN-APPEL, *IAS*

School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Arithmetic Applications of the Topological Trace formula"
GÜNTER HARDER, *Max Planck Institute, Bonn*

School of Social Science
Luncheon Seminar: "Markets, Hierarchies, and the State: Building Banking and Telephone Networks in Postbellum America"
DAVID WEIMAN, *IAS*

March 4
School of Mathematics
Applied Math-Math Physics Seminar: "Non-linear Dynamics"
ISRAEL SIGAL, *University of Toronto*

Special Applied Math-Math Physics Seminar: "Vortex Dynamics in High-Tc Superconductors"
VALERII VINOKUR, *Argonne National Laboratory*

March 7
School of Mathematics
Combinatorics and Complexity Seminar: "Binomial Ideals"
BERND STURMFELS, *Cornell University*

Geometric Analysis Seminar: "The Connection Formulae for the Painleve II Equation"
PERCY DEIFT, *IAS*

Members Seminar: "The K Theory of Toric Varieties and the Algebra of Polyhedra"
ROBERT MORELLI, *IAS*

March 8
School of Mathematics
PDE Seminar: "Multidimensional Systems of Hyperbolic Conservation Laws"
C. M. DAFERMOS, *Brown University*

Complex Geometry Seminar: "Super Connections and Quillen Metrics" (continued)
JEAN-MICHEL BISMUT, *IAS*

March 9
Institute Lecture Series
"Athens and Rome in the Second Century B.C."
CHRISTIAN HABICHT, *IAS*

School of Mathematics
Special Lecture Series: "Star Products, after Fedosov and Lecomte-de Wilde" (conclusion)
PIERRE DELIGNE, *IAS*

Special Seminar: "Characterizations of Oscillations with Applications"
D. KINDERLEHRER, *Carnegie Mellon University*

Number Theory and Geometry Seminar: "Geometry of p-adic Jets"
ALEXANDRU BUIUM, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Quantum Critical Spin Dynamics of Antiferromagnets"
SUBIR SACHDEV, *Yale University*

School of Social Science
Political Transitions Seminar: Discussion of Lisa Anderson, "The Political Construction of Affiliation: Interests and Identities in the Arab World" and "Obligation and Accountability: Islamic Politics in North Africa"; and Bruce K. Rutherford, "Can an Islamic Group Aid Democratization?"
LISA ANDERSON, *IAS*

March 10
School of Mathematics
Special Seminar: "Invariant Measures for Integrable Systems"
K. VANINSKY, *Mathematical Sciences Research Institute*

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Uniform Bounds for the Number of Points on Curves of Genus Larger than 1"
BARRY MAZUR, *Harvard University*

School of Natural Sciences
Theoretical Physics Seminar: "Black Hole Thermodynamics in Two Dimensions"
JOHN PRESKILL, *California Institute of Technology*

School of Social Science
Interdisciplinary Seminar: Discussion of Daniel Sherman, "Bodies and Names: Toward a Genealogy of Commemoration in Interwar France" and "Monuments, Mourning, and Masculinity in France after World War I"
DANIEL SHERMAN, *IAS*

Luncheon Seminar: "Gendered Subjects: Re-presenting the Worker in History"
AVA BARON, *IAS*

March 11
School of Mathematics
Applied Math-Math Physics Seminar: "Tides, Waves and Turbulence in Disks and Stars"
JEREMY GOODMAN, *Princeton University*

March 14
School of Mathematics
Combinatorics and Complexity Seminar: "An Identity Generalizing the Length-MAJ Symmetry and the Variety N-stable Flags"
ITARU TERADA, *Massachusetts Institute of Technology* and *Tokyo University*

Geometric Analysis Seminar: "On the Regularity Properties of Non-linear Wave Equations"
SERGIU KLAINERMAN, *Princeton University*

School of Natural Sciences
Theoretical Physics Seminar: "Topics in Lattice Integrable Models"
LUDWIG FADDE'EV, *SUNY at Stony Brook* and *Steklov Institute*

March 15
School of Historical Studies
Medieval Seminar: "The Progress of a Rotifer"
RUTHERFORD ARIS, *IAS*

School of Mathematics
PDE Seminar: "Some Recent Results in the Vectorial Calculus of Variations"
BERNARD DACOROGNA, *Ecole Polytech Federale Lausanne*

March 16
School of Mathematics
Special Lecture Series: "The Monge Ampere Equation; Good and Bad"
LUIS A. CAFFARELLI, *IAS*

March 17
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Diophantine Approximation on Abelian Varieties in Char. p"
FELIPE VOLOCH, *University of Texas at Austin*

School of Social Science
Luncheon Seminar: "Native Tongues: Effeminization, Miscegenation, and the Construction of Tudor Nationalism"
LINDA GREGERSON, *IAS*

March 18
School of Mathematics
Applied Math-Math Physics Seminar: "The Variational Theory of the Incompressible Euler Equations and Its Links with Quasi-neutral Plasmas"
YANN BRENIER, *Ecole Normale Supérieure*

March 21
School of Mathematics
Combinatorics and Complexity Seminar: "On the 'Log Rank' — Conjecture in Communication Complexity"
RAN RAZ, *Princeton University*

Geometric Analysis Seminar: "On the Regularity Properties of Non-linear Wave Equations" (continued)
SERGIU KLAINERMAN, *Princeton University*

Members Seminar: "Configuration Spaces of S^1 and Knot Invariants"
XIAO-SONG LIN, *IAS*

March 22
School of Mathematics
PDE Seminar: "Regularity in the Calculus of Variations under General Growth Conditions"
PAOLO MARCELLINI, *Università degli Studi, Firenze*

March 23
School of Social Science
Political Transitions Seminar: Discussion of Otto Kallscheuer, "Religious Patterns and Obstacles for Liberty and Pluralism"; Ewa Morawska, "Civil Religion vs. State Power in Poland"; Adam Michnik, "Liberalism and the Church"; and Maciej Zieba, "The Liberalism That We Need"
OTTO KALLSCHEUER, *IAS*

March 24
School of Mathematics
Special Seminar: "A Gap Phenomenon Arising in Isoperimetric Variational Problems"
VICTOR MIZEL, *Carnegie Mellon University*

School of Social Science
Luncheon Seminar: "Pragmatism and Patriotism"
ALAN RYAN, *Princeton University*

March 25
School of Mathematics
Applied Math-Math Physics Seminar: "Asymptotics Beyond All Orders — A Burgeoning New Field"
MARTIN KRUSKAL, *Princeton University*

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "A Note on the Least Prime in an Arithmetic Progression"
SERGEI KONYAGIN, *University of Georgia, Athens*

School of Natural Sciences
Lunchtime Seminar: "Some Stringy Geometry at Small Distances"
P. ASPINWALL, *IAS*

March 28
School of Mathematics
Combinatorics and Complexity Seminar: "Search for the Maximum of a Random Walk"
ANDREW ODLYZKO, *AT&T Bell Labs*

Geometric Analysis Seminar: "Symplectic Submanifolds and Estimates for Linear Systems"
SIMON DONALDSON, *Oxford University*

Members Seminar: "Lie Bi-algebras and Lie Algebra Cohomology"
JIANG-HUA LU, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Critical Exponents Without the Epsilon Expansion"
MARK ALFORD, *Cornell University*

March 29
School of Historical Studies
Medieval Seminar: "Images, the Carolingians, and the *Libri Carolini*: What Was at Issue? What Was at Stake?"
THOMAS NOBLE, *IAS*

School of Mathematics
PDE Seminar: "Approximation of Curvature Driven Interfaces"
RICARDO NOCHETTO, *University of Maryland*

Geometric Analysis Seminar: "The Witten Complex Revisited"
JEAN-MICHEL BISMUT, *IAS*

March 30
School of Mathematics
Geometric Analysis Seminar: "Carnot Geometry, Rigid Curves and Analytic Hypoellipticity"
LUCAS HSU, *IAS*

Number Theory and Geometry Seminar: "On $x^3 + y^3 = A$"
NOAM ELKIES, *Harvard University*

School of Natural Sciences
Condensed Matter Seminar: "Edge Transport in the Fractional Quantum Hall Effect"
CHARLES KANE, *University of Pennsylvania*

March 31
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Linearized Algebra"
NOAM ELKIES, *Harvard University*

School of Social Science
Luncheon Seminar: "The Holocaust as a Philosophical Problem"
TADEUSZ SZAWIEL, *Warsaw University*

April 4
School of Mathematics
Combinatorics and Complexity Seminar: "Eigenvalues of Graphs with Applications"
FAN CHUNG, *Bellcore*

Geometric Analysis Seminar: "Relativistic Fluids and Gravitational Collapse"
DEMETRIOS CHRISTODOULOU, *Princeton University*

Members Seminar: "Critical Percolation on the Torus"
HARU PINSON, *IAS*

April 5
School of Historical Studies
Medieval Seminar: "The Electronic *Beowulf*: An Introduction and Demonstration"
PAUL E. SZARMACH, *IAS*

School of Mathematics
Geometric Analysis Seminar: "Relativistic Fluids and Gravitational Collapse" (continued)
DEMETRIOS CHRISTODOULOU, *Princeton University*

April 6
School of Natural Sciences
Condensed Matter Seminar: "Two Dimensional Yang-Mills and $1/r^2$ Models"
J. A. MINAHAN, *University of Southern California*

School of Social Science
Political Transitions Seminar: Discussion of Mitchell Cohen, "Rooted Cosmopolitanism"; Ernest Gellner, "Nationalism and Politics in Eastern Europe"; Miroslav Hroch, "From National Movement to the Fully-Formed Nation"; and Joseph Roth, "The Bust of the Emperor"
MITCHELL COHEN, *IAS*

April 7
School of Historical Studies
Art History Colloquium: "Images of Holiness: The Representation of Saints in Persian and Turkish Miniature Painting"
KARIN RÜHRDANZ, *IAS*

School of Mathematics
Applied Math-Math Physics Seminar: "Kolmogorov Spectra of Weak Wave Turbulence"
V. ZAKHAROV, *University of Arizona*

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Intersections in a Siegel 3-fold"
F. RODRIGUEZ-VILLEGAS, *Princeton University*

School of Social Science
Interdisciplinary Seminar: Discussion of Susan Whitney, "From Brawls to Fashion Shows: French Communist Approaches to Young Women and Femininity in Interwar France"
SUSAN WHITNEY, *IAS*

Luncheon Seminar: "Alchemy or Abandonment: Feminist Critiques of Rights"
ELIZABETH KISS, *Princeton University*

April 11
School of Mathematics
Applied Math-Math Physics Seminar: "Kolmogorov Spectra of Weak Wave Turbulence" (continued)
V. ZAKHAROV, *University of Arizona*

Members Seminar: "Explicit Weil Uniformalization for Elliptic Curves over Function Fields"
ERNST GEKELER, *University of Saarlandes*

School of Natural Sciences
Theoretical Physics Seminar: "Integrable QFT with Boundary"
A. ZAMOLODCHIKOV, *Rutgers University*

April 12
School of Historical Studies
Medieval Seminar: "Social History of Satan — Part II: The Intimate Enemy in the New Testament"
ELAINE PAGELS, *IAS*

School of Mathematics
PDE Seminar: "Prescribing Scalar Curvature on S^n and Related Topics"
YANYAN LI, *IAS*

Geometric Analysis Seminar: "Knot Theory in the Presence of Curvature"
HERMANN GLUCK, *University of Pennsylvania*

April 13
School of Mathematics
Geometric Analysis Seminar: "Elementary Observations on Instanton-Corrected Cohomology of Kähler Manifolds"
EDWARD WITTEN, *IAS*

Number Theory and Geometry Seminar:
"On $\int_0^1 \left| \sum_{n \le X} \mu(n)\, e(n\alpha) \right| d\alpha$"
ANTAL BALOG, *Mathematical Institute of the Hungarian Academy*

Mathematical Seminar: "Quantized Energy Cascade and Log-Poisson Distribution for Turbulence"
ZHEN ZU SHE, *University of Arizona*

School of Natural Sciences
Condensed Matter Seminar: "Kinks in the Kondo Problem"
PAUL FENDLEY, *University of Southern California*

April 14
IAS Concert Series
CUARTETO LATINOAMERICANO

School of Mathematics
Mathematical Seminar: "Two Fluid, Maximum Entropy Methods for 2D Turbulence"
DAVID MONTGOMERY, *Dartmouth College* and BILL MATTHAEUS, *Bartol Research Institute*

Mathematical Seminar: "Wavelet and Wavelet-packet Analysis of 2D Turbulent Flows"
CLAUDE BASDEVANT and MARIE FARGE, *Ecole Normale Superieure*

Mathematical Seminar: "High-resolution and Predictability in 2D Vortex Dynamics, Incompressible and Compressible Results"
NORMAN ZABUSKY, *Rutgers University*

Mathematical Seminar: "Numerical Simulation of Vortex Ring Formation"
ROBERT KRASNY, *IAS*

Mathematical Seminar: "Negative Temperatures and Large Scale Vortices in 2D Turbulence"
GREGORY EYINK, *University of Illinois*

School of Social Science
Luncheon Seminar: "Revisiting Spain's Democratization, with a View to South America"
FELIPE AGUERO, *IAS*

April 15
School of Mathematics
Mathematical Seminars: "Onsager's Conjecture on Energy Conservation for 3D Euler Equation"
WEINAN E, *IAS*
"Refined Similarity Hypothesis and Local Energy Cascade"
GREGORY EYINK, *University of Illinois*
"A Model of Diffusion Limit for Kinetic Reversible Equation"
CLAUDE BARDOS and FRANCOIS GOLSE, *University Paris VII*
"Invariant Measures for the 2D Defocusing Nonlinear Schroedinger Equation"
JEAN BOURGAIN, *IAS*
"Dissipation Correlations in 3D Turbulence"
VICTOR YAKHOT, *Princeton University*

School of Natural Sciences
Lunchtime Seminar: "Once More About WZW & Calogero-Moser"
N. NEKRASOV, *Moscow*

April 20
School of Mathematics
Meeting on Mathematical Problems in Finance
LUIS CAFFARELLI, *IAS*, organizer

School of Social Science
Political Transitions Seminar: Discussion of Constantine Pleshakov, "The Portrait of a Nationalist as a Young Man: Russian National Identity and the Struggle of Ideas in the 1990s"
CONSTANTINE PLESHAKOV, *IAS*

April 21
School of Mathematics
Meeting on Mathematical Problems in Finance
LUIS CAFFARELLI, *IAS*, organizer

IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "The Distribution of Zeros of Automorphic L-functions"
PETER SARNAK, *Princeton University*

School of Social Science
Luncheon Seminar: "The Strangeness of Periodical News: Revolution to a News Consciousness"
JOHN SOMMERVILLE, *IAS*

April 22
School of Mathematics
Applied Math-Math Physics Seminar: "Some Applications of Burgers' Shocks, Avalanches and Droplets"
TERENCE HWA, *IAS*

April 25
School of Mathematics
Geometric Analysis Seminar: "Applications of Symplectic Capacities to Non-linear PDE's"
JEAN BOURGAIN, *IAS*

Members Seminar: "Galois Covers of Smooth Curves and Applications to Abhyankar's Conjecture and a Conjecture of Shafarevich"
FLORIAN POP, *IAS*

April 27
School of Mathematics
Number Theory and Geometry Seminar: "Zeros of Hecke L-functions Associated with Cusp Forms"
WENZHI LUO, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Measure Factors, Tension and Correlations of Fluid Membranes"
TOM POWERS, *University of Pennsylvania*

April 28
School of Mathematics
IAS, Princeton University, Rutgers University Number Theory and Harmonic Analysis Seminar: "Rational Expressions in Newton Functions and Slopes of Surfaces in P^4"
MEI-CHU CHANG, *IAS*

April 29
School of Mathematics
Applied Math-Math Physics Seminar: "Cholesteric Order in Polymers"
RANDALL KAMIEN, *IAS*

Special Seminar: "Real Algebraic Counterparts of Arnold Invariants of Immersed Circles"
OLEG VIRO, *University of California, Riverside* and *Uppsala Universitet*

May 4
School of Mathematics
Number Theory and Geometry Seminar: "Cusp Forms, L-series and Siegel Zeros"
P. LOCKHART, *Brown University*

School of Natural Sciences
Sackler Colloquia Series: "The Practical Route to Fusion Power"
ROB GOLDSTON, *Princeton University*

School of Social Science
Political Transitions Seminar: Discussion of Geoffrey Evans and Stephen Whitefield, "Identifying the Bases of Party Competition in Eastern Europe"; Miroslawa Grabowska, "Does the Left Reemerge?"; and Tadeusz Szawiel, "Polish Society and Democratic Politics" and "Political Parties in Poland: The Present Situation, Chances and Threats"
TADEUSZ SZAWIEL, *Warsaw University*

May 6
Institute Lecture Series
"Elliptic Curves"
ANDREW WILES, *Princeton University*

May 9
School of Mathematics
Members Seminar: "Determinants of Elliptic Operators and the Baker-Campbell-Hausdorff Formula"
KATE OKIKIOLU, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "A Cautionary History of Supersymmetry & Duality Transformations"
J. GATES, *University of Maryland*

May 11
School of Mathematics
Number Theory and Geometry Seminar: "On the S-unit Equation"
ENRICO BOMBIERI, *IAS*

School of Natural Sciences
Condensed Matter Seminar: "Quantized Hall Transport of Vortices in a Two Dimensional Array of Josephson Junctions"
ADY STERN, *Harvard University*

May 16
School of Mathematics
Members Seminar: "Capacity of a Condenser, PDE in Singular Domains and Invariants of Riemannian Submanifolds"
YAN SOIBELMAN, *IAS*

May 17
School of Natural Sciences
Theoretical Physics Seminar: "Universal Correlation in Random Matrix Theory"
A. ZEE, *University of California, Santa Barbara*

May 18
Park City/IAS Mathematics Institute
Mentoring Program for Women Mathematicians: "Changing the Image of Women in Science"
PAMELA DAVIS, *University of California, Los Angeles*

School of Natural Sciences
Condensed Matter Seminar: "Gauge Interactions and Fermion Liquids in D > 1: Solution by Bosonization"
BRAD MARSTON, *Brown University*

May 19
School of Natural Sciences
Theoretical Physics Seminar: "Superselection Rules & the Jackiw-Rebbi Monopole"
ALFRED GOLDHABER, *SUNY at Stony Brook*

May 25
School of Natural Sciences
Condensed Matter Seminar: "The Bizarre Physics of a Piece of Paper: Anomalous Elasticity in Tethered Membranes"
JOHN TONER, *IBM*

School of Social Science
Political Transitions Seminar: Discussion of John Lewis Gaddis, "Intelligence, Espionage, and Cold War History"; Ethan Klingsberg, "The Noel Field Dossier; Case Closed on Alger Hiss?"; Kristie Macrakis, Review of Werner Stiller, *Beyond the Wall: Memoirs of an East and West German Spy*; Review of Pavel Sudoplatov, *Special Tasks*
KRISTIE MACRAKIS, *IAS*

May 30
School of Mathematics
Special Seminar: "Combinatorial and Algebro-geometric Cohomology Classes on Moduli of Curves I"
ENRICO ARBARELLO, *IAS*

May 31
School of Mathematics
Special Seminar: "Towards the 'Arithmetical' Description of the Galois Group of a Local Field"
VICTOR ABRASHKIN, *IAS*

June 1
School of Mathematics
Special Seminar: "Towards the 'Arithmetical' Description of the Galois Group of a Local Field" (conclusion)
VICTOR ABRASHKIN, *IAS*

School of Social Science
Political Transitions Seminar: Discussion of Felipe Agüero, "Democratic Consolidation and the Military in Southern Europe and South America"; Guillermo O'Donnell, "Delegative Democracy"; Philippe C. Schmitter, "Democratic Dangers and Dilemmas"; Georgina Waylen, "Women and Democratization: Conceptualizing Gender Relations in Transition Politics"
FELIPE AGÜERO, *IAS*

June 2
School of Mathematics
Special Seminar: "Combinatorial and Algebro-geometric Cohomology Classes on Moduli of Curves II"
MAURIZIO CORNALBA, *IAS*

June 3
School of Natural Sciences
Lunchtime Seminar: "Composite Quarks & Leptons Constructed as Three Quasiparticle States in Quaternionic Quantum Mechanics"
STEVE ADLER, *IAS*

June 9–10
School of Historical Studies
"Force in History" Seminar
PETER PARET, *IAS*, moderator

June 23
School of Natural Sciences
Condensed Matter Seminar: "Quantum Chaos & Statistical Mechanics"
MARK SREDNICKI, *University of California, Santa Barbara*

June 30
School of Mathematics
Clavius Group — Differential Geometry Seminar: "A Mini-Course on the Holonomy Problem"
ANDREW P. WHITMAN, *College of the Holy Cross* and *Vatican Observatory*

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, 1994 and the related statements of support and revenue, expenses, capital additions and changes in fund balances and of changes in financial position 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.

We conducted our audit in accordance with generally accepted auditing standards. 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, 1994 and the results of its operations and the changes in its financial position for the year then ended in conformity with generally accepted accounting principles.

Deloitte & Touche LLP

DELOITTE & TOUCHE
Parsippany, New Jersey
September 9, 1994

BALANCE SHEET
JUNE 30, 1994 (WITH COMPARATIVE TOTALS FOR 1993)

ASSETS	1994	1993
OPERATING FUNDS:		
Cash and temporary investments	$ 250,256	$
Accounts receivable	94,129	150,182
Government grants and contracts receivable	1,238,090	1,389,656
Accrued income on investments	1,494,018	1,585,198
Prepaid and other assets	400,697	328,476
Due from endowment fund	1,200,000	700,000
TOTAL OPERATING FUNDS	$ 4,677,190	$ 4,153,512
PLANT FUNDS:		
Short-term investments (Note B)	$ 252,542	$ 1,765,000
Unamortized debt issuance expense	116,888	126,148
Land, buildings and improvements, equipment and rare book collection - net (Note C)	25,350,171	24,555,921
TOTAL PLANT FUNDS	$ 25,719,601	$ 26,447,069
ENDOWMENT AND SIMILAR FUNDS:		
Investments, at cost (Notes B & D)	$230,259,227	$208,616,746
TOTAL ENDOWMENT AND SIMILAR FUNDS	$230,259,227	$208,616,746

See Notes to Financial Statements

LIABILITIES AND FUND BALANCES	1994	1993
OPERATING FUNDS:		
Accounts payable and accrued expenses	$ 1,299,427	$ 1,186,616
Deferred restricted revenue (Note F)	3,377,700	2,931,607
Fund balance - unrestricted	63	35,289
TOTAL OPERATING FUNDS	$ 4,677,190	$ 4,153,512
PLANT FUNDS:		
Long-term debt (Note D)	$ 16,898,418	$ 17,274,470
Fund balance	8,821,183	9,172,599
TOTAL PLANT FUNDS	$ 25,719,601	$ 26,447,069
ENDOWMENT AND SIMILAR FUNDS:		
Due to operating funds	$ 1,200,000	$ 700,000
Accrued investment management fees	437,637	523,140
Fund balances:		
True endowment	49,101,876	43,291,383
Quasi-endowment:		
Restricted	18,974,509	17,048,594
Unrestricted:		
Designated	14,217,581	12,677,984
Undesignated	146,327,624	134,375,645
TOTAL ENDOWMENT AND SIMILAR FUNDS	$230,259,227	$208,616,746

STATEMENT OF SUPPORT AND REVENUE, EXPENSES, CAPITAL ADDITIONS AND CHANGES IN FUND BALANCES FOR THE YEAR ENDED JUNE 30, 1994 (WITH COMPARATIVE TOTALS FOR 1993)

	OPERATING FUNDS	
	UNRESTRICTED	RESTRICTED
SUPPORT AND REVENUE:		
Endowment income	$ 5,774,610	$2,192,169
Less - management fees	(1,966,659)	(746,588)
Private gifts and grants	1,000	1,777,778
Government grants and contracts		3,753,309
Total support and revenue	3,808,951	6,976,668
EXPENSES:		
School of Mathematics	1,101,731	2,443,352
School of Natural Sciences	1,713,949	2,614,590
School of Historical Studies	1,828,304	936,729
School of Social Science	33,000	1,374,152
Libraries and other academic expenses	1,691,364	578,324
Administration and general	3,304,015	7,466
Auxiliary activity - tenants' housing expenses, net of unrestricted revenue of $248,125 in 1994	38,332	97,822
Total expenses	9,710,695	8,052,435
DEFICIENCY OF SUPPORT AND REVENUE OVER EXPENSES BEFORE CAPITAL ADDITIONS	(5,901,744)	(1,075,767)
CAPITAL ADDITIONS:		
Gifts and grants		
Realized gain on investments - net		
Gain (loss) on sale of plant assets		
Total capital additions		
EXCESS (DEFICIENCY) OF SUPPORT AND REVENUE OVER EXPENSES AFTER CAPITAL ADDITIONS	(5,901,744)	(1,075,767)
FUND BALANCES AT BEGINNING OF YEAR	35,289	
TRANSFERS:		
Plant acquisitions and principal debt service payments and other, net	(218,724)	
Quasi-endowment funds utilized	6,147,647	1,454,574
Transfers to other endowment and similar funds	(62,405)	(378,807)
FUND BALANCES AT END OF YEAR	$ 63	$ -0-

See Notes to Financial Statements

TOTAL	PLANT FUNDS	ENDOWMENT AND SIMILAR FUNDS	TOTAL 1994 ALL FUNDS	TOTAL 1993 ALL FUNDS
$ 7,966,779			$ 7,966,779	$ 7,812,512
(2,713,247)			(2,713,247)	(2,025,045)
1,778,778			1,778,778	1,021,328
3,753,309			3,753,309	3,367,940
10,785,619			10,785,619	10,176,735
3,545,083	$ 444,784		3,989,867	3,850,251
4,328,539	472,862		4,801,401	4,266,237
2,765,033	291,440		3,056,473	2,810,506
1,407,152	129,888		1,537,040	1,557,377
2,269,688	157,367		2,427,055	2,037,372
3,311,481	288,832		3,600,313	3,491,855
136,154	145,781		281,935	211,578
17,763,130	1,930,954		19,694,084	18,225,176
(6,977,511)	(1,930,954)		(8,908,465)	(8,048,441)
	1,086,917	$ 1,219,867	2,306,784	1,986,685
		27,285,475	27,285,475	8,170,769
	157,548		157,548	(8,314)
	1,244,465	28,505,342	29,749,807	10,149,140
(6,977,511)	(686,489)	28,505,342	20,841,342	2,100,699
35,289	9,172,599	207,393,606	216,601,494	214,500,795
(218,724)	335,073	(116,349)		
7,602,221		(7,602,221)		
(441,212)		441,212		
$ 63	$8,821,183	$228,621,590	$237,442,836	$216,601,494

STATEMENT OF CHANGES IN FINANCIAL POSITION FOR THE YEAR ENDED JUNE 30, 1994 (WITH COMPARATIVE TOTALS FOR 1993)

	OPERATING FUNDS	PLANT FUNDS
RESOURCES PROVIDED:		
Deficiency of support and revenue over expenses before capital additions	$ (6,977,511)	$(1,930,954)
Capital additions:		
Gifts and grants		1,086,917
Realized gain on investments - net		
Gain on sale of plant assets		157,548
Excess (deficiency) of support and revenue over expenses after capital additions	(6,977,511)	(686,489)
Items not using (providing) resources:		
Depreciation		1,930,954
Gain on sale of investments - net		
Proceeds from sale of investments		1,512,458
Decrease in receivables	207,619	
Decrease in accrued income	91,180	
Decrease in prepaid and other assets		
Decrease in unamortized debt service expense		9,260
Increase in payables	112,811	
Increase in accrued management fees		
Increase in deferred restricted revenue	446,093	
Increase in interfund - payables		
Total resources (used in) provided by	(6,119,808)	2,766,183
RESOURCES USED:		
Purchases of investments		
Purchases of plant facilities and equipment		2,725,204
Increase in interfund - receivables	500,000	
Increase in receivables		
Increase in accrued income		
Increase in prepaid and other assets	72,221	
Decrease in payables		
Reduction of long-term debt		376,052
Decrease in accrued management fees		
Total resources used	572,221	3,101,256
TRANSFERS:		
Plant acquisitions and principal debt service payments	(218,724)	335,073
Quasi-endowment funds utilized	7,602,221	
Transfers to other endowment and similar funds	(441,212)	
Total transfers	6,942,285	335,073
INCREASE (DECREASE) IN CASH AND TEMPORARY INVESTMENTS	$ 250,256	$ –0–

See Notes to Financial Statements

ENDOWMENT AND SIMILAR FUNDS	TOTAL 1994 ALL FUNDS	TOTAL 1993 ALL FUNDS
	$ (8,908,465)	$ (8,048,441)
$ 1,219,867	2,306,784	1,986,685
27,285,475	27,285,475	8,170,769
	157,548	(8,314)
28,505,342	20,841,342	2,100,699
	1,930,954	1,454,428
(27,285,475)	(27,285,475)	(8,170,769)
766,540,746	768,053,204	789,900,184
	207,619	
	91,180	
		68,830
	9,260	9,260
	112,811	9,559,385
		523,140
	446,093	1,006,418
500,000	500,000	100,000
768,260,613	764,906,988	796,551,575
748,300,679	748,300,679	788,022,608
	2,725,204	6,985,947
	500,000	100,000
		629,629
		622,110
	72,221	
12,597,073	12,597,073	
	376,052	361,053
85,503	85,503	
760,983,255	764,656,732	796,721,347
(116,349)		
(7,602,221)		
441,212		
(7,277,358)		
$ –0–	$ 250,256	$ (169,772)

NOTES TO FINANCIAL STATEMENTS
YEAR ENDED JUNE 30, 1994

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 160 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 *Audits of Certain Nonprofit 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.

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 fund groups.

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 use 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 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 non-cash 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

Uses of operating funds for plant acquisitions and principal debt service payments are accounted for as transfers to plant funds. 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.

Recently Issued Accounting Standards

In June 1993, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 116, "Accounting for Contributions Received and Contributions Made" ("SFAS 116"). SFAS 116, effective for fiscal year 1996, establishes accounting standards for contributions. Contributions received are to be recognized as revenues when received, at fair value. Contributions made are to be recognized as expenses when made, at fair value. Not-for-profit entities, such as the Institute, are required to categorize contributions received as affecting permanently restricted net assets, temporarily restricted net assets, or unrestricted net assets and to recognize the expiration of donor restrictions when they expire. The Institute has not yet determined what effect the adoption of SFAS 116 will have on its financial statements.

In June 1993, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 117, "Financial Statements of Not-for-Profit Organizations" ("SFAS 117"). SFAS 117, effective for fiscal year 1996, requires not-for-profit organizations to provide a statement of financial position, a statement of activities, and a statement of cash flows. The Institute has not yet determined what effect the adoption of SFAS 117 will have on its financial statements.

B · INVESTMENTS

Investments purchased by the Institute are recorded at cost; investments received by gift are recorded at the fair market value at the date of donation.

Endowment and similar funds investments at June 30, 1994 are comprised of the following:

	CARRYING VALUE	MARKET VALUE
Pooled investments:		
Cash equivalents	$ 20,549,546	$ 20,549,546
Equity securities	100,644,384	105,674,052
Debt securities	108,895,922	106,107,136
Mortgages and notes receivable from faculty and staff	2,544,657	2,544,657
Investment accounts receivable	2,416,317	2,416,317
Investment accounts payable	(4,835,781)	(4,835,781)
Total pooled investments	230,215,045	232,455,927
Funds invested separately:		
Equity securities	44,182	56,932
Total	$230,259,227	$232,512,859

Marketable debt and equity securities are carried in the aggregate at lower of cost (amortized, in the case of debt securities) or market. Realized gains and losses are computed based on the average cost of the investment.

Equity securities include the Institute's interest in certain limited partnerships with a carrying value of approximately $45,524,094 and a market value of approximately $47,852,322 at June 30, 1994. 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 loss and net realized gain was $14,614 and $4,276,716, respectively, for the year ended June 30, 1994.

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. Earnings per unit of the

pooled investments for the year ended June 30, 1994, exclusive of realized gains and losses, amounted to $302 after deducting management fees.

The following table summarizes changes in carrying and market values of the pooled investment portfolio.

	INVESTMENT PORTFOLIO			MARKET VALUE
	MARKET VALUE	CARRYING VALUE	UNREALIZED APPRECIATION	PER UNIT
June 30, 1993	$232,596,305	$208,616,746	$23,979,559	$9,415
June 30, 1994	232,512,859	230,259,227	2,253,632	9,545
Decrease in unrealized appreciation for the year ended June 30, 1994			(21,725,927)	
Realized net gain for the year ended June 30, 1994			27,285,475	
Net realized and unrealized gain for the year ended June 30, 1994			$ 5,559,548	

Short-term investments within the plant fund represent unexpended proceeds of the 1991 NJEFA bonds. Such funds are invested in U.S. Government obligations with maturities of less than one year. At June 30, 1994, 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, 1994 follows:	
Land and improvements	$ 2,418,138
Buildings and improvements	32,557,427
Equipment	11,156,530
Rare book collection	203,508
Total	46,335,603
Less accumulated depreciation	(20,985,432)
Net book value	$ 25,350,171

D · LONG-TERM DEBT

A summary of long-term debt at June 30, 1994 follows:

6.275%, 1991 — NJEFA	$ 17,140,000
Less unamortized bond discount	241,582
Total long-term debt	$ 16,898,418

In September 1991, the Institute received proceeds of the New Jersey Educational Facilities Authority (NJEFA) offering of $17,895,000 Revenue Bonds, 1991 Series B, the Institute for Advanced Study Issue. The proceeds are to be used for the construction of a new academic building and debt retirement. A portion of the proceeds totalling $7,677,232 were used to retire the existing Revenue Bonds, 1980 Series A.

The bonds are dated September 1, 1991, bear interest, payable semi-annually, at the net average annual rate of 6.275%, are subject to redemption at various prices, and require principal payments and sinking fund installments through June 30, 2021. Bond principal in the amount of $405,000 (1995), $425,000 (1996), $455,000 (1997), $480,000 (1998) and $510,000 (1999) will mature in each of the designated years. The remaining balance of $14,865,000 is payable in semi-annual installments through June 30, 2021. The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute.

At June 30, 1994, the estimated fair value of the Institute's long-term debt was $16,882,900.

Interest expense on long-term debt for the year ended June 30, 1994 was $1,011,566.

The Institute has an unused line of credit for $76,822.

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 non-discriminatory basis. Contributions for the year ended June 30, 1994 totalled approximately $806,877.

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 those benefits if they reach normal retirement age while working for the Institute. The cost of retiree health care and life insurance benefits is recognized as expense as premiums are paid. For fiscal year 1994, those costs totalled approximately $173,000.

In December 1990, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 106, "Employers' Accounting for Postretirement Benefits Other Than Pensions" ("SFAS 106"). SFAS 106, effective for fiscal year 1996, will require that the Institute change its method of accounting for postretirement health care and life insurance benefits to an accrual basis. This change in accounting will require the recognition of a transition liability which represents the actuarial present value of benefits attributed to prior employee service. The Institute has not yet determined what effect the adoption of SFAS 106 will have on its financial condition.

F · CHANGES IN DEFERRED RESTRICTED REVENUE

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, 1993	$2,931,607
Additions:	
Contributions, grants, etc.	6,119,366
Net restricted endowment income	2,023,485
Quasi-endowment funds utilized	1,075,767
Total additions	9,218,618
Deductions:	
Funds expended from contributions, grants, etc.	5,673,273
Funds expended from restricted endowment	3,099,252
Total deductions	8,772,525
Balance at June 30, 1994	$3,377,700

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 $1,939,830 as of June 30, 1994 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 support and revenue, expenses, capital additions and changes in fund balances. 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 ($519,346 net of $348,330 in revenues) and Members' housing ($288,952, net of $1,075,430 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 totalled $1,417,392 for the year ended June 30, 1994.

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 totalled $1,126,782 and allocated interest income totalled $56,466 for the year ended June 30, 1994.

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.

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