INSTITUTE
for ADVANCED STUDY

REPORT

FOR THE ACADEMIC YEAR

1991·92

PRINCETON · NEW JERSEY

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OLDEN LANE
PRINCETON · NEW JERSEY · 08540
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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 to 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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A quote from a Member in 1991–92:

"My experience at the Institute was one of the most rewarding intellectual expe-
riences I have ever had. For me, the Institute fulfilled everything I could have
wished, and I believe from my own experience that it is fulfilling the mission
for which it was founded."

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A quote from a Member in 1991–92:

"I should especially note that the atmosphere characteristic of the Institute for Advanced Study was for me one of the most important stimuli in my research. The intensive exchange of scientific information and ideas among scholars of various professional interests; mutual support and assistance of scholars from different countries of the world; the constant readiness of the staff of the Institute to assist in the attempts to solve scientific and administrative problems, their open friendliness and efficiency rendering quite a special tone to all forms of relationship in the Institute turned the Institute into a real paradise for scholars of any scientific field. As to me, in the Institute I could, as nowhere else, abstract myself from the troublesome events in my country and get almost fully absorbed in my research . . . The four months spent in the Institute for Advanced Study were the happiest time in all my scholarly life."

ANNUAL REPORT 1991–92

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 an unsurpassed record of definitive scholarship.

Although small in scale, the Institute embraces in some form many of the major academic fields. But unlike universities it has no scheduled courses of instruction or curriculum, awards no degrees, 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 academic disciplines. This breadth of coverage and the opportunity it affords for independent, self-directed scholarship distinguish the Institute from most contemporary research centers. So too do its twenty-one permanent faculty 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. The first Director, Abraham Flexner, originated the concept from which the Institute took form, and he persuaded the Bambergers to provide

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resources for its realization. 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 foundations, corporations, private gifts and federal agency grants. It is governed by an elected Board of Trustees which appoints a director to oversee the Institute's operations and guide its development.

Set on about 800 acres in Princeton, New Jersey, the Institute includes ten academic buildings, a housing complex for Members, and two libraries. The Institute has had a close but non-affiliated relationship with Princeton University since the 1930's. The combination of the Institute and the University has given rise to a center for scholarship and science of world-wide consequence.

REPORT OF THE CHAIRMAN

It is my pleasure to introduce this annual report for the Institute for Advanced Study covering 1991–92, the sixth year of my service as Chair of the Institute's Board of Trustees and the first year of the tenure of the Institute's seventh Director, Phillip A. Griffiths.

This past year has been an eventful one for higher education, a time of questioning and challenge for some of our finest institutions. Many educational leaders are less confident than they were a decade ago of the ability of institutions to respond effectively to future needs and to fulfill their missions. While by no means isolated, the Institute has enjoyed a rare degree of insulation from many of the more volatile pressures affecting universities and has been able to undertake important steps of self-examination and renewal to prepare for a central role in theoretical research and learning in the 1990's and the next century. Director Phillip Griffiths has taken a leading hand in that task; with his understanding of the Institute and with goodwill and support from all sides, there is every reason to expect that in the coming decade the Institute for Advanced Study will continue to flourish as its accomplishments grow.

The Board and the entire Institute community mourn the death, in November 1991, of Gladys K. Delmas, Honorary Vice-Chairman of the Board. She was an extraordinary friend of the Institute and of scholarship. Her bequest of $10 million for the endowment is the largest gift since the founding of the Institute and is in addition to $5 million she gave to the Institute during her lifetime.

Emeritus Trustee and eminent attorney Lloyd Garrison died last fall. His long association with the Institute began in 1953 and was one of many ways in which he served higher education and numerous public causes.

Ralph Hansmann, a member of the Board since 1976 and for many years its Treasurer, retired from the Board in 1992 and became an emeritus Trustee. He has been associated with the Institute for more than thirty-five years, for much of that time with primary responsibility for oversight of the Institute's endowment. Through Ralph's skillful guidance, the endowment grew at a pace well ahead of many similar institutional funds.

This year the terms of two other distinguished Trustee colleagues, Wilfried Guth and G. Daniel Mostow, also ended. To all we express our deepest appreciation.

At the October 1991 meeting of the Corporation, Dr. Griffiths was confirmed as a member of the Board and as Director. At the May 1992 meeting, the Chair and Vice Chair of the Board were re-elected and four new Trustees were elected

to serve. They are Hyman Bass, Toru Hashimoto, Ronaldo H. Schmitz, and Brian F. Wruble.

Professor Bass, Professor of Mathematics at Columbia University, received his B.A. degree from Princeton University and his Ph.D. from the University of Chicago. He has been associated with Columbia University since 1959 and was a visiting Member at the Institute for Advanced Study in 1964 and 1965–66. He has also held visiting research appointments in France, Mexico, India, England, Brazil and Israel. He is a member of the National Academy of Sciences and serves on the editorial board of the American Mathematical Society.

Mr. Hashimoto of Tokyo, Japan, is President and Chief Executive Officer of The Fuji Bank, Ltd. He is a graduate of the Faculty of Law of the University of Tokyo and was a Fulbright Scholar at the Graduate School of Economics at the University of Kansas. He joined The Fuji Bank in 1957, and has held a number of positions including several posts with international responsibilities. In 1987 he became a Managing Director of The Fuji Bank; he was appointed Deputy President in 1990 and President and Chief Executive Officer in 1991.

Dr. Schmitz of Frankfurt, Germany, a Managing Director of Deutsche Bank AG, earned his diploma and doctorate from the University of Cologne and an MBA degree from the European Institute of Business Administration at Fontainebleau. From 1967 to 1990 he held a number of executive positions with BASF's operations in the United States, in Spain, and in several German locations. He became a member of the BASF AG board of managers in 1980 and joined Deutsche Bank AG in 1990.

Mr. Wruble holds B.S. and M.S. degrees in electrical engineering from Cornell University and an MBA from New York University. He served as a civilian engineer with the U.S. Navy and for nearly ten years he was on Wall Street, most recently as a vice-president at Smith Barney. He joined The Equitable in 1979, became Senior Vice President and Chief Financial Officer in 1983, and was elected Executive Vice President in 1984. In April 1992 he left The Equitable to become President and Chief Operating Officer of Delaware Management Holdings Inc. of Philadelphia.

The Trustees welcome our new colleagues and look forward to working with them in the years to come.

A detailed report on the financial condition of the Institute is shown in the financial statements which follow. A significant portion of the Institute's operating expenses are funded from the income produced by the Institute's endowment. Other operating income is provided by government grants, grants from private foundations, and corporate and individual gifts. Since the Institute

does not collect tuition or other revenues and does not enter into the usual kind of research contracts, to a very large degree its independence is made possible by the support received from foundations, individuals and corporations. To all those who contribute to the Institute, including former Members, foundations, corporations, public agencies, the Friends of the Institute for Advanced Study, and many others, the Trustees express our gratitude.

Last fall, construction began for two new buildings, a long-needed home for the School of Mathematics and a lecture hall for the entire Institute. Members of the Board of Trustees, Friends of the Institute, and past Members have donated or pledged over a third of the $8 million construction cost, and efforts continue to raise funds to cover the remainder. The new buildings will address a long-felt need and insure that the physical environment at the Institute is as supportive as it can be for productive intellectual inquiry.

I also want to note a series of weekend gatherings the Director and I hosted this past year for Trustees and a few others through which we could become more familiar with the work of the Institute. Each of the four weekends focused on one of the Institute's Schools. I was privileged to take part in all four events. Through them we came to appreciate anew the extraordinary range and intensity of the work of our Faculty and Members.

The Institute for Advanced Study provides the setting and the independence necessary to give the finest scholars and scientists a chance to engage in nondirected intellectual inquiry, quests that can lead to the unpredictable but monumental breakthrough or alter significantly our understanding of human behavior. The advancement of civilization has depended at each turn on places such as the Institute; our responsibilities as Trustees and supporters must be to see that the conditions at the Institute are as near ideal for that purpose as we can make them.

James D. Wolfensohn
Chairman of the Board of Trustees

A quote from a Member in 1991-92:

"I can honestly say that I have never found working (and living) conditions more suitable for this kind of work than I have here at the Institute. This includes of course the amenities of the Institute, its serene and pleasant setting and the support of a tremendously helpful staff. Equally or even more important was the fact that the Institute provided just the right mixture of undisturbed working time and intellectual contact and stimulations."

REPORT OF THE DIRECTOR

This is my first opportunity to report as Director on the accomplishments of the Institute for Advanced Study, but my association with the Institute goes back more than twenty years. I was a Member in the School of Mathematics in 1968–70 and again in 1981–82. As a young mathematician I appreciated the opportunities to work at the Institute and the setting it afforded for undistracted research and intellectual growth.

Returning to the Institute last year as its Director has been an exciting and gratifying experience of rediscovery. The work done at the Institute continues to be central to the most important areas of fundamental scholarship. Over the past two decades the research capacities of our universities have expanded at a breathtaking rate. Think tanks, research centers, and institutes have proliferated here and abroad, many of them consciously imitating the Institute for Advanced Study. And yet, despite the great number of new research opportunities this growth has opened up for scholars, the best and most promising people from throughout the world continue to be drawn to the Institute. The Institute's unmatched combination of a distinguished resident Faculty, the breadth of fields covered in our four Schools, an environment supporting productive work, and our singular legacy will serve us well in the decades ahead, especially if, as many predict, there is a contraction of research opportunities in our universities.

Our Schools and Faculty share a well-defined sense of mission and hold to the highest standards of scholarship. The Institute's endowment and current income continue to grow, and in the Board of Trustees and the Friends of the Institute we have an immense resource of leadership and support. The Institute's physical assets are well maintained and improving, and its staff is thoroughly dedicated to the Institute's mission.

The fall meeting of the Board of Trustees coincided with a groundbreaking for two new Institute buildings, one which will be a home for the School of Mathematics, and the other a long-needed auditorium and lecture hall. We are well on the way in efforts to raise funds to match the cost of the buildings, and we hope to receive significant support for acquisition of state-of-the-art computers and other instrumentation on which mathematicians, scientists, and other scholars increasingly depend. We also plan to expand and upgrade our fiber optic cabling network. The auditorium will be important to the Institute community as the site for lectures, meetings, concerts and other gatherings not easily accommodated elsewhere.

The Institute was host to several major scholarly events this past year. In the fall the School of Historical Studies convened an international conference on the theme "German History from the Perspective of Art Collectors, Donors and

Museums" which brought together about seventy-five scholars from the United States and Europe with support from the Fritz Thyssen Stiftung and The Andrew W. Mellon Foundation. In the spring a week-long conference on fluid dynamics supported by the Alfred P. Sloan Foundation culminated the year's focus of the School of Mathematics on new areas of applied mathematics. These and other Institute colloquia, seminars and lectures are listed in the Record of Events section of this report.

At its biennial meeting in May 1992, the Association of Members of the Institute for Advanced Study (AMIAS) re-elected Robert S. Doran as its president. Dr. Doran, Professor of Mathematics at Texas Christian University, is a dynamic leader of the Institute's more than 4500 past Members. I was privileged to address the AMIAS meeting and was reminded anew of the extent of the interest and support the Institute receives from AMIAS.

The Institute was saddened by the death in March 1992 of Deane Montgomery, a dear friend and distinguished emeritus faculty member. Professor Montgomery was associated with the Institute for nearly fifty years, including thirty years as Professor in the School of Mathematics. For many years he led the Institute seminar in topology and had a profound influence on all who knew him as colleague, teacher and mentor.

In 1991–92, Director's Visitors at the Institute included Dr. Paul Berg, Nobel Laureate and Professor of Biochemistry at Stanford University; Professor Yuri Bessmertny of the Institute of General History of the Soviet Academy of Sciences; Professor Ding Shisun of Beijing University; Professor Lu Qi-keng of the Institute of Mathematics, Beijing; Dr. Maxine Singer, President of the Carnegie Institution of Washington; and Professor Xiao Er Jian of Fudan University, People's Republic of China.

I would like to express the grateful appreciation of the Institute for the bequest of $10 million from the late Gladys P. Delmas, former Trustee and Honorary Vice Chairman of the Board. Mrs. Delmas began her long association with the Institute in the 1970's, and we mourn the passing of this esteemed colleague, whose generosity and enthusiasm were legendary and now form part of our inheritance, a testimony to her love of learning and her belief in our enterprise.

A special note of appreciation is also extended for the Alfred P. Sloan Foundation's generous $8 million support of the Digital Sky Survey project in which astrophysicists from the Institute for Advanced Study actively participate.

The Institute's Trustees, with the outstanding leadership of James D. Wolfensohn, have been wonderfully generous in their gifts and pledges; equally so in their guidance and encouragement through the course of my first year as

Director. As we welcome new Trustees to the Board, I would also like to express my appreciation to Wilfried Guth, Ralph Hansmann and G. Daniel Mostow. Dr. Guth's sophisticated understanding of the importance of higher research and a practical sense of the complexities of this particular academic community have enriched us greatly. The Institute is fortunate to have Mr. Hansmann's dedication and deep sense of the purposes and priorities of the Institute continue as he becomes a Trustee Emeritus. G. Daniel Mostow, academic Trustee for the School of Mathematics, is a long-time colleague and friend. Professor Mostow is an esteemed mathematician and articulate enunciator of the world of mathematics. He chaired the Institute's Visiting Committee to the School of Mathematics in 1985–86 and chaired the Buildings and Grounds Committee from 1988–92. To Dr. Guth, Mr. Hansmann and Professor Mostow, I am deeply grateful.

The Friends of the Institute likewise have been a valuable asset in many ways, and I want to express my appreciation to Mary P. Keating and the Executive Committee of the Friends. In the Trustees and the Friends, the Institute is indeed very well served; I cannot imagine a more supportive group of such people anywhere in higher education.

Looking back over my first year as Director, I recognize how indebted I am to many others whose help and support have also been indispensable. Without trying to acknowledge all by name, let me say how greatly I value the efforts, good will, and vision of all who are associated with the Institute.

In the following article, reprinted with permission from the August 17, 1992, issue of *The Scientist,* I focus on the exact sciences and mathematics. However, my conclusions regarding the critical role of independent centers such as the Institute for Advanced Study apply equally to scholarship in the humanities and social sciences, areas where institutional priorities and public policy pose even greater threats to free-ranging, creative scholarship.

Phillip A. Griffiths

Don't Underestimate The Usefulness of 'Useless' Knowledge

Since World War II, scientific research in the United States has been sustained and driven largely by a vigorous system of public funding. This system has worked well in general and has brought the U.S. to its present position of scientific leadership. The majority of international prizes and awards consistently goes to scientists in the U.S., and by all accepted measures, U.S. science dispro- portionately produces important and innovative scientific papers.

But American leadership is beset by a host of problems. The nation's universities, which generate the bulk of leading-edge research, are severely hampered by financial problems and divisive debates over priorities. A series of humiliating events—such as the claims about cold fusion, the *Challenger* disaster, and numerous incidents of fraud and poor judgement—have tarnished the reputation of science. At the same time that the nation has diminished confidence in the work of American science, federal and private grants have been increasingly used to serve political and social, rather than scientific, objectives.

These issues have alarmed scientific leaders. Nobel Laureate Leon Lederman, speaking as president of the American Association for the Advancement of Science, has asserted bluntly that "science is sick." Frank Press, president of the National Academy of Sciences, affirms more gently that "there is a great deal of stress in the very scientific community that is responsible for America's leadership."

Effects of this stress are evident in the graceless public debate between the government and the scientific community over funding priorities. Congress, by its political nature, usually seeks prompt and practical returns for the dollars it allocates to research. The scientific community protests that research is inherently unpredictable and that scientists themselves should have the major role in allocating research dollars.

The Nature of Research

We as a nation can begin to resolve this debate by paying closer attention to the nature of research itself. Research is a living process, like an organism, that evolves—from a stage of germination through growth to maturity. The germ of a researcher's idea is very different from a fully grown theory, and we must adjust our expectations accordingly. For example, the expectation of prompt and practical results is wholly appropriate for mature research and development programs, in which, for example, the task is to put humans on the moon or develop a new computer chip. But such expectations are not suitable for more youthful basic research, and truly ruinous to the infancy of fundamental or speculative research.

As we come to understand the nature of pure research, we will also see that it is indispensable to the more familiar applied research that almost everybody understands as necessary for the development and well-being of the nation. Consider, for example, the need to understand air flow past an airplane wing in order to deal with the problem of turbulence. Underlying such a study is basic research—in this case, differential equations known as Navier-Stokes equations, which describe the flow of any type of fluid. These equations, in turn, depend on

Sir Isaac Newton's greatest fundamental discovery, the calculus, which occurred centuries before the work of Navier and Stokes.

Abraham Flexner, one of the great educators in the first half of this century, described a memorable conversation with George Eastman that illustrates how easily we misunderstand fundamental research. He asked Eastman, whose Kodak company became a paragon of applied research, what scientist had made the most valuable contribution to modern life. Eastman named Guglielmo Marconi, who invented the wireless telegraph in 1895. Flexner described Eastman's amazement when informed that Marconi had little to do with the principle behind the telegraph; that the fundamental work on the transmission of electromagnetic waves was begun in 1865 by James Clerk Maxwell and confirmed by Heinrich Hertz in 1888.

"Hertz and Maxwell could invent nothing," Flexner wrote, "but it was their useless theoretical work which was seized upon by a clever technician and which has created new means for communication, utility, and amusement by which men whose merits are relatively slight have obtained fame and earned millions."

The research history of the laser amplifies Flexner's point and illustrates the dramatic evolution of research. In the 1920s, experimental physicists found that electrons have a completely unexpected property they named "spin." Soon thereafter, the mathematical physicist Paul Dirac, in a burst of fundamental creativity, came up with the now-famous equation that fully describes the motion of an electron, including its spin. This equation was a rich theoretical lode for subsequent basic research. From the firm platform of this basic work, scientists and engineers discovered how to apply Dirac's "useless" knowledge to devices using beams of electromagnetic energy. Further applied research and development then led to the invention of the laser, whose ever-expanding usefulness would surely astonish even Dirac.

We see then that fundamental ideas create new paradigms and new fields; they provide the concepts and frameworks for new basic research. Fundamental thinking has much in common with art, with play, with dreams; it is fragile and unformed. It cannot survive under pressures of time or expectation. Only when the imagination is allowed to soar freely can it obtain a truly original view of the world. To the degree that the imagination is restricted—ordered to fly at a certain altitude, land on a certain runway—its vision dims and narrows.

Historical Evolution

Because of ascendancy of the political process in funding decisions and the public lack of understanding of the pragmatic importance of pure research, allocations of research funds today are seldom made out of concern for the natural evolution

of knowledge acquired through pure or basic research. Funding decisions are prompted as well by important but short-term concerns, such as the drive for economic return.

The predictability and accountability sought by government in its new emphasis on priority setting are understandable. A host of science-related issues demand attention—economic competitiveness, health care, and the environment, to name a few—and it is not unreasonable of the public to expect results in return for tax dollars. In the face of this expectation, the government is unlikely to increase significantly its support for speculative research. Whatever the scientific community may want, Congress will continue to press for result-oriented scientific and engineering research.

But we neglect Flexner's teachings at our peril. Without understanding the history and workings of scientific research, we cannot plan wisely for its future. Early in U.S. history, Americans showed little interest in research for its own sake. Those who cared for basic research studied in Europe, particularly in one of the great German research institutes inspired by Alexander von Humboldt. Not until 1875, with the founding of The Johns Hopkins University, did the U.S. have an institution specifically designed for the study of basic science.

Initially, the Hopkins model aroused the interest of American educators, and worthy imitations were underwritten by philanthropists: the University of Chicago by John D. Rockefeller and Stanford University by Leland Stanford, for example. Existing institutions strengthened their graduate schools. Rockefeller University, founded in 1901 as the Rockefeller Institute for Medical Research, and the Carnegie Institution, founded in 1902, provided settings for fundamental research in medicine and the biological and physical sciences.

By a rare stroke of fortune, Flexner was given the chance to institutionalize his views of the importance of pure research. In the late 1920s, he was approached by the philanthropist Louis Bamberger and his sister, Mrs. Felix Fuld, who wanted to make a lasting contribution with their fortunes. Flexner suggested an institute specifically designed for fundamental research—a home for the world's greatest intellects, whose only responsibility would be to follow their interests wherever they might lead. Thus was born, in 1930, the Institute for Advanced Study in Princeton, N.J.

Flexner's idea was powerful enough to attract, within a short period, the likes of Albert Einstein and Kurt Gödel, the eccentric mathematician immortalized in the Gödel theorem and celebrated in Douglas Hofstadter's best-selling *Gödel, Escher, Bach: An Eternal Golden Thread* (New York, Basic Books, 1979). Institute Faculty members included John von Neumann, a mathematician who developed the basic model of the modern computer; the humanist and historian Erwin

Panofsky, who was as renowned in his field as was Einstein in physics; and others of comparable stature. In line with Flexner's thesis, their lack of direction or expectation was almost always regarded as crucial to the most creative fundamental work. For example, Gödel devised a highly abstract mathematical theorem concerning "undecidable" mathematical statements that seemed on its face quite useless. However, it was the Gödel theorem that sparked Alan Turing to conceive of the famous "Turing Machine," which forms the basis of how one seeks to determine whether a given problem is solvable by computer. Similarly, von Neumann's early work with computers had little apparent utility—until others found in it the basis for what we know as computer software. For both scientists, the object was not to create a marketable product, but simply to answer a fundamental riddle.

This, as Flexner realized, may be the greatest paradox in the scientific world: The great discoveries are almost always the result of intellectual curiosity that is seeking only to satisfy itself. Yet federal funding today is increasingly directed not toward the individuals who usually make these fundamental discoveries, but toward programs with preset goals. Indeed, fundamental research is not—and by its nature can never be—the highest priority for government funding.

In my opinion, this condition is desirable as well as it is inevitable. It is for the best that untargeted—or "useless"—research, while often the wellspring of practical application, can be most excitingly and productively nurtured in environments far removed from the stressful, competitive, economically driven, results-oriented world of government and politics. It also is my view that such far-removed environments are best exemplified at independent facilities—the Institute for Advanced Study and similar institutions—whose charters center on the untargeted intellectual pursuit. I believe that as we move into the future, these independent institutions must assume a larger role as centers of and advocates for fundamental inquiry.

Important Investment

Since independent institutions are largely supported by private sources (the philanthropy of individuals, foundations, and corporations) and do not receive student tuitions, they are able to provide an environment for undirected scholarship that is undistracted by immediate concerns. Such research is conducted by individuals whose only criterion for selection is the capability of producing scholarship that can be seminal. And in this environment of freedom, the independent institutions are in a position to assume a role as centers of unfettered scientific inquiry.

The university is the place where most basic research will continue to occur. But universities serve many masters, including renewed and appropriate attention to

undergraduate education. Faculty are under increasing pressures, including that they obtain increased research funding—and therefore tailor their work to government priorities. This trend is wrenching for the universities, whose traditional culture and governance structures resist the setting of internal priorities. Increasingly, universities are having to organize like businesses, conforming to an externally imposed model poorly suited to fundamental research.

As a result, scientists spend more time writing proposals and less time doing science. And these proposals, subject to the homogenizing effect of the peer review system, are by necessity more cautious than creative. As the number of proposals climbs, top researchers find themselves managing dozens of assistants and millions of dollars. Such individuals can rarely afford to take risks in their grant proposals.

The British physicist Freeman Dyson has observed that scientists, like other people, tend to follow current fashions. There is nothing inherently wrong with this, because topics of the moment may be significant. However, Dyson warns, "unfashionable people and unfashionable ideas have often been of decisive importance to the progress of science."

Dyson continues: "At any particular moment in the history of science, the most important and fruitful ideas are often lying dormant merely because they are unfashionable. Especially in mathematical physics there is commonly a time lag of 50 or 100 years between the conception of a new idea and its emergence into the mainstream of scientific thought. If this is the time scale of fundamental advance, it necessarily follows that anybody doing fundamental work in mathematical physics is almost certain to be unfashionable."

Corresponding Responsibility

In light of the opposing realities in both university and government settings, private efforts to support fundamental research assume very great importance. Fellowships supplied by the MacArthur, Packard, and other foundations enable individuals to pursue their interests over a long period, directed only by their intellectual curiosity. Along with the Carnegie Institution, the Institute for Advanced Study, and a few other independent centers, these programs offer virtually the only non-university paths for fundamental research outside the life sciences.

This freedom to pursue pure and often unfashionable research brings with it responsibilities. One is to serve as a model for the scientific community to provide leadership and set standards for the scientific community. Another is to take unpopular positions with respect to government policies when that should prove necessary for the integrity of the scientific enterprise.

A more general responsibility is to constantly remind our goal-oriented society of the limits of planning and priority setting. In the end, no one can plan or predict the benefits that flow from the unfettered human intelligence; from what happens when Newton sits under the apple tree.

These are not responsibilities that independent institutions have sought in the past. But if they can serve as a constructive counterbalance to current trends, they can play a major role in preserving the health of science and of society as a whole.

ACKNOWLEDGMENTS

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Mr. and Mrs. James D. Wolfensohn

BEQUEST

The Institute acknowledges with special gratitude the generous bequest of
Gladys Krieble Delmas, Former Trustee and Honorary Vice-Chair of the Board.
In light of her keen understanding of and belief in the mission of the Institute
and her astute recognition of its need for independent financial strength in order
to maintain the highest standards of excellence and academic freedom,
Mrs. Delmas bequeathed to the Institute for Advanced Study
its largest single gift since its founding.

A quote from a Member in 1991–92:

"The amount of work completed within this time span of seven months far exceeded that which a normal academic year would have allowed. To be sure, years of tilling and sowing contributed, but such a harvest also depended on the special environment the Institute has established. I have enjoyed here almost daily exchanges with those working from distinct but related directions, so that in this relatively brief time span I seem to have developed a network of extra-disciplinary colleagues even larger in size than has been possible within my own university after the passage of years."

THE SCHOOL OF HISTORICAL STUDIES

Faculty

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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

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 1991/92 GLEN BOWERSOCK participated in a colloquium in Turku, Finland, before departure for California to spend a sabbatical term as Sather Professor of Classical Literature at Berkeley. He delivered six Sather Lectures on "Fiction as History, from Nero to Julian." They are to be published by the University of California Press. He also taught a graduate seminar on documentary texts from Roman Syria. While on the West Coast, Professor Bowersock lectured at the Universities of Washington, British Columbia, Victoria, California at Los Angeles, and California at Davis, and he spoke at a meeting of the Northern Section of the California Classical Association.

Professor Bowersock served on the Search Committee for the chair of Byzantine Philology at Harvard University while continuing as a Senior Fellow of the Dumbarton Oaks Center for Byzantine Studies. He also continued as a Member of the Council of the American Numismatic Society and General Editor of the Harvard series *Revealing Antiquity*. In April he was elected to the Council of the American Philosophical Society for a three-year term. Currently Professor Bowersock is preparing his Sather Lectures for publication and together with Professor C.P. Jones, he recently completed an extensive commentary on the *Martyrdom of Pionius* on the basis of materials left by the late French epigraphist Louis Robert.

GILES CONSTABLE gave lectures at Trinity College in San Antonio (November 1991), and at the Centre for Medieval Studies in Toronto (in honor of Bertie Wilkinson, February 1992). Professor Constable spoke at the Annual Conference of the Medieval Association of the Midwest at Central Missouri State University

(September 1991), and attended meetings of the Society for the Study of the Crusades and the Latin East (July 1991), Princeton-Rutgers Medievalists (October 1991), and the Delaware Valley Medieval Association (December 1991). For the spring semester, Professor Constable was in residence as Visiting Professor of History and Religious Studies at the Arizona Center for Medieval and Renaissance Studies at Arizona State University in Tempe. During that time Professor Constable gave public lectures at Arizona State University, the University of Arizona in Tucson, Northern Arizona University in Flagstaff, and the University of California at Los Angeles, and was commentator for a conference on "The Final Hour: Death in Medieval and Early Modern Europe" at Arizona State University (February 1992).

Professor Constable's publications are: "Two Monastic Fragments Attributed to Urban II from the *Collectio Britannica*" (with Robert Somerville), *In Iure Veritas: Studies in Canon Law in Memory of Schafer Williams*, ed. Steven Bowman and Blanche Cody (1991); "The Abbot and Townsmen of Cluny in the Twelfth Century," *Church and City, 1000–1500: Essays in Honour of Christopher Brooke*, ed. David Abulafia, Michael Franklin, and Miri Rubin (1992); "Introduction" to *The Second Crusade and the Cistercians*, ed. Michael Gervers (1992); and *People and Power in Byzantium: An Introduction to Modern Byzantine Studies* (with Alexander Kazhdan) 1982; second printing with additional preface, 1991.

OLEG GRABAR co-sponsored with Professor Michael Cook of Princeton University a series of eight Seminars in Islamic Studies which considered a variety of research topics ranging from the history of sexuality to a Persian text on Jerusalem. There was no theme, but every speaker was expected to focus on a puzzle and on specific sources. Up to twenty colleagues from several institutions attended each seminar.

In late March 1992, Professor Grabar led a seminar with Professor Paret within the theme "Culture and the State" developed through a grant from The Andrew W. Mellon Foundation. A lively discussion followed the presentations of papers on the collection of the art of non-European areas in London, Paris, Berlin, and Vienna. The main speakers and commentators were from the University of London, the National Gallery of Ontario, Harvard University, Princeton University, the Wissenschaft Kollegium in Berlin, and Washington, D.C. Another meeting of the Mellon Seminar was devoted to research problems raised by School Members about Culture and the State.

Professor Grabar lectured on the collecting of Islamic art at Emory University in Atlanta; on Jerusalem at the Present Day Club of Princeton and the Semitic Museum at Harvard University; on Islamic artistic theories at the Ismaili Institute in London; on Persian painting at Columbia University, the Institute for Advanced Study, and the Harvard Club in Princeton; and on ornament at the

University of California at San Diego. Professor Grabar contributed papers to seminars on esthetics and philosophy in New York; on Central Asian Art at the Hermitage Museum in St. Petersburg; on palaces at the University of Pennsylvania and Harvard University; and on art theory at the University of California at San Diego. From May through early July, he gave a series of eight seminar lectures on "Approaches to Islamic Art" at the Institut du Monde Arabe in Paris, and in July he was one of the speakers at a plenary session of the International Congress of Historians of Art in Berlin.

Professor Grabar directed one doctoral thesis to completion at Harvard University; he was on the Review Committee of the West Asian Department of the Royal Ontario Museum; and he continued to chair the Steering Committee for a potential exhibition of Islamic Art at the Smithsonian Institution.

Professor Grabar published: "K.A.C. Creswell and His Work," *Muqarnas 8* (1991), pp. 1–3.

CHRISTIAN HABICHT worked mainly on the manuscript for his new book on Hellenistic Athens, 338–30 B.C. He also wrote two papers for international conferences, the first for the Tenth International Congress for Greek and Latin Epigraphy, held at Nîmes in October 1992 (for which he was also charged to organize a session); the second for the Centennial of the French excavations at Delphi in September 1992 at Athens and Delphi. He continued to serve on editorial boards and on two committees of the American Philosophical Society.

He published half a dozen articles and had several others accepted for publication. His computerized file of Athenians B.C. grew to some 24,000 individuals and was edited by Julia Bernheim in two different formats: 1) by names in alphabetical order; 2) by Athenian demes, with the appropriate names for each of the 139 demes following in alphabetical order. Both files are available for consultation.

Professor Habicht received the Reuchlin Prize in the Humanities. At the public ceremony, held at Pforzheim in July 1991, he gave a talk on "Cicero, Reuchlin und die zornigen jungen Männer", to be published in *Antike und Abendland,* vol. 38, 1992. He was invited to give the Nellie Wallace Lectures at Oxford in 1993–94.

IRVING LAVIN lectured at the Museum of Modern Art in New York, the Chrysler Museum in Norfolk, Virginia, Rhodes College, Tulane University and Richmond University, and gave a course of lectures at the University of Kansas in Lawrence. He participated in colloquia in Kyoto, Japan and Taxco, Mexico. His talk on "Bernini's Bust of the Savior and the Problems of the Homeless in 17th Century Rome" was presented at a School of Social Science weekly meeting. He taught a seminar in the Department of Art and Archaeology at Princeton

University and continued to organize the colloquium series in the history of art sponsored by the School of Historical Studies. Professor Lavin continued his services to several organizations and institutions, including the advisory boards of the J. Paul Getty Trust and the Canadian Centre for Architecture, as chairman of the U. S. National Committee for the History of Art and as a member of the executive committee of the Comité International d'Histoire de l'Art. He also continued to serve on the advisory boards of several scholarly journals, including *Art e Dossier, The Journal of Medieval and Renaissance Studies, Palladio, Rivista di storia dell'architettura e restauro,* and *Quaderni d'italianistica.*

PETER PARET published a collection of his essays, *Understanding War: Essays on Clausewitz and the History of Military Power* (Princeton University Press, 1992), and with his former student Daniel Moran brought out an edition of Clausewitz's historical and political writings, also published by Princeton University Press. His banquet address at the annual meeting of the Society for Military History appeared in *Parameters,* and an expanded version of a talk on National Socialist propaganda before the American Philosophical Society was published in the Society's *Proceedings. Makers of Modern Strategy,* of which Professor Paret was edi- tor-in-chief, was translated into Spanish. With Oleg Grabar, he chaired the sec- ond of three year-long Institute Mellon Seminars. The topic for 1991–1992, "Art and the State," concentrated on 19th- and 20th-century Europe. The seminars began with an international conference under his chairmanship on "German His- tory from the Perspective of Art Collectors, Donors, Museums" which was jointly sponsored by the Institute, the Fritz Thyssen Stiftung, and The Andrew W. Mellon Foundation.

During the academic year Professor Paret gave lectures and seminars at several institutions, including a series of undergraduate lectures and graduate seminars at the University of South Carolina, and chaired a session at a conference on American and German history sponsored by the German Historical Institute in Washington, D.C. He continued his service as a member of the Council of the American Philosophical Society, as a member of various editorial boards and committees, and as a Senior Fellow of the Hoover Institution at Stanford Univer- sity, concentrating on the evaluation and further development of the institution's archives. He is currently engaged in a number of projects in the fields of German cultural history and the history of ideas and institutions.

PROFESSORS EMERITI

MARSHALL CLAGETT continued work on Volumes II and III of his *Ancient Egyptian Science* and Volume II is near completion. Trips to the British Museum and the Petrie Museum last year turned up additional pertinent material.

GEORGE F. KENNAN completed a book of personal and political philosophy, *Around the Cragged Hill*. The book is scheduled to appear in early 1993. Professor Kennan participated extensively in arrangements for a committee of distinguished outsiders to visit the Kennan Institute for Advanced Russian Studies in Washington and to give their opinion of its present activities and its future objectives. He received the Peace Prize of the Washington National Cathedral and spoke on that occasion. Between these and other engagements, Professor Kennan continued his studies of European diplomatic history in the final years of the 19th century.

In 1991 KENNETH M. SETTON published *Venice, Austria, and the Turks in the Seventeenth Century,* and in 1992 a small volume on *Western Hostility to Islam*, dealing with the medieval and early modern periods.

Once again HOMER THOMPSON'S time has been spent chiefly in supervising the publication program of the Excavation of the Athenian Agora. The third volume in the epigraphic series has appeared. Written by three authors, the book presents the inscriptions dealing with as many categories of civic records. Two more substantial manuscripts have been received and are being reviewed: one for a volume of inscriptions recording decrees and one on pottery of the Roman period. As time permits Professor Thompson continues his own study of the Sanctuary of Athena Sounias.

In March 1992, MORTON WHITE completed the manuscript of a book, *What Is Free Will? Do We Have It? How Do We Know?* (Princeton University Press)

THE SCHOOL OF HISTORICAL STUDIES

MEMBERS, VISITORS AND RESEARCH STAFF

MOHAMMAD AL-ASAD
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Institute for Advanced Study · A

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Art History
University of Paris 1 · F

ABEER AUDEH
Contemporary Architecture, especially in the
Arab World
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Art History
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Ancient Greek History and Diplomacy
Emory University · F

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Greek and Roman History
Hamburg University

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Institute of General History, USSR Academy of
Sciences · F

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University of Western Australia · F

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Islamic Studies
Yale University · S

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Byzantine History
King's College London · D

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Latin; History of Ancient Religion
Tübingen University · S

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Art History
Smith College · S

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Religious Orders and Movements, Crusades
Free University, Berlin · S

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Greek Literature
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Medieval Intellectual History
University of San Diego

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Art and Cultural History
Wallraf-Richartz-Museum, Cologne · V

SHAUN E. MARMON
Islamic History
The University of Rhode Island

MENDEL METZGER
Iconography in Medieval Hebrew Liturgical
Books
Centre National de la Recherche Scientifique,
Paris and Strasbourg · VF

THÉRÈSE METZGER
Iconography of the Bible
Strasbourg, France · F

KENNETH J. MOURÉ
European Economic History; Modern France
University of California, Santa Barbara

JOACHIM NIEMEYER
Military History
Wehrgeschichtliches Museum, Rastatt · I

ROBERT R. PALMER
18th Century European History
Princeton, New Jersey · V

LEE PATTERSON
Medieval Literature
Duke University · F

M. ANNE REYNOLDS
Renaissance Rome
The University of Sydney · F

GUIDO RUGGIERO
Renaissance History
University of Connecticut · VF

ROBERTO RUSCONI
Medieval History; Church History
University of Salerno

JAMES RUSSELL
Classical Archaeology, Roman/Early Byzantine
The University of British Columbia · S

JEAN-FRANÇOIS SALLES
Archaeology and History of the Arabian Gulf
University of Lyon 2

HAGEN SCHULZE
Comparative History of Nationalism
University of the Bundeswehr, Munich · S

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Art History
The University of Iowa

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New Haven, Connecticut

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Medieval Church History; Mendicant Orders
Institute for Advanced Study · A

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Medieval Intellectual History; History of Science
The University of Iowa · F VS

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Greek and Latin Literature
Harvard University

BENGT E. THOMASSON
Ancient History
Göteborg, Sweden · V

KRISTEN VAN AUSDALL
Italian Renaissance Art
Institute for Advanced Study · A

JOAN WEINSTEIN
Art and Cultural History
University of Pittsburgh · VS

STEPHEN A. WHITE
Ancient Philosophy
University of Texas at Austin

JOHN W. WILLIAMS
Medieval Art
University of Pittsburgh · S VF

T. PETER WISEMAN
Roman History and Historiography
University of Exeter · S

ELIZABETH ZACHARIADOU
Ottoman History
University of Crete · S

THE SCHOOL OF MATHEMATICS

Faculty

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

Professors Emeriti

DEANE MONTGOMERY
(deceased March 15, 1992)
ATLE SELBERG
ANDRÉ WEIL

THE SCHOOL OF MATHEMATICS

ACADEMIC ACTIVITIES

The scientific life of the School of Mathematics is centered in the interaction of its Members, both informally and through the many seminars, between five and ten each week, that are organized by Members and Faculty. The Members' Seminar is a long-standing tradition in the School and attempts to provide a vehicle for communication among Members that transcends the boundaries of specific domains. There were more specialized seminars on analysis, organized by L. Caffarelli, and a seminar on complex analysis organized by J.F. Treves. V. Berkovich gave a weekly lecture during the year on algebraic geometry, more precisely on the etale cohomology of algebraic spaces. In addition there was a joint seminar on algebraic groups organized by A. Borel and by F. Bien of Princeton University that met in alternate weeks at the Institute and at the University.

The major activity of 1991–92 was the special program on the theoretical and computational aspects of fluid dynamics. Our Distinguished Visiting Professor for the year was Alexandre Chorin from the University of California at Berkeley. A. Chorin is a leading figure in the numerical and theoretical study of turbulence and combustion, and in particular a specialist in the use of probabilistic vortex methods. Other senior participants who were important for forming the core of this program were B. Engquist (UCLA), A. Majda (Princeton), G. Papanicolaou (Courant Institute), and V. Rokhlin (Yale). In total there were sixteen participants.

This program represents the first serious effort to bring applied mathematics to the Institute since the days of John von Neumann. Part of the motivation for it comes from the recent rapid development of high speed computers which has fundamentally altered the way in which mathematicians can contribute to the solution of fluid-dynamical problems. Reliable large-scale computation reveals phenomena in fluid flow that are often otherwise inaccessible to experimental measurement. To understand and control them requires new mathematical ideas from nonlinear analysis, differential equations, statistical mechanics and geometry, in conjunction with advanced computational techniques and more traditional tools of applied mathematics such as asymptotic methods. This year attempted to incorporate many of these ingredients.

We have had an outstanding group of mathematicians with a variety of different perspectives on computing theory and numerical analysis. For example, the development of new rapid summation algorithms brings together ideas of V. Rokhlin (wavelets), T. Buttke (3D vortex methods) and J. Strain (interfaces for crystal growth). Another example is the practical implementation of ideas from homogenization in computations involving turbulent transport and flow through

porous media following the theoretical work of B. Engquist, A. Majda, and G. Papanicolaou among others.

In fact, the participants were concerned with a wide class of applied problems — particularly those with large numbers of interacting length or time scales such as fully developed turbulence, crystal growth, dendrite formation, and flow through porous media. Another area of great importance was the development of more rapid and efficient algorithms to investigate these problems. These include new interpolation schemes developed by V. Rokhlin and multigrid and adaptive grid methods of A. Almgren, B. Engquist, T. Hou and G. Papanicolaou.

The weekly seminar on applied mathematics conducted by A. Chorin, which was the focus of the program, was supplemented by a seminar on mathematical physics organized by T. Spencer and G. Papanicolaou. Some highlights of these seminars were lectures by short-term visitors: J. Kalda on "The Transport of a Passive Scalar in 2D Turbulent Flow"; V. Zakharov on "Integrable Turbulence"; and P. Collela on "Adaptive Algorithms in Computational Fluid Mechanics."

In March there was a week-long workshop on "Turbulence and Statistical Physics" (supported by the Alfred P. Sloan Foundation) which featured lectures on experimental, mathematical, numerical and engineering aspects of turbulence. These lectures drew from an international cast of scientists who helped to broaden the scope of scientific activity here and to bring us up to date on the latest developments in this active field.

With the help of the National Science Foundation's Scientific Computing Research Environments in the Mathematical Sciences Program, the School of Mathematics substantially upgraded its computing facilities to accommodate this year's program. In addition, we received a block grant of 2400 hours of supercomputing time from the National Center for Supercomputing Applications. We received vital support from outside sources such as the Alfred P. Sloan Foundation, The Ambrose Monell Foundation, the Department of the Air Force, the Defense Advanced Research Projects Agency, and the National Science Foundation to help cover the additional cost of supporting our distinguished scientists.

There were also several visitors in probability, E. Çinlar of the Department of Civil Engineering and Operations Research of Princeton University, M. Rao of the University of California at Riverside, and S. Varadhan of the Courant Institute.

Although the activity in numerical analysis and applied mathematics at the Institute will probably be less intense in the next few years, an applied mathematics seminar is planned. Weinan E, an outstanding young mathematician with interests in homogenization, numerical analysis, and fluid dynamics, has been

appointed to the School for three years, and he has agreed to be responsible for the seminar.

The two principal lecture series, the Marston Morse lectures and the Hermann Weyl lectures, were in quite different areas. The Marston Morse lectures were on differential geometry. The lecturer was J. Cheeger of the Courant Institute, and his title was *Degeneration of Riemannian Metrics under Curvature Bounds*. The Hermann Weyl lectures were on number theory this year and were delivered by Laurent Clozel of the University of Paris. His title was *Arithmetic and Geometry of Shimura Varieties*.

In January ROBERT LANGLANDS gave the Colloquium Lectures of the American Mathematical Society in Baltimore, speaking on automorphic forms and on percolation. In May LUIS CAFFARELLI received an honorary doctorate from the Universidad Autónoma de Madrid.

During the year the School lost a distinguished emeritus professor. DEANE MONTGOMERY, who had been associated with the Institute since 1945 and as a professor in the School of Mathematics from 1951 until his retirement in 1980, passed away in Chapel Hill, North Carolina, on March 15. In his years at the Institute, Professor Montgomery was particularly concerned with the development of young American mathematicians, especially in topology, and was a central figure in maintaining the Institute's preeminent role in American mathematics. His own major mathematical contribution was to the solution of the fifth of the outstanding problems on Hilbert's famous list. He received the Steele Prize of the American Mathematical Society in 1988.

THE SCHOOL OF MATHEMATICS

MEMBERS AND VISITORS

MICHAEL AIZENMAN
Mathematical physics
Princeton University · F

ANN ALMGREN
Computational fluid mechanics
University of California, Berkeley

FREDERICK ALMGREN
Geometric measure theory; calculus of variations
Princeton University · S

LETICIA BARCHINI
Representation theory of Lie groups
State University of New York, Stony Brook

MICHAEL BEALS
Partial differential equations
Rutgers University, New Brunswick · V

HENRI BERESTYCKI
Partial differential equations
Université Paris VI · S

VLADIMIR BERKOVICH
Algebraic geometry
Weizmann Institute of Science, Israel

MAX BEZARD
Partial differential equations
École Polytechnique, France

YANN BRENIER
Fluid mechanics
École Normale Supérieure, France · S

THOMAS BUTTKE
Fluid mechanics
Courant Institute

YU CHEN
Forward and inverse scattering theory, elliptic
partial differential equations
Yale University

ALEXANDRE CHORIN
Fluid dynamics
University of California, Berkeley · DVP

ERHAN ÇINLAR
Statistical equilibrium of stochastic flows
Princeton University · S

CHARLES CONLEY
Representations of Lie groups
University of California, Los Angeles

GILLES COURTOIS
Differential geometry
École Polytechnique, France

XIANZHE DAI
Global analysis; differential geometry
Massachusetts Institute of Technology

WEINAN E
Fluid equations; incompressible flows
Courant Institute

BJÖRN ENGQUIST
Numerical analysis; partial differential equations;
fluid mechanics
University of California

STEVEN FERRY
Topology
State University of New York, Binghamton · S

KAZUHIRO FUJIWARA
Arithmetic algebraic geometry
University of Tokyo

JANE GILMAN
Riemann surfaces; Teichmüller theory; Fuchsian
and Kleinian groups
Rutgers University, Newark · S

ROBERT GILMAN
Ergodic theory and group theory
Stevens Institute of Technology

CRISTIAN GUTIÉRREZ
Harmonic analysis; partial differential equations
Temple University

NICHOLAS HANGES
Partial differential equations
Lehman College, City University of New York

HARUZO HIDA
Number theory; automorphic forms
University of California, Los Angeles · F

THOMAS HOU
Fluid mechanics
Courant Institute

TOM ILMANEN
Geometry; partial differential equations
University of California, Berkeley

HOWARD JACOBOWITZ
Differential geometry of CR structures, partial
differential equations
Rutgers University, Camden

DAVID JERISON
Real and harmonic analysis; partial differential
equations
Massachusetts Institute of Technology

SHI JIN
Numerical methods of transport equation;
numerical methods of hyperbolic partial
differential equations; computational fluid
dynamics
University of Arizona · V

NICHOLAS KATZ
Arithmetic algebraic geometry
Princeton University · VF MS

KOJI KITAGAWA
Automorphic forms; number theory
University of California, Los Angeles

TOSHIYUKI KOBAYASHI
Non-commutative harmonic analysis; Lie theory
University of Tokyo

PIERRE LE DOUSSAL
Joint appointment in Natural Sciences ·
Statistical Physics
Harvard University

CLAUDIA LEDERMAN
Partial differential equations
CONICET, Buenos Aires · VS

CONGMING LI
Nonlinear partial differential equations; nonlinear
functional analysis; variational methods;
differential geometry
University of Pennsylvania

LUEN-CHAU LI
Integrable Hamiltonian systems
Pennsylvania State University · F

JOHN LOWENGRUB
Numerical analysis and vortex dynamics
Stanford University

ANDREW MAJDA
Applied mathematics; partial differential
equations
Princeton University

DANIEL MARCUS
Fluid dynamics
Lawrence Livermore Laboratory · F

PERTTI MATTILA
Geometric measure theory
University of Jyväskylä · F

DAVID MC LAUGHLIN
Fluid dynamics
Princeton University · VS

MARIO MILMAN
Real and harmonic analysis
Florida Atlantic University · S

JUN MURAKAMI
Topology (knot theory and representation
theory)
Osaka University

ALAN NADEL
Algebraic geometry
Massachusetts Institute of Technology

DIANA NUNZIANTE
Partial differential equations
Istituto Universitario Navale, Napoli · VF

YONG-GEUN OH
Symplectic geometry; nonlinear Schrödinger
equations
Courant Institute

GEORGE PAPANICOLAOU
Fluids, random media
Courant Institute

VLADIMIR PLATONOV
Algebraic groups
Institute of Mathematics, Byelorussian Academy
of Sciences, Minsk

JAMES RAMSEY
The theoretical and empirical implications of time
reversibility in economic modeling
New York University · F

MALEMPATI RAO
Probability theory; abstract analysis
University of California, Riverside

VLADIMIR ROKHLIN
Fluid dynamics
Yale University

MICHAEL SHELLEY
Fluid mechanics
University of Chicago

YAKOV SINAI
Dynamical systems
Landau Institute, Moscow · VF

RICHARD SKORA
Topology
Columbia University

EUGENE SPEER
Mathematical physics; probabilistic cellular
automata
Rutgers University, New Brunswick

JOHN STRAIN
Numerical analysis; partial differential equations;
fluid mechanics
Courant Institute

ABDOLREZA TAHVILDAR-ZADEH
Partial differential equations
Courant Institute

JACQUES TILOUINE
Automorphic forms and Iwasawa theory
Université de Paris-Sud, Orsay

GEORGE TOMANOV
Algebraic groups, Lie groups, number theory
Bulgarian Academy of Sciences

JEAN FRANCOIS TREVES
Partial differential equations, complex variables
Rutgers University, New Brunswick

SRINIVASA R. S. VARADHAN
Probability theory; partial differential equations;
hydrodynamic limits
Courant Institute

ANDREW WILES
Number theory
Princeton University · S

NANHUA XI
Quantum groups; algebraic groups
Institute of Mathematics, Academia Sinica

XUE XIN
Partial differential equations, fluid dynamics
Mathematical Sciences Research Institute

HORNG–TZER YAU
Hydrodynamic limits
Courant Institute · F

SAI KEE YEUNG
Differential geometry; complex manifolds
Massachusetts Institute of Technology

SHOUWU ZHANG
Number theory, algebraic geometry
Columbia University

YUXI ZHENG
Partial differential equations; vortex theory
Mathematical Sciences Research Institute

THE SCHOOL OF NATURAL SCIENCES

Faculty

STEPHEN L. ADLER *[New Jersey Albert Einstein Professor]*
JOHN N. BAHCALL
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THE SCHOOL OF NATURAL SCIENCES

ACADEMIC ACTIVITIES

Recent activities in the School of Natural Sciences have focused on three frontiers of physics: the very small, the very large, and the very many. The study of the very small is known as elementary particle physics. Its aim is to understand the nature of the elementary building blocks of matter and their mutual interactions. It has long been traditional to divide the fundamental interactions into four classes—strong, electromagnetic, weak, and gravitational. In the 1970's compelling theories describing three of the four traditional interactions were constructed. The successful theories of the strong, electromagnetic and weak interactions are all very similar mathematically, and beautiful unified theories encompassing these three interactions have been constructed. A great remaining challenge, which drives much of the research of the School, is to understand how gravity fits in.

Over long distances and for macroscopic bodies, gravity is well described by Einstein's theory of general relativity, perhaps the most beautiful of all physical theories. However, the conceptual framework of general relativity is not easy to reconcile with the conceptual framework used to describe the microworld, i.e., quantum mechanics. We are attempting to address several fascinating physical questions that hinge on the proper treatment of general relativity within quantum mechanics, such as whether the topology of space-time changes due to quantum fluctuations produce "wormhole" or "baby universes," whether small black holes can evaporate completely into ordinary particles, and many others.

The mathematical theory of relativity does not seem, superficially, to be closely related in form to the theories that successfully describe the other interactions. Since the mid–1980's, however, it has been widely realized that all four interactions arise inexorably together when one tries to extend the traditional theory of interacting point particles to spatially extended objects—superstrings—in a consistent way. This potential "theory of everything" remains the focus of much research at the Institute. The study of superstring theory has stimulated the development of new mathematical techniques, some of which have proven to be of great interest to pure mathematicians. Since superstring theory appears to incorporate gravity in a manner consistent with quantum mechanics, it holds tremendous promise for addressing the problems previously mentioned.

Despite the fact that there is now a reliable "standard model" for the strong, electromagnetic, and weak interactions, much remains to be done in these fields. An especially important theoretical challenge, still only partially met, is to calculate the consequences of quantum chromodynamics or QCD—the modern theory of the strong interaction—with decent accuracy. At present, some of the

world's fastest computers and novel advanced techniques of parallel processing are employed on this problem, but even so, new insights will be necessary to solve it.

The first hint of physics beyond the "standard model" may be revealed through experiments that detect weakly interacting particles (neutrinos) produced in the interior of the Sun. The number of these solar particles that actually reach the earth is less than predicted by the combined standard models of solar evolution and of particle physics. Research done at the Institute has established the difference between the best theoretical estimates and the experiments and has also quantified the recognized uncertainties in the theoretical predictions.

Another frontier in the physics of the very small is, remarkably, cosmology. The tie between elementary particle physics and cosmology is that, according to the widely accepted big bang picture, the Universe is extremely hot and dense during its earliest moments. To describe the behavior of matter under such extreme conditions, we must employ all the results and tools of elementary particle physics. An overview of the important astrophysics research being done at the Institute is to be found in Professor John Bahcall's summary below.

Finally, two spectacular experimental discoveries in the last decade have proved again that the behavior of many identical particles, each in itself mundane—ordinary atoms in ordinary matter—can present startling surprises. Two fascinating, qualitatively new behaviors of matter were discovered: the quantized Hall effect, and high temperature superconductivity. (Both were promptly rewarded with Nobel prizes.) Revolutionary new theoretical concepts involving fractional charge and new forms of quantum statistics have proved their worth in the Hall effect. Vigorous attempts are afoot to exploit these ideas in other contexts, including high temperature superconductivity.

FACULTY

STEPHEN ADLER'S principal activity this year, just as last, has been work on a book on Quaternionic Quantum Mechanics, to be published by Oxford University Press. Revisions made during the summer of 1991 led to a semi-final version, which was used as the basis for a fall term course (continued informally into the spring term) at Princeton University. Teaching from the material lead to further revisions; a number of new sections were also added, including one dealing with the construction of Fock space and second quantization for the quaternionic many body problem, which is an essential prerequisite for quantum field theory. Professor Adler now has an essentially final version of 12 chapters and plans to add one or two more chapters dealing with future directions. The manuscript is scheduled to be copy-edited this fall, with publication planned for

the spring of 1993. Further work on the quaternionic project, beyond what is in the book, will deal with a study of quantum field theory.

Professor Adler has also continued work with Gyan Bhanot on Monte Carlo acceleration algorithms, based on changes of variables which are specific to lattices whose dimension is a power of two. Preliminary studies on the U(1) lattice gauge theory showed that for this model, the new algorithms reduce the critical exponent from two to close to zero. During the past academic year, a very efficient computer code was written to implement the algorithms for the case of the "XY" model, but the results here were not very good, with only a small reduction in critical slowing down being achieved. Current efforts are aimed at understanding what is happening in a more detailed way, by determining which specific modes are the recalcitrant ones which resist acceleration.

In other work, Bhanot and Lacki (in collaboration with Creutz of Brookhaven Laboratory) explored methods for the enumeration of states for discrete models. A new method was invented to generate all states of discrete systems with a reduced number of arithmetic operations. In one application, an Ising spin glass model was studied and it was found that the "phase transitions" reported in numerical simulations are not a true singularity of the free energy in the thermo-dynamic limit. Another application involved the calculation of weak coupling series for the average free energy per site, to a very high order in the three dimensional Ising model, resulting in a considerable extension of the results previously known by analytic techniques.

JOHN BAHCALL'S work in 1991–92 concentrated in two main areas: refining the theoretical predictions for the solar neutrino mystery and using the Hubble Space Telescope to make observations of nearby stars and of distant quasars that cannot be made with ground-based telescopes. Working with M. H. Pinson-neault (postdoctoral fellow at Yale University), Professor Bahcall showed that all of the complicated computer codes that are used to calculate solar evolution yield essentially the same answers when they are programmed with the same input parameters. In addition, Bahcall and Pinsonneault made a number of improvements in the solar models and derived the most precise available predic-tions for the various experiments in progress. The results of the Bahcall-Pinson-neault calculations are in good agreement with conventional (non-neutrino) measurements of solar properties, although they are in disagreement with the solar neutrino experiments. Bahcall and Hans Bethe (Cornell University) have argued that the uncertainties in the theoretical solar models are not sufficient to explain this disagreement and that therefore new physics—beyond the standard model description of neutrinos—must be involved.

With the Hubble Space Telescope, Professor Bahcall and his collaborators (Jan-nuzi and Schneider from the Institute, plus other researchers from CalTech, the

Universities of California and Pittsburgh, the Institute d'Astrophysique, the Royal Greenwich Observatory, and the Space Telescope Science Institute) completed the first systematic study of the gaseous medium between us and quasars out to redshifts of order unity. This region of intergalactic space was not previously studied because the ultraviolet light that must be observed is absorbed in the earth's atmosphere. The astronomers found, among other surprises, approximately twenty times more hydrogen clouds than had been expected based upon studies of larger redshift quasars. Many researchers around the world are trying now to figure out what is the nature of these hydrogen clouds. Another collaboration, involving Bahcall, Maoz (the postdoctoral member in charge of the program), Schneider, and several non-Institute researchers completed a study of 500 distant quasars imaged with the Hubble Space Telescope. This survey, the largest yet carried out using the Hubble Telescope, turned up an object that appears to be the most distant known gravitational lens and showed that lensing is much less frequent than predicted by some cosmological theories. Guhatha-kurta and Yanny, together with Bahcall and Schneider, investigated the core of one of the most beautiful old collections of stars in the Galaxy, the well-known globular cluster 47 Tuc. Using the Hubble Space Telescope, they obtained accurate measurements of the number and brightnesses of stars in the dense inner region of this star cluster and discovered a number of "blue straggler" stars whose nature has not been definitely established.

The Members in astronomy and astrophysics have worked on an astonishing variety of topics, obtaining in the process important new results. The areas in which significant advances were made include: the implications of recent studies of the cosmic microwave background radiation, the properties of large redshift quasars, the formation of black holes, the distribution and velocities of infrared bright galaxies, the production of microlenses, the stability of huge gaseous rings around galaxies, the characteristics of globular clusters, the search for dark matter, and the discovery of a faint red star that may be a brown dwarf.

FREEMAN DYSON worked mainly on two mathematical problems in collaboration with Madan Lal Mehta of Saclay (France), Harold Widom of the University of California at Santa Cruz, and Pavel Bleher of Tel Aviv. The Bleher problem concerns the statistics of small differences between linear combinations of incommensurable frequencies, a problem that arises in many areas of nonlinear dynamics, in particular in applying perturbation theory to planetary motions in the solar system over long periods of time. Bleher has found numerical evidence for a remarkable conjecture, that in the case of three incommensurable frequencies the small differences occur in a repetitive pattern. Whether this is generally true remains to be seen and, if true, remains to be proved. A preliminary attack on the problem was recorded in Professor Dyson's preprint, "Nearest Neighbor Distances on a Circle."

The Mehta-Widom problem concerns an esoteric mathematical object known to experts as the Painlevé Transcendent of the Fifth Kind. This object appears in many physical contexts, in particular in the theory of the statistical behavior of energy levels in a random quantum-mechanical system (a theory recently given the name of "quantum chaos"). Using a combination of physical and mathematical arguments, it was possible to find new and unexpectedly simple expressions for the fifth transcendent. This work is recorded in another IAS preprint, "The Coulomb Fluid and the Fifth Painlevé Transcendent."

Professor Dyson gave two memorial lectures in England, the Milne Lecture in Oxford in October 1991 and the Schrödinger Lecture at Imperial College in London in May 1992. The Milne Lecture was published in the Quarterly Journal of the Royal Astronomical Society in June 1992 with the title "Hunting for Comets and Planets." Professor Dyson discussed occultation astronomy, the detection of dark objects in the foreground by searching for eclipses or gravitational lensing of bright objects in the background. New technologies of light detection and data processing now make occultation astronomy ripe for rapid development. The Schrödinger Lecture, with the title "Quantum Past," discussed the old problem of the physical interpretation of quantum mechanics, with emphasis on some new insights provided by Hawking's discovery of the process of black-hole radiation.

Professor Dyson's book *From Eros to Gaia*, an anthology of lectures and magazine articles written for the general public, was published by Pantheon Books in June 1992.

PIET HUT made contributions to a number of different areas in stellar dynamics, from the three-body problem and the evolution of star clusters to the structure of the dark matter in the Universe. In addition, he continued his interdisciplinary collaborations in the areas of computer science and geology. In the former field, he is involved in a project to develop faster hardware and software for astrophysical simulations. In the latter, he is studying the dynamics of multiple cometary impacts and their geological and paleontological consequences. Professor Hut, in collaboration with Douglas Heggie from Edinburgh University, completed a long-term study of the three-body problem, including a definitive analytical treatment of the various approximation techniques for three-body gravitational scattering. Other aspects of the three-body problem which they studied were the various four-dimensional regularization techniques which avoid the Kepler singularities in three-dimensional close encounters. Finally, the process of double star formation, through the net effect of two-body and three-body encounters, was analyzed in a thermodynamic treatment in collaboration with Jeremy Goodman from Princeton University. The evolution of star clusters still yields new and fundamental results, as exemplified by another collaboration of Hut with Goodman and Heggie. This yielded the time scale for exponential

growth in such systems, as being a fraction of the crossing time, independent of the number N of stars, apart from a very weak log log N dependence. Other basic new results were two forms of stability analysis: one of a self-gravitating isothermal sphere, in collaboration with Jun Makino from Tokyo University; the other a study of mass segregation in two-component star systems, both in a microcanonical and in a canonical ensemble, in collaboration with Yueming Xu, a postdoctoral Member at the IAS.

On the more applied side, Professor Hut gathered several observers and theorists together for a small workshop on the topic of double stars in globular clusters. This resulted in a comprehensive review paper on that topic, covering various types of optical, X-ray, and radio observations, as well as direct-integration, Fokker-Planck, and Monte-Carlo simulations. Together with George Djorgovski from the California Institute of Technology, Professor Hut determined the average rates of core collapse and evaporation for the ensemble of galactic globular clusters. In separate investigations, Professor Hut put limits on the amount and type of dark matter present in two astrophysical systems: on massive black holes in the area around the center of our galaxy (with Martin Rees, a visitor from Cambridge University); and on elementary particles in the halos of star clusters (with Douglas Heggie and Kim Griest, a visitor from Berkeley).

In 1991–92 FRANK WILCZEK'S analysis of quantum hair for black holes was broadened, leading to an identification of its concrete physical effects; Wilczek completed what he hopes to be the definitive paper on the subject, "Quantum Hair on Black Holes," written with S. Coleman and J. Preskill (in *Nuclear Physics*, B378, 175, 1992). A recently discovered class of black hole solutions, with qualitatively new and instructive properties, was analyzed in a paper co-authored by C.F.E. Holzhey, "Black Holes as Elementary Particles," (in *Nuclear Physics*, B380, 447, 1992). Wilczek invested much time during the spring semester teaching an advanced graduate class at Princeton University—Black Hole Quantum Mechanics—partly as a way of learning the subject.

Professor Wilczek's work in condensed matter using ideas related to fractional quantum statistics continued. A qualitatively new state of matter suggested in "Paired Hall State at Half Filling," (*Physical Review Letters*, 66, 3205, 1991) and "Paired Hall States," written with M. Greiter and X.G. Wen (*Nuclear Physics*, B374, 567, 1992) has apparently been observed experimentally, "Paired Hall States in Double Layer Electron Systems," written with Greiter and Wen, IASSNS-HEP-92/1). Extension of the fractional statistics idea to non–identical particles was suggested in "Disassembling Anyons," (in *Physical Review Letters*, 69, 132, 1992). Wilczek is vigorously pursuing the applications briefly suggested there.

Professor Wilczek's work on the phase transition in QCD has been pushed fur-
ther in "Application of the Renormalization Group to a Second Order QCD
Phase Transition," (*International Journal of Modern Physics*, A7, 3911, 1992) and
"Static and Dynamical Critical Phenomena at a Second Order QCD Phase Tran-
sition," (IASSNS-HEP–92/60) written with K. Rajagopal. An interesting possi-
bility is that large domains of misaligned vacuum might be produced. With his
student Krishna Rajagopal, Wilczek is investigating the possibility that this actu-
ally happens as a result of rapid cooling (quenching) and how it might be
observed.

One direction in EDWARD WITTEN'S work in 1991–92 involved seeking a
better understanding of string theory with two dimensional target space. This is
the most "physical" of the soluble string theories discovered in recent years;
it may well give clues to understanding background independence (i.e., basic
geometrical concepts) in string theory. Witten's principal contribution in the last
year was the discovery of a "ground ring" of discrete spin zero states in two
dimensional string theory. By studying the properties of this ring, one is able to
explain many of the mysterious properties of two dimensional string theory;
among other things one goes a long way toward explaining why this theory has
a description via free fermions.

Barton Zwiebach and Professor Witten pursued this subject further, discovering
a striking differential geometric interpretation of the ground ring and making
contact with some of the structures that had appeared in Zwiebach's earlier work
on string field theory.

Professor Witten also continued his interests in geometrical applications of gauge
theories. His principal contribution in this direction during the year was to
uncover a much richer structure in two dimensional Yang-Mills theory (without
matter) than had been recognized hitherto. In the process many mysteries were
unraveled. For instance, in examining the exact solution of two dimensional
Yang-Mills theory (obtained following an old construction by Migdal) one finds
that the perturbation series terminates after finitely many terms, yet the partition
function is not a polynomial; it contains exponentially small contributions of
unstable classical solutions and indeed can be written exactly as a sum over contri-
butions of all classical solutions, stable and unstable. Nothing in the standard
tool kit of quantum field theorists can explain such behavior. Professor Witten
discovered the explanation by finding a mapping between physical Yang-Mills
theory and topological Yang-Mills theory in two dimensions. Mathematically,
this mapping involved a novel non-abelian generalization of a celebrated integra-
tion formula of Duistermaat and Heckman; since physical Yang-Mills theory is
completely soluble, this also rendered the topological theory computable, solv-
ing a problem that has been much studied in recent years.

In a further contribution at the intersection of topological gauge theories and string theory, Witten showed that there is a string theory (constructed using a topological world-sheet theory) in which the target space theory is three dimensional Chern-Simons gauge theory. Witten's main interest in this is that he thinks it might offer a new vantage point on the problem of background independent geometry in string theory—the same puzzle that motivates the work cited above on two dimensional string theory.

Finally, Professor Witten continues to be interested in the construction of time dependent solutions of string theory. In 1990–91, he discovered a black hole solution of string theory (in two dimensional target space) by considering a gauged WZW conformal field theory. In a recent paper, Chiara Nappi and Professor Witten discovered an interesting cosmological solution of string theory, by studying a different gauged WZW model. The solution they found describes an anisotropic expanding and recollapsing closed universe. The most intriguing property of the solution is that the recollapse occurs just at the moment when a naked singularity is about to form; thus, a violation of cosmic censorship is narrowly avoided. Witten plans to pursue this matter further, studying other ganged WZW models with a view to possibly finding a counter example to cosmic censorship, if indeed it is false. This is a long-shot, perhaps, but well worth pursuing, since a failure of cosmic censorship might give us one of our few opportunities for experimental observation of phenomena characteristic of ultra-short distances.

THE SCHOOL OF NATURAL SCIENCES

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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

THE SCHOOL OF SOCIAL SCIENCE

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 — policy, economy, religion, and family — 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 among 254 applicants were invited to the School of Social Science as Members and Visitors for the academic year 1991–92; three research associates were also part of the School's scholarly community. The Andrew W. Mellon Foundation provided support for four Members, the Volkswagen-Stiftung funded two, and the Ford Foundation one. The UPS Foundation provided general support for the group of seven women and fourteen men.

Fields of inquiry of these scholars from Argentina, France, Germany, Israel, Italy and the United States were: anthropology, three; history, three; law, two; literature, one; philosophy, two; political science, six; and sociology, four.

In 1991–92 the school continued its focus on the history, sociology, and philosophy of the sciences and the social sciences and the conceptual and organizational processes by which knowledge is produced. A biweekly seminar, comprised of the Mellon Fellows, faculty, and other Members, explored this year's theme: "Ethics, Politics, and Law." Twenty-five Thursday Luncheon Seminars featured presentations to audiences drawn from the School, other Schools of the Institute, nearby universities, and the wider scholarly community.

FACULTY

During the academic year 1991–92 CLIFFORD GEERTZ was elected a Corresponding Fellow of the British Academy, received an Honorary Doctor of Letters degree from Williams College, Williamstown, Massachusetts, and was the recipient of the Horace Mann Award, Antioch College, Yellow Springs, Ohio. He served on the External Advisory Board of the Society for the Humanities, Cornell University, and was an External Consultant to the Division of Social Sciences, University of California, Santa Cruz; participated in a conference on Arts in Bali at Princeton University; was a discussant for the Tanner Lectures at the Center for Human Values, Princeton University; lectured at Hartwick College, Oneonta, New York; and addressed the "Culture and Identities" Congress of Dutch and Flemish Anthropologists and Sociologists in Amsterdam. Professor Geertz's publications this year include " 'Local Knowledge' and Its Limits: Some *Obiter Dicta*", *The Yale Journal of Criticism* 5(2):129–35; "The Social Scientist as Author: Clifford Geertz on Ethnography and Social Construction," (Gary Olson, interviewer), *Journal of Advanced Composition* 11:245–68; and "An Interview with Clifford Geertz," (Richard Handler, interviewer), *Current Anthropology* 32(5):603–13.

Academic year 1991–92 saw the publication of two books edited by JOAN SCOTT: *Love and Politics in Wartime: Letters to My Wife, 1943–5* by Benedict S. Alper (University of Illinois Press) and *Feminists Theorize the Political*, edited with Judith Butler (Routledge). In addition she published several articles: " 'A Woman Who Has Only Paradoxes to Offer': Olympe de Gouges Claims Rights for Women," in *Rebel Daughters: Women and the French Revolution*, edited by Sara E. Melzer and Leslie W. Rabine; "Women's History," in *New Perspectives on Historical Writing*, edited by Peter Burke (Polity Press); "The History of Women's Work," in *The History of Women*, edited by Georges Duby and Michelle Perrot, Vol. IV (published in Italian by Laterza, in French by Plon, and in English by Harvard University Press); "The Evidence of Experience," *Critical Inquiry*, (Summer 1991); "The Campaign Against 'Political Correctness': What's Really at Stake?" *Change*, (November/December 1991); "The New University: Beyond Political Correctness," *Boston Review*, (March/April 1992); "Liberal Historians: a Unitary Vision," *Chronicle of Higher Education*, September 11, 1991.

In October, Professor Scott gave the Carl Becker Lectures at Cornell University. She was a visiting scholar at MIT's Center for the Humanities where she gave lectures and a seminar. She gave papers at several conferences: on political identity at the City University of New York Graduate Center; on multiculturalism at the University of North Carolina, Chapel Hill; and on French feminists' claims for political rights at the University of Southern California. She lectured at the New School for Social Research, the University of California, Santa Barbara and the University of California, Santa Cruz. In May 1992, Professor Scott testified before the Civil Rights Commission inquiry into racial and ethnic tensions in the U.S. on the question of multiculturalism in the curriculum. She received an honorary degree from Brown University in May 1992.

During the academic year 1991–92, MICHAEL WALZER lectured at Princeton, the University of Pennsylvania, New York University, the New School for Social Research, Harvard, the University of Vermont, and Middlebury College. He gave the first Robert Cover Memorial Lecture at Yale Law School and served as a Distinguished Lecturer at West Point. He presented papers to The Society for Religious Ethics and The Society for Ethics and the Professions. In May, Professor Walzer travelled to Paris to give a series of four lectures at The Collège International de Philosophie, and in June, to Jerusalem to give the keynote address at the meetings of the Israel Political Science Association. A new edition of *Just and Unjust Wars* was published in the spring, with a preface on the Gulf War. *Company of Critics* appeared in an Italian translation, and a new book *What Does It Mean to Be an American?* was also published in Italy. At the Institute for Advanced Study, he ran the School of Social Science's seminar on law and ethics, continued to work on a series of essays on ethnicity, nationalism, "the politics of difference," and on a book tentatively titled "Biblical Politics" — the basis of a number of his lectures this past year.

In September, Professor Walzer was presented with the American Political Science Association's Benjamin Lippincott Award "for a work of exceptional quality by a living political theorist that is still considered significant after a time span of at least 15 years since its publication" *(The Revolution of the Saints)*. In May, Georgetown University gave him an honorary degree.

PROFESSOR EMERITUS

On the basis of information and documents collected during the previous year, which he had spent at the Wissenschaftskolleg (Institute for Advanced Study) in Berlin, Professor Emeritus ALBERT O. HIRSCHMAN wrote an essay on the 1989 demise of the German Democratic Republic in light of the concepts of "exit" and "voice," which he had introduced in his 1970 book, *Exit, Voice, and Loyalty*. He presented this essay in outline at the regular luncheon seminar of the School of Social Science and at the Center of European Studies of Harvard

University. Having been appointed permanent visiting fellow at the Wissen-
schaftskolleg in Berlin, he spent the months of May and June 1992 there and
gave this talk (in a German version) as an evening lecture in front of a large
public. He also traveled to Leipzig and Dresden, the two cities where the decisive
demonstrations that led to the downfall of the GDR had taken place, collected
additional information on the 1989 events, and incorporated it into his text,
which is to be published in English and German.

His 1991 book, *The Rhetoric of Reaction,* whose French version came out almost
simultaneously with the English edition, was published in Italian and Spanish
versions in the course of the year. In France, where the book was widely
reviewed, the magazine *Le Débat* of March–April 1992 published a critique by
the sociologist Raymond Boudon together with an extended reply by Professor
Hirschman, who used the occasion to present a summary of the principal theses
and intent of the book.

On January 15, 1992, Professor Hirschman gave a Faculty Lecture with the title
"Industrialization and its Manifold Discontents: East, West, and South," pub-
lished in 1992 in *World Development.* He took part in a Berkeley conference on
the interdisciplinary uses of the new economic growth models that incorporate
technological progress as an endogenous variable. He also participated in the
annual meetings at Irvine, California of the Society for the Advancement of
Socio-Economics, where he joined a panel discussion of a new book by Robert
E. Lane, Professor of Political Science at Yale University, on "The Market Expe-
rience." Hirschman's critique entitled "Does the Market Keep Us out of Mischief
or out of Happiness?" is to be published as a review article in *Contemporary
Sociology.*

In April 1992, the Johns Hopkins University Press published a book which is
the outcome of a conference that was held in Buenos Aires in 1989 by the
Inter-American Development Bank to commemorate the 30th anniversary of the
publication of Hirschman's *The Strategy of Economic Development* (1958). The book,
which brings together eleven papers by economists, mostly from Latin America,
is entitled *Towards a New Development Strategy for Latin America: Pathways from
Hirschman's Thought* (1992). It contains a brief paper by Professor Hirschman
entitled "The Case against 'One Thing at a Time,' " which he had presented
upon being awarded an honorary degree by the University of Buenos Aires
during the conference.

THE SCHOOL OF SOCIAL SCIENCE

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Sociology
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DRUCILLA CORNELL
Law
Benjamin N. Cardozo School of Law

HASSAN ELBOUDRARI
Anthropology
École des Hautes Études en Sciences Sociales · A

FRANCO FERRARESI
Sociology
Università degli Studi di Torino · v

REBECCA FRENCH
Law
Harvard Law School

ALBRECHT FUNK
Political Science
Universität Hamburg

ELISABETTA GALEOTTI
Philosophy
Università degli Studi di Torino

JENNIFER HOCHSCHILD
Political Science
Princeton University · v

STANLEY KATZ
History
American Council of Learned Societies · vs

MICHAEL MEEKER
Anthropology
University of California, San Diego

GWENDOLYN MIKELL
Anthropology
Georgetown University

TERRY NARDIN
Political Science
University of Wisconsin, Milwaukee · v

BERNHARD PETERS
Sociology
Johann Wolfgang Goethe Universität, Frankfurt

JON RIEDER
Sociology
Barnard College, Columbia University

ALAN RYAN
Political Science
Princeton University

DEBORAH TANNEN
Linguistics
Georgetown University · vs

EDWARD TENNER
History
Princeton University Press · v

JUAN CARLOS TORRE
Political Science
Instituto Torcuato di Tella, Buenos Aires

GEORGIA WARNKE
Philosophy
University of California, Riverside

NOAM ZOHAR
Political Science
The Shalom Hartman Institute, Jerusalem · A

v *Visitor* · A *Research Assistant* · R *Research Associate* · D *Distinguished Visitor*

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.

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 1991–1992

September 16
School of Mathematics
Theoretical Physics Seminar: "Multigrid &
Cluster Applications in 2D Gravity, Surface
Models, etc."
SORIN SOLOMON, *Weizmann Institute*

September 24
School of Mathematics
Analysis Seminar: "Oscillatory Integrals and
Dispersive Equations"
CARLOS KENIG, *University of Chicago*

September 26
School of Mathematics
CR and Related Structures Seminar: "Recent
Developments in Embedding 3-dimensional CR
Manifolds"
CHARLES EPSTEIN, *University of Pennsylvania*

September 27
School of Natural Sciences
Lunchtime Seminar: "Ground Ring of Two-
Dimensional String Theory"
EDWARD WITTEN, *IAS*

September 30
School of Mathematics
Members Seminar: "Decomposition in Derived
Categories and Motivic Cohomology"
PIERRE DELIGNE, *IAS*

October 1
School of Mathematics
Applied Mathematics Seminar: "Analysis-based
Fast Algorithms in Applied Mathematics"
VLADIMIR ROKHLIN, *IAS*

School of Mathematics
Hermann Weyl Lecture: "Arithmetic and
Geometry of Shimura Varieties"
LAURENT CLOZEL, *Université de Paris-Sud*

October 2
School of Mathematics
Analysis Seminar
HENRI BERESTYCKI, *Paris VI*

October 3
School of Historical Studies
Art History Colloquium: "The Architectural
History of the Shroud of Turin"
JOHN BELDON SCOTT, *University of Iowa*

School of Mathematics
CR and Related Structures Seminar: "Mizohata
Vector Fields on S2"
HOWARD JACOBOWITZ, *IAS*

School of Social Science
Luncheon Seminar: "Should We Start Again with
Dewey?"
ALAN RYAN, *Princeton University*

October 7
School of Mathematics
Members Seminar: "On the Critical Values of
L-functions of GL(1), GL(2) and GL(2) x GL(2)"
HARUZO HIDA, *IAS*

School of Social Science
Law and Ethics Seminar: Organizational Meeting
MICHAEL WALZER, *IAS*

October 7–9
School of Historical Studies
Interdisciplinary Symposium: "German History
from the Perspective of Art Collectors, Donors,
Museums"
PETER PARET, *IAS*

October 8
School of Mathematics
Applied Mathematics Seminar: "Projection
Methods for Incompressible Flow"
DANIEL MARCUS, *IAS*

School of Mathematics
Hermann Weyl Lecture: "Arithmetic and
Geometry of Shimura Varieties"
LAURENT CLOZEL, *Université de Paris-Sud*

October 9
School of Mathematics
Analysis Seminar: "Initial Boundary Value
Problem for Vlasoz-Maxwell System"
MAX BEZARD, *IAS*

October 10
School of Mathematics
CR and Related Structures Seminar: "Sobolev
Estimates for the FBI Transform and Propagation
of Singularities"
SAGUN CHANILLO, *Rutgers University*

School of Mathematics
Hermann Weyl Lecture: "Arithmetic and
Geometry of Shimura Varieties"
LAURENT CLOZEL, *Université de Paris-Sud*

School of Social Science
Luncheon Seminar: "The Philosophy of the
Limit: Systems Theory and Feminist Legal
Reform"
DRUCILLA CORNELL, *Benjamin N. Cardozo School of
Law*

October 11
School of Natural Sciences
Lunchtime Seminar: "Paired Hall States: Possible
New Phases of Matter Supporting Unusual
Quasiparticles"
FRANK WILCZEK, *IAS*

October 14
School of Mathematics
Members Seminar: "Rigid Local Systems on
Open Sets of P1"
NICHOLAS KATZ, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Fractional
Superstrings"
P. ARGYRES, *Cornell University*

October 15
School of Historical Studies
Medieval Seminar: "No Man but an Angel: Early
Efforts to Canonize Lorenzo Giustiniani
(1381–1450)"
PATRICIA LABALME, *IAS*

School of Mathematics
Applied Mathematics Seminar: "Underresolved
Numerical Solutions of P.D.E.'s"
BJÖRN ENGQUIST, *IAS*

School of Mathematics
Hermann Weyl Lecture: "Arithmetic and
Geometry of Shimura Varieties"
LAURENT CLOZEL, *Université de Paris-Sud*

October 16
School of Mathematics
Analysis Seminar: "H1 BMO and the Dirac Klein
Gordon Equation"
YUXI ZHENG, *IAS*

Faculty Lecture: "On the Place of Mathematics in
Culture"
ARMAND BOREL, *IAS*

October 17
School of Mathematics
CR and Related Structures Seminar: "Nonlinear
Fourier Analysis"
LEON EHRENPREIS, *Temple University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
VLADIMIR BERKOVICH, *IAS*

School of Mathematics
Hermann Weyl Lecture: "Arithmetic and
Geometry of Shimura Varieties"
LAURENT CLOZEL, *Université de Paris-Sud*

School of Social Science
Social Science Luncheon Seminar: "Notes on the
New Tribalism"
MICHAEL WALZER, *IAS*

October 18
School of Mathematics
Hermann Weyl Lecture: "Arithmetic and
Geometry of Shimura Varieties"
LAURENT CLOZEL, *Université de Paris-Sud*

October 21
School of Mathematics
Members Seminar: "Realizations of Unitary
Representations in Dolbeault Cohomology
Spaces"
LETICIA BARCHINI, *IAS*

School of Social Science
Law and Ethics Seminar: The Relativism
Argument, Discussion of Stuart Hampshire,
"Justice is Strife" and Michael Walzer, "Moral
Minimalism"
MICHAEL WALZER, *IAS*

October 22
School of Mathematics
Applied Mathematics Seminar: "A Fast Adaptive
3D Vertex Method Using Local Corrections"
ANN ALMGREN, *IAS*

October 23
School of Mathematics
Analysis Seminar: "Bounds for the Fundamental
Solution of Degenerate Parabolic Equations"
CRISTIAN GUTIÉRREZ, *IAS*

October 24
School of Mathematics
CR and Related Structures Seminar: "Maximally
Complex Closed Manifolds in CPn"
MIKHAIL SMIRNOV, *Princeton University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Middle Class
Blacks and the Complexities of the American
Dream"
JENNIFER HOCHSCHILD, *Princeton University*

October 28
School of Natural Sciences
Theoretical Physics Seminar: "The Gauged
WZW Model"
A. KUPIAINEN, *Rutgers University*

School of Mathematics
Members Seminar: "Outer Space Has the Fixed
Point Property"
RICHARD SKORA, *IAS*

October 29
School of Historical Studies
Medieval Seminar: "Editing of Medieval Texts"
RICHARD JACKSON, *University of Houston*
with presentations by MONICA GREEN, *Duke
University,* ROBERTO RUSCONI, *University of Salerno,*
KATHERINE TACHAU, *The University of Iowa,*
RICHARD TARRANT, *Harvard University*

School of Mathematics
Applied Mathematics Seminar: "Instability and
Turbulence in High Mach-number Combustion"
ANDREW MAJDA, *IAS*

October 30
School of Mathematics
Analysis Seminar: "Existence of Multi-peak
Solutions of Semi-linear Neumann Problem"
YONG-GEUN OH, *IAS*

October 31
School of Mathematics
CR and Related Structures Seminar:
"Microlocalization and CR Manifolds"
JOSEPH J. KOHN, *Princeton University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
VLADIMIR BERKOVICH, *IAS*

School of Mathematics
Special Seminar: "Mirror Manifolds"
PHILIP CANDELAS, *University of Texas*

School of Social Science
Social Science Luncheon Seminar: "The
Campaign against Political Correctness: What's
Really at Stake?"
JOAN SCOTT, *IAS*

November 1
School of Natural Sciences
Lunchtime Seminar: "Mirror Manifolds"
PETER CANDELAS, *University of Texas*

November 4
School of Mathematics
Members Seminar: "Proper Actions on Non-
Riemannian Homogeneous Spaces"
TOSHIYUKI KOBAYASHI, *IAS*

School of Social Science
Law and Ethics Seminar: Relativisim Again,
Discussion of Clifford Geertz, "Anti Anti-
Relativism" and "The Uses of Diversity";
Richard Rorty, "On Ethnocentrism: A Reply to
Clifford Geertz"; and Ruth Benedict, "The Uses
of Cannibalism"
CLIFFORD GEERTZ, *IAS*

November 5
School of Mathematics
Analysis Seminar: "The Scalar-Curvature
Problem on Manifolds of Dimension Greater
than or Equal to 5"
ABBAS BAHRI, *Rutgers University*

School of Mathematics
Applied Mathematics Seminar: "Interfacial Flows
and Methods in Fluid Mechanics"
MICHAEL SHELLEY, *IAS*

November 7
School of Historical Studies
Art History Colloquium: "Text and Image in
Some Medieval Hebrew Bibles"
THÉRÈSA METZGER, *Strasbourg*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology of P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Discourse
Ethics and Interpretive Conflict"
GEORGIA WARNKE, *University of California, Riverside*

November 8
School of Natural Sciences
Lunchtime Seminar: "Charged Black Holes in
Two-Dimensional String Theory"
CHIARA NAPPI, *IAS*

November 11
School of Mathematics
Members Seminar: "The HOMFLY Polynomial
of Links and the Mixed-tensor Representation of
Uq (gln)"
JUN MURAKAMI, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Growing Hair on
Black Holes"
S. COLEMAN, *Harvard University*

November 12
School of Mathematics
Applied Mathematics Seminar: "Mechanical
Equilibrium Determines the (Fractal) Fiber
Architecture of the Aortic Heart Valve Leaflets"
CHARLES S. PESKIN, *Courant Institute*

November 13
School of Historical Studies
Islamic Seminar
MICHAEL COOK, *Princeton University*

School of Mathematics
Analysis Seminar: "Unique Continuation for
Sub-elliptic Operators"
NICOLA GAROFALO, *Purdue University*

November 14
School of Mathematics
CR and Related Structures Seminar: "Analytic
Extension of Functions via Nonlinear Fourier
Transforms"
TONG T. BANH, *Temple University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continuated)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The Chador
Case: Citizenship and Toleration in
Contemporary Democracy"
ELISABETTA GALEOTTI, *Università degli Studi di Torino*

November 15
School of Natural Sciences
Theoretical Particle Physics Seminar: "The
Three-Dimensional Ising Model and 2d-quantum
Gravity"
A. G. SEDRAKYAN, *Yerevan Physics Institute*

November 18
School of Mathematics
Members Seminar: "Groups and Languages"
ROBERT GILMAN, *IAS*

School of Natural Sciences
Theoretical Particle Physics Seminar: "BRST
Analysis of Physical States for 2D (Super)
Gravity Coupled to (Super) Conformal Matter"
PETER BOUWKNEGT, *CERN*

School of Social Science
Law and Ethics Seminar: Difference: Tibetan
Law, Discussion of Rebecca French,
*The Golden Yoke: A Legal Ethnography of Tibet
Pre–1959*, Chapter 9 "Legal Concepts" and
Chapter 10 "Crime and Punishment in Tibet"
REBECCA FRENCH, *Harvard Law School*

November 19
School of Historical Studies
Medieval Seminar: "Making Identities in
Fifteenth-Century England: Henry V and John
Lydgate"
LEE PATTERSON, *Duke University*

School of Mathematics
Applied Mathematics Seminar: "Vortices,
Turbulence, Percolation"
ALEXANDRE CHORIN, *IAS*

November 20
School of Mathematics
Analysis Seminar: "Multidimensional Stability of
Traveling Waves in a Bistable Reaction-Diffusion
Equation"
JACK XIN, *IAS*

Faculty Lecture: "Universality and the
Mathematician"
ROBERT LANGLANDS, *IAS*

November 21
School of Mathematics
CR and Related Structures Seminar: "Degenerate
Elliptic Operators"
GERARDO MENDOZA, *Temple University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Unintended
Consequences and the Road"
EDWARD TENNER, *Princeton University*

November 22
School of Natural Sciences
Lunchtime Seminar: "Quantum W3 Gravity"
KARELJAN SCHOUTENS, *SUNY-Stony Brook*

November 25
School of Mathematics
Members Seminar: "A Search for Structure in the
Context of Economic and Financial Data"
JAMES RAMSEY, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Topological Anti-
Toplogical Fusion"
SERGIO CECOTTI, *SISSA, Trieste*

November 26
School of Historical Studies
Art History Colloquium: "Allegory and
Symbolism in a 16th-Century Book Illustration:
The Ambiguities of Apollo and Marsyas"
M. ANNE REYNOLDS, *University of Sydney*

School of Historical Studies
Medieval Seminar: "Feud and Law: Was There an
Ethos of Vengeance in Medieval England?"
PAUL HYAMS, *Cornell University*

School of Mathematics
Applied Mathematics Seminar: "Stabilizing
Effects of Surface Tension for General Two-phase
Flow"
THOMAS HOU, *IAS*

December 2
School of Mathematics
Members Seminar: "Convex Potentials and the
Monge Ampére Equation"
LUIS A. CAFFARELLI, *IAS*

School of Natural Sciences
Theoretical Particle Physics Seminars: "New
Perturbative Rules for Gauge Theories"
ZVI BERN, *University of Pittsburgh*

School of Social Science
Law and Ethics Seminar: Difference: Law,
Gender, and Politics in Ghana, Discussion of
Gwendolyn Mikell, "Legal Change and Kin
Economic Relations in Matrilineal Areas of
Ghana"
GWENDOLYN MIKELL, *Georgetown University*

December 3
School of Mathematics
Applied Mathematics Seminar: "Numerical
Methods for Crystal Growth"
JOHN STRAIN, *IAS*

December 4
School of Historical Studies
Islamic Seminar
OLEG GRABAR, *IAS*

School of Mathematics
Analysis Seminar: "On the Complete
Integrability of the SVD Flows on Generic
Symplectic Leaves"
LUEN–CHAU LI, *IAS*

School of Mathematics
Mathematical Physics Seminar: "Slow and Fast
Kinematics of Scalar and Vector Fields"
STEPHEN CHILDRESS, *Courant Institute*

School of Natural Sciences
Special Condensed Matter Seminar: "String
Theory of Metals"
F.D.M. HALDANE, *Princeton University*

December 5
School of Historical Studies
Art History Colloquium: "The Perspective of the
Annunciation (Italy 14th–15th Centuries)"
DANIEL ARASSE, *University of Paris*

School of Mathematics
CR and Related Structures Seminar: "The CR
Yamabe Problem"
DAVID JERISON, *IAS*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The Golden
Yoke: A First Look at the Tibetan Legal System
Pre–1959"
REBECCA FRENCH, *Harvard Law School*

December 6
School of Natural Sciences
Lunchtime Seminar: "W-Infinity Symmetry in
$c = 1$ $(d = 2)$ Matrix Model"
SPENTA WADIA, *IAS*

December 7
School of Historical Studies
Delaware Valley Medieval Association Annual
Meeting:
GARY MACY, *University of San Diego:* "Lateran IV
and the Dogma of Transubstantiation"
KATHERINE TACHAU, *The University of Iowa:* "The
Condemnations of Autrecourt and Mirecourt:
What New Research Has to Tell Us about
Academic Freedom in Fourteenth-Century Paris"
ROBERTO RUSCONI, *University of Salerno:* "Preaching
between Propaganda and Satire in Some Late
Fifteenth-Century *Einblattdrucke*"
YURI BESSMERTNY, *USSR Academy of Sciences,
Moscow:* "Medieval Studies and Its Fate in the
Soviet Era (or: August 1991 as Seen by a Moscow
Historian)"

December 9
School of Mathematics
Members Seminar: "On Gromov's Conjecture on
Entropy"
GILLES COURTOIS, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Intersection
Theory on Moduli Space & New Matrix Models"
MAXIM KONTSEVICH, *Harvard University*

December 10
School of Mathematics
Special Analysis Seminar: "Special Bounded
Hessian Functions: Variational Principles for Free
Gradient Discontinuities"
FRANCO TOMARELLI, *University of Milano*

School of Mathematics
Applied Mathematics Seminar: "High Order and
Efficient Methods for Vorticity"
JOHN LOWENGRUB, *IAS*

December 11
School of Mathematics
Analysis Seminar: "Convergence of the Allen-
Cahn Equation to Motion by Mean Curvature"
TOM ILMANEN, *IAS*

School of Mathematics
Mathematical Physics Seminar: "Limit Behavior
of Solutions of the Regularized Nonlinear
Schrödinger Equation"
FRANK MERLE, *University of Paris VI*

Faculty Lecture: "Under the Influence of Gravity"
PIET HUT, *IAS*

December 12
School of Mathematics
CR and Related Structures Seminar: "A
Construction of Peak Functions on Some Pseudo-
convex Domains"
JEFFREY MC NEAL, *Princeton University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The Social
Organization of Moral Argument"
JON RIEDER, *Barnard College*

December 13
School of Mathematics
Special Mathematical Physics Seminar: "Gacs'
Fault-tolerant, Universal, Self-organizing
Cellular Automata"
LAWRENCE F. GRAY, *University of Minnesota*

December 16
School of Historical Studies
Mellon Seminar: "Bridges and the *Battaglide:* The
Urban Geography of Popular Violence in Early-
Modern Venice"
ROBERT C. DAVIS, *IAS*

School of Historical Studies
Nationalism, Cultural Symbols, and Politics:
"Some Reflections on the Meaning of Lafayette"
LLOYD S. KRAMER, *IAS*

School of Historical Studies
Posters as Historical Documents: a) Some
National Socialist Posters by Hans Schweitzer; b)
Images of Women as Political Arguments
BETH IRWIN LEWIS AND PETER PARET, *IAS*

School of Social Science
Law and Ethics Seminar: Difference: Medical
Ethics and Jewish Law, Discussion of Noam J.
Zohar, "Medical Uses of Human Bodies/
Autopsies and Cadaver Transplants in *Halacha*"
NOAM ZOHAR, *IAS*

December 17
School of Mathematics
Mathematical Physics Seminar: "Statistical
Mechanics of Flux Lines in High-
T_c-superconductors: A Mini Review"
PIERRE LE DOUSSAL, *IAS*

School of Mathematics
Applied Mathematics Seminar: "Complexity of
Turbulence: Trying to Separate Imaginary and
Real Parts"
VICTOR YAKHOT, *Princeton University*

December 18
School of Historical Studies
Islamic Seminar
ALEXANDER KNYSH, *IAS*

School of Mathematics
Analysis Seminar: "Regional Blow-up for a
Semilinear Heat Equation"
JUAN VAZQUEZ, *Universidad Autónoma de Madrid*

School of Mathematics
Special Analysis Seminar: "Special Bounded
Hessian Functions: Variational Principles for Free
Gradient Discontinuities"
FRANCO TOMARELLI, *University of Milan*

December 19
School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

December 20
School of Natural Sciences
Lunchtime Seminar: "Generalized Duality in
Curved String-Backgrounds"
AMIT GIVEON, *IAS*

January 7
School of Mathematics
Applied Mathematics Seminar: "Adaptive
Logarithms in Computational Fluid Mechanics"
P. COLELLA, *UCLA, Berkeley*

January 8
School of Mathematics
Mathematical Physics Seminar: "On Burger's
Equation with Random Initial Data and the
Statistical Theory of Shocks"
WEINAN E, *IAS*

January 9
School of Historical Studies
Art History Colloquium: "Mazarin's Collége, the
Louvre, and Le Vau"
HILARY BALLON, *Columbia University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The
Language of Resurgence in Post-Ataturkist
Turkey"
MICHAEL MEEKER, *University of California-San Diego*

January 13
School of Mathematics
Members Seminar: "Chaotic Behavior of Some
Area Preserving Maps with Small Noise"
THOMAS SPENCER, *IAS*

School of Social Science
Law and Ethics Seminar: Relativism Yet Again,
Discussion of Peter Winch, "Understanding a
Primitive Society" and Jürgen Habermas,
"Some Characteristics of the Mythical and
Modern Ways of Understanding the World"
GEORGIA WARNKE, *University of California, Riverside*

January 14
School of Mathematics
Analysis Seminar: "Time Decay Estimates for
Wave Equations"
MICHAEL BEALS, *IAS*

School of Mathematics
Applied Mathematics Seminar: "Hamiltonian
Structure of 3D Incompressible Flow"
THOMAS BUTTKE, *IAS*

School of Mathematics
Mathematical Physics Seminar: "A Nonlinear
PDE Describing Fluctuations in a Cellular
Automaton Interface"
EUGENE SPEER, *IAS*

January 15
School of Historical Studies
Islamic Seminar
MOHAMMAD AL-ASAD, *IAS*

Faculty Lecture: "Industrialization and Its
Manifold Discontents: West, East, and South"
ALBERT HIRSCHMAN, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Black Holes &
Liouville Theory"
S. SHATASHVILI, *Rutgers University*

January 16
School of Mathematics
Applied Math/Partial Differential Equations
Seminar: "Multi-constrained Variational
Problems in MHD"
BRUCE TURKINGTON, *University of Massachusetts*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Michael
Oakeshott's World of Ideas"
TERRY NARDIN, *University of Wisconsin-Milwaukee*

January 17
School of Natural Sciences
Lunchtime Seminar: "New Symmetries & States
in Two-Dimensional Closed String Theory"
BARTON ZWIEBACH, *IAS*

January 20
School of Mathematics
Members Seminar: "Boundedness of Fano
Varieties"
ALAN NADEL, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Exact S Matrix for
Two-Dimensional String Theory"
R. PLESSER, *Yale University*

January 21
School of Mathematics
Analysis Seminar: "Dislocation in Crystals"
AVNER FRIEDMAN, *University of Minnesota*

School of Mathematics
Applied Mathematics Seminar: "Black Hole
Accretion with Radiative Viscosity"
ABRAHAM LOEB, *IAS*

School of Mathematics
Mathematical Physics Seminar: "Convection
Enhanced Diffusion"
GEORGE PAPANICOLAOU, *IAS*

January 22
School of Historical Studies
Public Lecture: "Byzantium and the Rise of
Islam: Culture, Religion, and the State"
AVERIL CAMERON, *King's College London*

School of Mathematics
Applied Mathematics Seminar: "Implicit
Numerical Methods for Kinetic Equations"
GIOVANNI RUSSO, *L'Aquila*

January 23
School of Mathematics
CR and Related Structures Seminar: "Some
Progress on Spherical CR Manifolds"
ZHONGUAN LI, *MIT*

School of Mathematics
Special Mathematical Physics Seminar: "Graph
Cohomology"
MAXIM KONTSEVICH, *Harvard University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Why Is It So
Hard to Change the World?"
BERNHARD PETERS, *Johann Wolfgang Goethe
Universität, Frankfurt*

January 27
School of Mathematics
Members Seminar: "An Extended Bochner
Approach to Stochastic Integration"
MALEMPATI RAO, *IAS*

School of Social Science
Law and Ethics Seminar: Difference: Feminism
and Law, Discussion of Drucilla Cornell, *Beyond
Accommodation: Ethical Feminism, Deconstruction, and
the Law*, Chapter 4, "Feminine Writing, Metaphor
and Myth"
DRUCILLA CORNELL, *Benjamin N. Cardozo School of
Law*

January 28
School of Historical Studies
Medieval Seminar: "What Senses and Intellect
Do: Argument and Judgment in Late Medieval
Theories of Knowledge"
KATHERINE TACHAU, *The University of Iowa*

School of Mathematics
Analysis Seminar: "A Priori Estimates of
Solutions to Nonlinear Elliptic Equations"
CONGMING LI, *IAS*

School of Mathematics
Applied Mathematics Seminar: "Existence and
Uniqueness of a Pressure Field for the Variational
Euler Equations"
YANN BRENIER, *IAS*

School of Mathematics
Mathematical Physics Seminar: "Anisotropic
Localization"
PING SHENG, *Exxon Research and Engineering
Company*

January 29
School of Historical Studies
Seminar: "Christians and Jews in Seventh- and
Eighth-Century Byzantium"
AVERIL CAMERON, *King's College London*

School of Natural Sciences
Condensed Matter Seminar: "The Missing Phases
of the Liquid Crystal-Superconductor Analogy"
SCOT R. RENN, *Cornell University*

School of Natural Sciences
Theoretical Physics Seminar: "Effective String
Amplitudes for Hadronic Physics"
D. LEWELLEN, *University of California-Santa Barbara*

January 30
School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The
Conjuncture of Gender and State Interests in
Africa"
GWENDOLYN MIKELL, *Georgetown University*

January 31
School of Natural Sciences
Lunchtime Seminar: "Black Holes in Magnetic
Monopoles"
ERICK WEINBERG, *IAS*

February 3
School of Mathematics
Members Seminar: "Collective Misbehavior of an
Interacting Particle System"
S.R. VARADHAN, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "A Possible
Solution to the Strong CP Problem"
STUART SAMUEL, *City College of New York*

February 4
School of Historical Studies
Medieval Seminar: "Trotula: The Cultural
History of a Text"
MONICA GREEN, *Duke University*

School of Mathematics
Analysis Seminar: "On the Regularity of
Spherically Symmetric Wave Maps"
A. SHADI TAHVILDAR-ZADEH, *IAS*

School of Mathematics
Applied Mathematics Seminar: "Small Scale
Structures in Quasi-two-dimensional Flow"
WEINAN E, *IAS*

School of Mathematics
Mathematical Physics Seminar: "Constrained
Euler Equations for Internal Range Dynamics
Turbulence"
Z. S. SHE, *Princeton University*

February 5
School of Natural Sciences
Condensed Matter Seminar: "Novel Electron
Correlations Manifested in Double-Layer
Quantum Hall Systems"
GREGORY S. BOEBINGER, *AT&T Bell Laboratories*

February 6
School of Mathematics
Complex Analysis Seminar: "Geometry of
Global Mizohata Structures"
HOWARD JACOBOWITZ, *IAS*

School of Mathematics
Special Applied Mathematics Seminar: "Spurious
Frequencies in Fluid Mechanics Resulting from
Boundary Conditions"
SAUL ABARBANEL, *Tel Aviv*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology of P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "On Political
Evil"
GEORGE KATEB, *Princeton University*

February 10
School of Mathematics
Members Seminar: "Floer Cohomology and
Arnold-Givental Conjecture of Lagrangian
Intersections"
YONG-GEUN OH, *IAS*

School of Social Science
Law and Ethics Seminar: The Rhetoric of
American Politics, Discussion of Jon Rieder,
"Free Riders and Freedom Riders: Biblical
Narrative and Investment Logic in the Civil
Rights Movement"
JON RIEDER, *Barnard College*

February 11
School of Mathematics
Analysis Seminar: "Parabolic Harnack
Inequalities and Free Boundary Problems"
SANDRO SALSA, *University of Milan*

School of Mathematics
Applied Mathematics Seminar: "The Half-cylinder Wake Evolution of the Karman Vortex Street and Models of Turbulence"
G. BROWN, *Princeton University*

School of Mathematics
Mathematical Physics Seminar: "Asymptotic Stability of Soliditary Waves"
M. WEINSTEIN, *University of Michigan*

February 12
School of Natural Sciences
Condensed Matter Seminar: "Theories of Directed Lines"
R. KAMIEN, *Harvard University*

February 13
School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale Cohomology of P-ADIC Analytic Spaces" (continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Building Democracies in Hard Times: The Current Latin American Experience"
JUAN CARLOS TORRE, *Instituto Torcuato di Tella, Buenos Aires*

February 14
School of Natural Sciences
Lunchtime Seminar: "Domain Walls in Supergravity & Superstring Theory"
MIRJAM CVETIĆ, *University of Pennsylvania*

February 15
School of Historical Studies
Islamic Seminar
JEROME CLINTON, *Princeton University*

February 17
School of Mathematics
Members Seminar: "On the Structure of the Algebraic Groups over Number Fields"
GEORGE TOMANOV, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "When Vacuum Bubbles Collide"
M. TURNER, *University of Chicago & Fermilab*

February 18
School of Historical Studies
Medieval Seminar: "Horatius on the Bridge"
ROBERT DAVIS, *Florida Atlantic University*

School of Mathematics
Analysis Seminar: "Phase Space Analysis of Non-linear Waves, Global Existence and Rough Operators"
A. SOFFER, *Princeton University*

School of Mathematics
Applied Mathematics Seminar: "On the Transport of a Passive Scalar in 2D Turbulent Flow"
J. KALDA, *Estonian Academy of Sciences*

School of Mathematics
Mathematical Physics Seminar: "Statistical Mechanics of Some Stationary Non-equilibrium Processes"
JOEL LEBOWITZ, *Rutgers University*

February 19
School of Mathematics
Joint IAS-Princeton University Seminar on Algebraic Groups: "Invariant and Finite Generation Problems on Homogeneous Spaces"
ARMAND BOREL, *IAS*

Faculty Lecture: "An Interpretation of Persian Painting"
OLEG GRABAR, *IAS*

February 20
School of Mathematics
Complex Analysis Seminar: "Extremal Kähler Metrics"
CLAUDE LEBRUN, *SUNY Stony Brook*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale Cohomology for P-ADIC Analytic Spaces" (continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Exit and Voice in the Downfall of the German Democratic Republic"
ALBERT HIRSCHMAN, *IAS*

February 24
School of Historical Studies
Mellon Seminar: "Culture and the State"
JOHN BELDON SCOTT, "Interpreting the
Representation of the Shroud: Court Spectacle
and Religion in Early Modern Turin"; HILARY
BALLON, "Education and National Identity in 17th
Century France: the Policies of Cardinals
Richelieu and Marzarin"; and JEAN-FRANÇOIS
SALLES, "Archaeology and Politics in the Middle
East"

School of Mathematics
Members Seminar: "Arithmetic
Compactifications of Modular Varieties"
KAZUHIRO FUJIWARA, *IAS*

School of Social Science
Law and Ethics Seminar: Law and Culture in
America, Discussion of Albrecht Funk,
"American Individualism and the Right-to-
Privacy"
ALBRECHT FUNK, *Universität Hamburg*

February 25
School of Mathematics
Analysis Seminar: "A Priori Estimates for
Parametric Problems"
LIHE WANG, *Princeton University*

School of Mathematics
Applied Mathematics Seminar: "Vortex Sheet
Motion"
R. KRASNY, *University of Michigan*

School of Mathematics
Mathematical Physics Seminar: "Product Hardy
Spaces and Averaging Lemmas"
MAX BEZARD, *IAS*

February 26
School of Historical Studies
Islamic Seminar
SHAUN MARMON, *IAS*

School of Mathematics
Special Analysis Seminar: "Vortices for
Minimizers to a Variational Problem"
DAN PHILLIPS, *Purdue University*

School of Mathematics
Joint IAS-Princeton University Seminar on
Algebraic Groups: "Invariant and Finite
Generation Problems on Homogeneous Spaces"
(continued)
ARMAND BOREL, *IAS*

February 27
School of Mathematics
Joint IAS-Princeton University Complex
Analysis Seminar: "Homotopy Formulas for 2b"
S. BERHANU, *Temple University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The Justice of
the Queue: Life-Saving, Chance and
Commitment in Jewish and Western
Perspectives"
NOAM ZOHAR, *IAS*

February 28
School of Natural Sciences
Lunchtime Seminar: "Global-Symmetry
Violation in Particle Physics & Cosmology"
MARK KAMIONKOWSKI, *IAS*

March 2
School of Mathematics
Theoretical Physics Seminar: "Integrable Models
and Topological Field Theories"
BORIS DUBROVIN, *University of Naples*

School of Mathematics
Members Seminar: "Iwasawa's Main Conjecture
for CM Fields and Deformations of Galois
Representations"
JACQUES TILOUINE, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Integrable Models
& Topological Field Theories"
B. DUBROVIN, *University of Naples*

March 3
School of Mathematics
Analysis Seminar: "Eta Invariant and Degenerate
Elliptic and Parabolic Problems"
XIANZHE DAI, *IAS*

School of Mathematics
Applied Mathematics Seminar: "Negative
Temperature States and Large Scale Long-lived
Structures in 2D Turbulence"
G. EYINK, *Rutgers University*

School of Mathematics
Mathematical Physics Seminar: "Numerical
Transport in Diffusive Regimes"
SHI JIN, *IAS*

March 4
School of Mathematics
Joint IAS-Princeton University Seminar on
Algebraic Groups: "Epimorphic Subgroups of
Complexity One"
FREDERIC BIEN, *Princeton University*

March 5
School of Historical Studies
Art History Colloquium: "Santiago de
Compostela: Pilgrimage, Piety and Politics"
JOHN WILLIAMS, *University of Pittsburgh*

School of Mathematics
Joint IAS-Princeton University Complex
Analysis Seminar: "Estimates on the Bergman
Kernels of Convex Domains"
JEFF MC NEAL, *Princeton University*

School of Mathematics
Special Mathematical Physics Seminar: "Order,
Topology and Shape of Closed Vesicles"
TOM LUBENSKY, *University of Pennsylvania*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Varieties of
Terrorism: Left Wing and Right Wing Terrorism
in Italy"
FRANCO FERRARESI, *Università degli Studi di Torino*

March 9
School of Mathematics
The Fifteenth Marston Morse Memorial Lectures:
"Degeneration of Riemannian Metrics Under
Curvature Bounds" (1 of 3)
JEFF CHEEGER, *Courant Institute, New York
University*

School of Mathematics
Joint IAS-Princeton University Seminar on
Algebraic Groups: "Equivariant Embeddings of
Spherical Varieties"
FRIEDRICH KNOP, *Basel and Rutgers*

March 10
School of Historical Studies
Medieval Seminar: "The 'Book of Prophecies' by
Christopher Columbus: Its Cultural
Background"
ROBERTO RUSCONI, *University of Salerno*

School of Mathematics
Analysis Seminar: "H-systems with Variable H"
ENRIQUE LAMI DOZO, *Université Libre de Bruxelles,
Belgium*

School of Mathematics
Applied Mathematics Seminar: "Thermal
Turbulence"
A. LIBCHABER, *NEC Research Institute*

School of Mathematics
Mathematical Physics Seminar: "Particle Systems
over Stochastic Flows"
ERHAN ÇINLAR, *IAS*

School of Natural Sciences
Condensed Matter Colloquium: "Current Status
of Fractional Statistics Superconductivity as an
Explanation of High-Tc Superconductors"
R.B. LAUGHLIN, *Stanford University*

March 11
School of Mathematics
The Fifteenth Marston Morse Memorial Lectures:
"Degeneration of Riemannian Metrics Under
Curvature Bounds" (2 of 3)
JEFF CHEEGER, *Courant Institute, New York
University*

Faculty Lecture: "Prime Numbers: From
Recreational Mathematics to Practical Uses"
ENRICO BOMBIERI, *IAS*

March 12
School of Mathematics
Joint IAS-Princeton University Complex
Analysis Seminar: "CR Maps and Spherical Space
Forms"
JOHN D'ANGELO, *University of Illinois, Urbana-
Champaign*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Bernini's Bust
of the Savior and the Problem of the Homeless
in Seventeenth Century Rome"
IRVING LAVIN, *IAS*

March 13
School of Mathematics
The Fifteenth Marston Morse Memorial Lectures:
"Degeneration of Riemannian Metrics Under
Curvature Bounds" (3 of 3)
JEFF CHEEGER, *Courant Institute, New York
University*

School of Natural Sciences
Lunchtime Seminar: "Application of the
Renormalization Group to the QCD Phase
Transition"
FRANK WILCZEK, *IAS*

March 16
School of Mathematics
Special Mathematical Physics Seminar:
"Integrable Turbulence"
VLADIMIR ZAKHAROV, *University of Arizona*

School of Mathematics
Special Seminar: "Quantum KdV Hamiltonians,
and Affine Quantum Groups"
EDWARD FRENKEL, *Harvard University*

School of Mathematics
Members Seminar: "Controlled Topology, New
Spaces, and the Characterization of Manifolds"
STEVEN FERRY, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Staircase Model: Is
It a Joke or Not?"
A. ZAMOLODCHIKOV, *Rutgers University*

School of Social Science
Law and Ethics Seminar: Ethnography of
Political/Legal Conflict: France, Discussion of Luc
Boltanski, "Endless Disputes, from Intimate
Injuries to Public Denunciations"
LUC BOLTANSKI, *École des Hautes Études en Sciences
Sociales, Paris*

March 17
School of Mathematics
Mathematical Physics Seminar: "Variational
Principles and Bounds for Viscoelastic and Other
Nonselfadjoint Transport Problems"
GRAEME MILTON, *Courant Institute*

March 18
School of Historical Studies
Islamic Seminar
HASSAN ELBOUDRARI, *IAS*

School of Mathematics
Joint IAS-Princeton University Seminar in
Algebraic Groups: "Weyl Groups of Spherical
Varieties"
FRIEDRICH KNOP, *Basel and Rutgers*

March 19
School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The
Sociology of Critical Capacity"
LUC BOLTANSKI, *École des Hautes Études en Sciences
Sociales*

March 21
School of Mathematics
Workshop on Fluid Dynamics and Statistical
Physics
A. CHORIN, A. LIBCHABER, A. MAJDA, G.
PAPANICOLAOU, T. SPENCER, *IAS*

March 23
School of Mathematics
Members Seminar: "Representations of
Semidirect Product Lie Groups of Finite Length"
CHARLES CONLEY, *IAS*

March 24
School of Historical Studies
Medieval Seminar: "Words and Pictures"
ELIZABETH BEATSON, *IAS Alumna*

March 25
School of Mathematics
Joint IAS-Princeton University Seminar in
Algebraic Groups: "Contractions of Actions of
Algebraic Groups"
FRANK GROSSHANS, *University of Pennsylvania*

March 26
School of Mathematics
Joint IAS-Princeton University Complex
Analysis Seminar: "Holomorphic Curvature and
Geodesic Disks"
MARCO ABATE, *Università de Roma II*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "Privacy in the
Era of Cyberspace"
ALBRECHT FUNK, *Universität Hamburg*

March 27
School of Historical Studies
Seminar: "The Art of 'Others' in Four Capitals:
London, Paris, Berlin, and Vienna"
MICHAEL ROGERS, *School of Oriental and African
Studies, London*, GLEN LOWRY, *National Gallery of
Art, Toronto*

School of Natural Sciences
Lunchtime Seminar: "Black Holes as Elementary
Particles"
CHRISTOPH HOLZHEY, *Princeton University*

March 30
School of Mathematics
Special Analysis Seminar: "Recent Progress on
Stability of Viscous Shock Waves"
TAI-PING LIU, *Stanford University*

School of Mathematics
Members Seminar: "Abstract and Topological
Properties of Arithmetic Groups and Their
Application"
VLADIMIR PLATONOV, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Topology of
Moduli Spaces"
GRAEME SEGAL, *Cambridge University*

School of Social Science
Law and Ethics Seminar: History of Political/
Moral Conflict: France, Discussion of "Voltaire
and the Invention of the Public 'Affaire' "
ELISABETH CLAVERIE, *École des Hautes Études en
Sciences Sociales, Paris*

March 31
School of Historical Studies
Medieval Seminar: "Dangerous Manoeuvres:
Intercession and Social Status in Mamluk Egypt"
SHAUN MARMON, *IAS*

School of Mathematics
Analysis Seminar: "Approximation of Waves in a
Space Frequency Formulation"
JIM DOUGLAS, *Purdue University*

School of Mathematics
Mathematical Physics Seminar: "Detection,
Characterization and Processing of Singularities
with Wavelets"
STEPHANE MALLAT, *Courant Institute*

School of Natural Sciences
Theoretical Particle Physics Seminar: "Loop Gas
Model for Open Strings"
V. A. KAZAKOV, *École Normale Supérieure*

April 1
School of Mathematics
Special Seminar: "Semi Classical Limit of the
Cubic Schröedinger Hierarchies"
CHARLES DAVID LEVERMORE, *University of Arizona*

School of Mathematics
Joint IAS-Princeton University Seminar in
Algebraic Groups: "Contractions of Actions of
Algebraic Groups" (continued)
FRANK GROSSHANS, *University of Pennsylvania*

April 2
School of Historical Studies
Art History Colloquium: "The Representation of
Preachers in the Art at the End of the Middle
Ages as a Mirror of Reality"
ROBERTO RUSCONI, *University of Salerno*

School of Mathematics
Joint IAS-Princeton University Complex
Analysis Seminar: "Real Analytic Regularity of
Bergman and Szego Projections on Decoupled
Domains"
SO-CHIN CHEN, *SUNY*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The
Relativity of Linguistic Strategies: Rethinking
Power and Solidarity"
DEBORAH TANNEN, *Georgetown University*

April 6
School of Natural Sciences
Theoretical Particle Physics Seminar: "The Secret
Chern-Simons Action for the Hot Gluon Plasma"
V.P. NAIR, *Columbia University*

April 7
School of Historical Studies
Medieval Seminar: "Colonial Murals from
Morelos, Mexico"
CHRISTOPHER COUCH, *Smith College*

School of Mathematics
Analysis Seminar: "Elliptic Equations with
V.M.O. Coefficients"
FILIPPO CHIARENZA, *Università di Catania*

School of Mathematics
Mathematical Physics Seminar: "Stability of
Viscous Shock for Systems of Conservation
Laws"
J. XIN, *Courant Institute*

School of Natural Sciences
Theoretical Physics Seminar: "A Predictive
Framework for Fermion Masses in
Supersymmetric Theories"
S. DIMOPOULOS, *Stanford University*

April 8
School of Historical Studies
Islamic Seminar
DROR ZEEVI, *Princeton University*

School of Mathematics
Special Mathematical Physics Seminar:
"Continuous Symmetry Breaking in Statistical
Mechanics"
T. BALABAN, *Rutgers University, Boston University*

School of Mathematics
Joint IAS-Princeton University Seminar in
Algebraic Groups: "The Invariants of a Set of
(2x2)-matrices and Their Applications to Discrete
Groups"
ERNEST VINBERG, *Moscow, MIT*

April 9
School of Mathematics
Special Mathematical Physics Seminar:
"Numerical Methods for Acoustic Inverse
Scattering"
YU CHEN, *IAS*

School of Mathematics
Joint IAS-Princeton University Complex
Analysis Seminar: "Constructible Functions and
Lagrangian Cycles"
PIERRE SCHAPIRA, *Université de Paris-Nord*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale
Cohomology for P-ADIC Analytic Spaces"
(continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "The *Enquête:*
Medical Observation as a Technique of
Government in Modern Paris"
ANDREW AISENBERG, *IAS*

April 10
School of Natural Science
Lunchtime Seminar: "A New (Old?) String-
Inspired Approach to Field Theory Calculations:
Understanding the Bern-Kosower Rules"
MATT STRASSLER, *Stanford University*

April 13
School of Mathematics
Special Analysis Seminar: "Nonlinear Oblique
Boundary Value Problems for Parabolic
Equation"
NINA URALTZEVA, *Russia*

School of Natural Sciences
Theoretical Physics Seminar: "A Survey of the Green's Bracket"
DONALD M. MAROLF, *University of Texas at Austin*

School of Social Science
Law and Ethics Seminar: Difference: Islamic Ethics, Discussion of Hassan Elboudrari, "When Sainthood Ends in Conformity: Ethical Discourse of (/on) a Muslim Saint (Morocco, 17th c.)"
HASSAN ELBOUDRARI, *IAS*

April 14
School of Mathematics
Analysis Seminar: "Singular Perturbations of Functionals and Applications to Phase Transitions"
ANTONIO CORDOBA, *Universidad Autónoma de Madrid*

School of Mathematics
Mathematical Physics Seminar: "Singularities for Complex Solutions of the 3D Euler Equations"
RUSSELL CAFLISCH, *UCLA*

April 15
School of Mathematics
Special Mathematical Physics Seminar: "Rigorous Feasibility Constraints for Nonlinear Inversion Problems"
JAMES BERRYMAN, *Lawrence Livermore Laboratory*

School of Mathematics
Mathematical Physics Seminar: "Numerical Methods for Acoustic Inverse Scattering"
YU CHEN, *IAS*

School of Mathematics
Joint IAS-Princeton University Seminar in Algebraic Groups: "An Elementary Counter Example to Hilbert's Fourteenth Problem"
LIN TAN, *University of Pennsylvania-West Chester*

April 16
School of Mathematics
Joint IAS-Princeton University Complex Analysis Seminar: "Parametrices for Laplacians in Strictly Pseudoconvex Domains"
GERARDO MENDOZA, *Temple University*

School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale Cohomology for P-ADIC Analytic Spaces" (continued)
VLADIMIR BERKOVICH, *IAS*

School of Social Science
Social Science Luncheon Seminar: "In the Vicinity of Sainthood: Glimpses of (Islamic) Hagiographic Discourses."
HASSAN ELBOUDRARI, *IAS*

April 21
School of Historical Studies
Medieval Seminar: "Salvation, Heresy and Miracles: Theology of the Eucharist in the Early 13th Century"
GARY MACY, *University of California, San Diego*

April 22
School of Natural Sciences
Condensed Matter Seminar: "Self-Organized Critical Phenomena"
CHAO TANG, *NEC Research Institute*

April 23
School of Mathematics
P-ADIC Analytic Spaces Seminar: "Etale Cohomology for P-ADIC Analytic Spaces" (continued)
VLADIMIR BERKOVICH, *IAS*

April 24
School of Natural Sciences
Lunchtime Seminar: "Collective Field Theory of Open & Closed Strings in 1 + 1 Dimensions"
MICHAEL DOUGLAS, *Rutgers University*

April 27
School of Natural Sciences
Theoretical Physics Seminar: "Developments in Chern-Simons Perturbation Theory"
SCOTT AXELROD, *MIT*

School of Social Science
Law and Ethics Seminar: American Culture and Politics, Discussion of Jennifer Hochschild, "The Word American Ends in Can: The Ambiguous Promise of the American Dream"
JENNIFER HOCHSCHILD, *Princeton University*

April 28
School of Mathematics
Mathematical Physics Seminar: "Invariant Gibbs
Measures for Semilinear Wave Equations"
K. VANINSKY, *Courant Institute*

May 1
Board of Trustees Lecture: "The Language of
God: Reflections on Modern Physics"
FRANK WILCZEK, *IAS*

May 5
School of Mathematics
Applied Mathematics Seminar: "Dynamical
Phase Transitions in Interacting Lattice Gases"
STEPHANE ZALESKI, *École Normale Supérieure,
CNRS*

May 8
School of Natural Sciences
Lunchtime Seminar: "Growing Inhomogeneities
in Cosmological Goldstone Modes"
KATHERINE BENSON, *IAS*

May 11
School of Mathematics
Members Seminar: "The Based Rings of Cells in
Affine Weyl Groups of Rank 2"
NANHUA XI, *IAS*

School of Natural Sciences
Theoretical Physics Seminar: "Thermal
Fluctuations of Rigid Chiral Membranes"
PHIL NELSON, *University of Pennsylvania*

School of Social Science
Law and Ethics Seminar: Philosophical
Postscript, discussion of Allan Gibbard, *Wise
Choices, Apt Feelings,* "Communities of
Judgment" and "Rationale and Warrant"
ELISABETTA GALEOTTI, *Università degli Studi di
Torino*

May 13
School of Natural Sciences
Theoretical Physics Seminar: "The Black Hole in
Three Spacetime Dimensions"
CLAUDIO TEITELBOIM, *IAS and Centro de Estudios
Científicos de Santiago*

May 19
School of Natural Sciences
Theoretical Physics Seminar: "Gamma Ray
Bursts: Facts & Fantasies"
BOHDAN PACYNSKI, *Princeton University*

May 22
School of Natural Sciences
Lunchtime Seminar: "Chiral Gravity"
VIPUL PERIWAL, *IAS*

May 26
School of Natural Sciences
Theoretical Physics Seminar: "$N = 2$
Supersymmetry & Polymers in Two
Dimensions"
HUBERT SALEUR, *Yale University*

June 3
School of Natural Sciences
Theoretical Physics Seminar: "Solar Neutrino
Update"
John Bahcall, IAS

June 5
School of Natural Sciences
Lunchtime Seminar: "Integrable Hierarchies &
$c = 1$ String Theory"
ROBBERT DIJKGRAAF, *IAS*

June 19
School of Natural Sciences
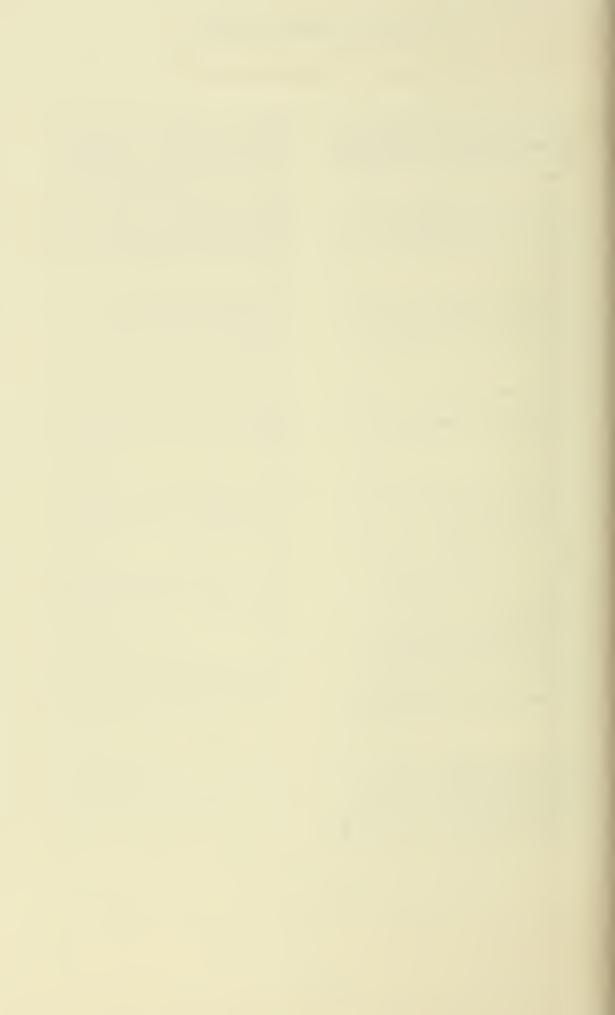Lunchtime Seminar: "Hamiltonian Structures of
Integrable Systems"
JEREMY SCHIFF, *IAS*

June 24
Institute Lecture: "Dealing with Genes"
PAUL BERG, *Stanford University*

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 the Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation (the "Institute") as of June 30, 1992 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, 1992 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

DELOITTE & TOUCHE
Parsippany, New Jersey
September 21, 1992

BALANCE SHEET
JUNE 30, 1992 [WITH COMPARATIVE AMOUNTS FOR 1991]

ASSETS	1992	1991
OPERATING FUNDS:		
Cash and temporary investments	$ 169,772	$ 780,959
Accounts receivable	95,955	63,389
Government grants and contracts receivable	814,254	953,203
Accrued income on investments	963,088	1,325,729
Prepaid and other assets	397,306	245,022
Due from endowment fund	600,000	
TOTAL OPERATING FUNDS	$ 3,040,375	$ 3,368,302
PLANT FUNDS:		
Short-term investments [Note B]	$ 7,228,752	$ —
Restricted cash		458,114
Unamortized debt issuance expense	135,407	62,142
Land, buildings and improvements, equipment and rare book collection — net [Note C]	19,024,402	17,216,399
TOTAL PLANT FUNDS	$ 26,388,561	$17,736,655
ENDOWMENT AND SIMILAR FUNDS:		
Investments, at cost [Notes B & D]	$206,305,411	$182,886,503
TOTAL ENDOWMENT AND SIMILAR FUNDS	$206,305,411	$182,886,503

LIABILITIES AND FUND BALANCES	1992	1991
OPERATING FUNDS:		
Accounts payable and accrued expenses	$ 1,072,840	$ 1,653,510
Deferred restricted revenue [Note F]	1,925,189	1,536,791
Fund balance — unrestricted	42,346	178,001
TOTAL OPERATING FUNDS	$ 3,040,375	$ 3,368,302
PLANT FUNDS:		
Interest payable [Note D]	$	$ 293,114
Long-term debt [Note D]	17,635,523	7,489,435
Plant fund balance	8,753,038	9,954,106
TOTAL PLANT FUNDS	$ 26,388,561	$ 17,736,655
ENDOWMENT AND SIMILAR FUNDS:		
Due to operating funds	$ 600,000	$ —
Fund balances:		
True endowment	41,273,383	37,923,222
Quasi-endowment:		
Restricted	17,473,828	16,740,382
Unrestricted:		
Designated	12,376,295	11,560,295
Undesignated	134,581,905	116,662,604
TOTAL ENDOWMENT AND SIMILAR FUNDS	$206,305,411	$182,886,503

STATEMENT OF SUPPORT AND REVENUE, EXPENSES, CAPITAL ADDITIONS AND CHANGES IN FUND BALANCES FOR THE YEAR ENDED JUNE 30, 1992 [WITH COMPARATIVE AMOUNTS FOR 1991]

	OPERATING FUNDS	
	UNRESTRICTED	RESTRICTED
SUPPORT AND REVENUE:		
Endowment income	$ 5,362,123	$2,232,194
Less — management fees	[1,036,916]	[431,254]
Private gifts and grants	500	1,142,481
Government grants and contracts		2,985,516
Total support and revenue	4,325,707	5,928,937
EXPENSES:		
School of Mathematics	1,114,728	2,403,838
School of Natural Sciences	1,654,173	2,090,540
School of Historical Studies	1,778,952	745,720
School of Social Science		1,282,664
Libraries and other academic expenses	1,257,753	321,325
Administration and general	2,831,725	10,549
Auxiliary activity — tenants' housing expenses, net of unrestricted revenue of $252,542 in 1992	125,514	91,840
Total expenses	8,762,845	6,946,476
EXCESS [DEFICIENCY] OF SUPPORT AND REVENUE OVER EXPENSES BEFORE CAPITAL ADDITIONS	[4,437,138]	[1,017,539]
CAPITAL ADDITIONS:		
Gifts and grants		
Realized gain on investments — net		
Gain on sale of plant assets		
Investment income		
Total capital additions		
EXCESS [DEFICIENCY] OF SUPPORT AND REVENUE OVER EXPENSES AFTER CAPITAL ADDITIONS	[4,437,138]	[1,017,539]
FUND BALANCES AT BEGINNING OF YEAR	178,001	
TRANSFERS:		
Plant acquisitions and principal debt service payments and other, net	113,402	
Quasi-endowment funds utilized	4,244,957	1,029,011
Transfers to other endowment and similar funds	[56,876]	[11,472]
FUND BALANCES AT END OF YEAR	$ 42,346	$ —0—

See Notes to Financial Statements

TOTAL	PLANT FUNDS	ENDOWMENT AND SIMILAR FUNDS	TOTAL 1992 ALL FUNDS	TOTAL 1991 ALL FUNDS
$ 7,594,317			$ 7,594,317	$ 9,671,629
[1,468,170]			[1,468,170]	[1,082,824]
1,142,981			1,142,981	1,275,104
2,985,516			2,985,516	2,621,374
10,254,644			10,254,644	12,485,283
3,518,566	$ 271,630		3,790,196	3,414,883
3,744,713	294,002		4,038,715	3,824,877
2,524,672	157,057		2,681,729	2,657,759
1,282,664	68,070		1,350,734	1,396,594
1,579,078	153,301		1,732,379	2,109,915
2,842,274	227,918		3,070,192	2,815,668
217,354	119,732		337,086	251,628
15,709,321	1,291,710		17,001,031	16,471,324
[5,454,677]	[1,291,710]		[6,746,387]	[3,986,041]
	203,744	$ 11,850,908	12,054,952	1,989,807
		16,173,620	16,173,620	809,236
	300			
				2,802
	204,044	28,024,528	28,228,572	2,801,845
[5,454,677]	[1,087,666]	28,024,528	21,482,185	[1,184,196]
178,001	9,954,106	182,886,503	193,018,610	194,202,806
113,402	[113,402]			
5,273,968		[5,273,968]		
[68,348]		68,348		
$ 42,346	$8,753,038	$205,705,411	$214,500,795	$193,018,610

STATEMENT OF CHANGES IN FINANCIAL POSITION
FOR THE YEAR ENDED JUNE 30, 1992 [WITH COMPARATIVE AMOUNTS FOR 1991]

	OPERATING FUNDS	PLANT FUNDS
RESOURCES PROVIDED:		
Deficiency of support and revenue over expenses before capital additions	$ [5,454,677]	$[1,291,710]
Capital additions:		
Gifts and grants		203,744
Realized gain on investments — net		
Investment income		
Excess [deficiency] of support and revenue over expenses after capital additions	[5,454,677]	[1,087,966]
Items not using [providing] resources:		
Depreciation		1,291,710
Amortization of debt issuance expense		
Decrease to restricted cash		458,114
Gain on sale of investments — net		
Gain on sale of plant assets		300
Proceeds from sale of investments		
Increase in long-term debt		10,146,088
Decrease in receivables	106,383	
Decrease in accrued income	362,641	
Increase in payables		
Increase in deferred restricted revenue	388,398	
Increase in interfund — payables		
Total resources provided [used]	[4,597,255]	10,808,246
RESOURCES USED:		
Purchases of investments		7,228,752
Purchases of plant facilities and equipment		3,099,713
Increase in interfund — receivables	600,000	
Increase in receivables		
Increase in deferred charges	152,284	
Increase in restricted cash		
Increase in unamortized debt service expense		73,265
Decrease in payables	580,670	293,114
Reduction of long-term debt		
Total resources used	1,332,954	10,694,844
TRANSFERS:		
Plant acquisitions and principal debt service payments	113,402	[113,402]
Quasi-endowment funds utilized	5,273,968	
Transfers to other endowment and similar funds	[68,348]	
Total transfers	5,319,022	[113,402]
INCREASE [DECREASE] IN CASH AND TEMPORARY INVESTMENTS	$ [611,187]	$ —

	ENDOWMENT AND SIMILAR FUNDS	TOTAL 1992 ALL FUNDS	TOTAL 1991 ALL FUNDS
		$ [6,746,387]	$ [3,986,041]
	$ 11,850,908	12,054,652	1,989,807
	16,173,620	16,173,620	809,236
			2,802
	28,024,528	21,481,885	[1,184,196]
		1,291,710	1,351,425
			3,108
		458,114	
	[16,173,620]	[16,173,620]	[809,236]
		300	
	573,726,281	573,726,281	330,055,425
		10,146,088	
		106,383	171,903
		362,641	439,146
	6,821,009	6,821,009	766,194
		388,398	647,685
	600,000	600,000	
	592,998,198	599,209,189	331,441,454
	587,792,578	595,021,330	326,791,437
		3,099,713	3,273,533
		600,000	
			671,735
		152,284	20,489
			5,040
		73,265	
		873,784	4,960
			151,222
	587,792,578	599,820,376	330,918,416
	[5,273,968]		
	68,348		
	[5,205,620]		
	$ —	$[611,187]	$523,038

NOTES TO FINANCIAL STATEMENTS · JUNE 30, 1992

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.

Forward Contracts

The Institute enters into forward exchange contracts for the sale of foreign currencies as hedges of investments denominated in foreign currencies. Gains and losses resulting from such forward contracts are deferred and included in the measurement of the gain or loss of the hedged security when sold.

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.

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, 1992 are comprised of the following:

	CARRYING VALUE	MARKET VALUE
Pooled investments:		
Cash equivalents	$ 17,150,771	$ 17,150,771
Equity securities	110,476,211	111,615,460
Debt securities	81,182,572	82,649,724
Mortgages and notes receivable from faculty and staff	3,023,861	3,023,861
Investment accounts receivable	6,747,505	6,747,505
Investment accounts payable	[12,318,433]	[12,318,433]
Total pooled investments	206,262,487	208,868,888
Funds invested separately:		
Equity securities	42,924	57,325
Total	$206,305,411	$208,926,213

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 $1,688,024 and a market value of approximately $1,703,705 at June 30, 1992. The Institute accounts for these investments under the equity method and, accordingly, recognizes its proportionate share of ordinary income and net realized gains attributable to the investments of the partnerships. The Institute's proportionate share of ordinary income and net realized gain was $74,286 and $3,015,494, respectively, for the year ended June 30, 1992.

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, 1992, exclusive of realized gains and losses, amounted to $252 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, 1991	$189,001,190	$182,886,503	$ 6,114,687	$7,704
June 30, 1992	208,926,213	206,305,412	2,620,801	8,226
Decrease in unrealized appreciation for the year ended June 30, 1992			[3,493,886]	
Realized net gain for the year ended June 30, 1992			16,173,620	
Net realized and unrealized gain for the year ended June 30, 1992			$12,679,734	

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, 1992, 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, 1992 follows:

Land and improvements	$ 2,418,138
Buildings and improvements	22,959,646
Equipment	8,017,235
Rare book collection	199,508
Construction-in-progress	3,615,250
Total	37,209,777
Less accumulated depreciation	[18,185,375]
Net book value	$ 19,024,402

D · LONG-TERM DEBT

A summary of long-term debt at June 30, 1992 follows:

6.275%, 1991 — NJEFA	$ 17,895,000
Less unamortized bond discount	[259,477]
Total long-term debt	$ 17,635,523

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 $370,000 (1993), $385,000 (1994), $405,000 (1995), $425,000 (1996) and $455,000 (1997) will mature in each of the designated years. The remaining balance of $15,855,000 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.

Interest expense on long-term debt for the year ended June 30, 1992 was $960,690 net of $180,000 in interest costs capitalized as a component of construction-in-progress.

The Institute has an unused line of credit for $256,072.

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, 1992 totalled approximately $754,000.

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 1992, those costs totalled approximately $144,000.

In December 1990, the Financial Accounting Standards Board issued Statement of Financial Accounting Standards No. 106, "Employers' Accounting for Post-retirement Benefits Other Than Pensions" ("SFAS 106"). SFAS 106, effective for fiscal year 1994, will require that the Institute change its method of account-ing 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, 1991	$1,536,791
Additions:	
Contributions, grants, etc.	4,969,742
Net restricted endowment income	1,800,940
Quasi-endowment funds utilized	1,017,539
Total additions	7,788,221
Deductions:	
Funds expended from contributions, grants, etc.	4,581,344
Funds expended from restricted endowment	2,818,479
Total deductions	7,399,823
Balance at June 30, 1992	$1,925,189

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, aggre-gated $2,001,221 as of June 30, 1992 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 ($417,000 net of $379,000 in revenues) and Members' housing ($237,000, net of $906,000 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 $1,268,000 for the year ended June 30, 1992.

Interest expense on plant fund debt, net of interest income on short-term invest-ments, is allocated to schools based upon their occupancy of academic buildings funded with such debt. Allocated interest expense totalled $942,000 and allocated interest income totalled $273,000 for the year ended June 30, 1992.