The Institute for Advanced Study

Annual Report 1978/79

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been made possible by a generous grant from
the Union Carbide Corporation.

The Institute for Advanced Study

Annual Report for the Fiscal Year

July 1, 1978 - June 30, 1979

It is fundamental in our purpose, and our express desire, that in the appointments to the staff and faculty, as well as in the admission of workers and students, no account shall be taken, directly or indirectly, of race, religion, or sex. We feel strongly that the spirit characteristic of America at its noblest, above all, the pursuit of higher learning, cannot admit of any conditions as to personnel other than those designed to promote the objects for which this institution is established, and particularly with no regard whatever to accidents of race, creed or sex.

Extract from the letter addressed by the Founders to the Institute's Trustees, dated June 6, 1930, Newark, New Jersey.

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The Institute for Advanced Study: Background and Purpose

The Institute takes the following premises on the nature of learning as fundamental: most important work is the product of the disciplined and creative individual mind; accordingly, the individual scholar must be responsible for how he uses the precious resources of his own time and energy; the community of peers in his area of intellectual work is the ultimate judge of the results. (From PROCEDURES FOR ACADEMIC GOVERNANCE OF THE INSTITUTE.)

The Institute for Advanced Study, 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." During the past half-century, these goals have been implemented by a Faculty of exceptional merit; by an annually renewed group of carefully selected visiting members; and by the development of facilities and a mode of operation designed specifically to support and assist the Institute's intellectual purposes in every way possible.

Although the Institute is small when measured in terms of the size of its immediate academic community or of its operating budget, its intellectual weight is great and its influence on science and scholarship extraordinary. From its earliest years, it has been internationally recognized as one of the world's leading centers of research. Indeed, its successful example has created numerous imitators both in the United States and abroad.

From the beginning the Institute has been an international institution, although American in location and organizational form. It has operated throughout its existence on the premise that science and learning transcend national boundaries and that scholars and scientists are members of one republic of the spirit. Of the present Faculty, many have begun their scientific and scholarly careers outside the United States. One-third of the visiting members come from abroad, mostly from the great centers of learning of Western Europe and, to a lesser extent, from other regions of the world.

With its devotion to the continuing examination of new and centrally important questions as they arise at the frontiers of knowledge, the Institute partakes of the character of both a university and a research institute, while differing in significant ways from both. It is unlike a university, for instance, in its small size—its academic membership annually numbers somewhat under 200—and in the fact that it has no formal curriculum, no scheduled courses of instruction, no com-

mitment that all branches of learning be represented in its Faculty and members. It is unlike the usual research institute in that it supports many separate fields of study, maintains no laboratories and determines its programs in terms of individual intellectual imperatives rather than the collective aims of research teams or the particular interests of potential donors.

For close to five decades the Institute for Advanced Study has made a substantial contribution to the world of higher learning by providing support—intellectual and material—to visiting members whose development and growth constitute one of its principal purposes. More than half of these visiting members are young men and women 35 years of age or less whose work at the Institute involves the Faculty in a substantial amount of postdoctoral training. Though none of the visiting members are students in the narrow sense of being degree candidates, educational growth is still before them.

The Institute devotes special attention to identifying young people of accomplishment and promise, and offers them membership at a stage in their careers when independent work is of the highest importance to their intellectual development. These younger temporary members then return to or join the faculties of universities all over the world and share what they have learned as a result of their stay at the Institute. This might be termed the invisible work of the Institute; its visible work is contained in the publications of the Faculty and visiting members. Both serve to reinforce in highly significant ways the quality of scholarship and research throughout the world.

The varied work of the Institute is, of course, specialized; no advanced study or deep scholarship can be otherwise. Formal attempts to organize scholarly work at the Institute are minimized, although lectures and seminars are a regular feature of its internal life. The choice and conduct of research and study are matters which are decided entirely by each individual member of the Institute.

The Institute is nonetheless an intellectual community and not a mere collection of scholars. Community is possible because Faculty and members have some substantial knowledge outside their own fields of specialization. The fact that the visiting members live together in Institute housing, eat in the same dining hall, share the same common room and libraries, and carry out their work in an institutional setting where human scale has been carefully maintained is conducive to common interest, mutual understanding and friendship.

The Faculty and members of the Institute are also a part of the larger community of Princeton, with its University and its many institutions of research and learning. Many Institute seminars are open to interested members of the University's faculty and graduate school, and University seminars and conferences are frequently attended by Institute Faculty and members. Without the University, Princeton itself would be both physically and intellectually inadequate as the site of the Institute; and the Institute has brought a degree of international excellence to the general academic community of Princeton, contributing to the development of what has become one of the world's great educational centers.

The Institute today occupies a square mile of land in Princeton, New Jersey. Most of this is farm and woodland. Its buildings house libraries, offices for Faculty and members, seminar and lecture rooms, and common rooms. Although the Institute has no administrative or organic connection with Princeton University, there has always been very close collaboration between the two institutions on matters of common interest.

Report of the Chairman

The publication of the 1978-79 Annual Report of the Institute for Advanced Study coincides with the celebration of the Institute's fiftieth anniversary year. The information contained in this Report provides evidence of the overall intellectual and financial strength of the Institute and illustrates its continuing commitment to the advancement of research and scholarship throughout the world.

The Institute's financial position is shown as part of the Treasurer's Report. The performance of the endowment portfolio has consistently exceeded national averages and, in our view, the results obtained demonstrate responsible and successful stewardship of the funds entrusted to the Institute.

Given the absence of income from tuition, fees or large-scale alumni giving, and in a time of rapidly mounting operating costs and inflationary pressures, the Institute's ability to maintain its position at the frontiers of knowledge depends to an increasing extent on its ability to secure new endowment and operational funds. In this connection, the period 1977-81 has been focused on a capital campaign designed to add $15 million to the Institute's endowment.

There are several changes to note in the membership of the Board, the Faculty and the administration.

I would mention first, with sadness, our losses. Professor Emeritus Kurt Gödel died during the preceding year. Mr. Minot C. Morgan, Jr., our retired General Manager, died this year. More detailed accounts of their careers and contributions appear in the Report of the Director.

At the April, 1979, meeting of the Board of Trustees, the existing Corporate Officers were re-elected for an additional term, including Mr. John Hunt, who replaced Mr. Morgan as Secretary of the Corporation. Re-elected Trustees for the term expiring in 1984 were the Chairman, Mr. Donald B. Straus and Mrs. Elizabeth A. Whitehead.

Four new Trustees have been elected to the Board during the past two years:

Mrs. Gladys Krieble Delmas was born in Montgomery County, Pennsylvania, and received her B.A. from Vassar College in 1935. After further study at the Sorbonne and at the University of Cambridge, she resided in Europe and Latin America for more than three decades. In 1976 she endowed the Gladys Krieble Delmas Foundation, which conducts a program of fellowships for advanced research in Venice. In addition to her philanthropic activities, Mrs. Delmas is a press and radio journalist. She holds the Order of Merit from the Italian Government.

Mr. Howard C. Kauffmann, President of the Exxon Corporation, received his B.A. from the University of Oklahoma in 1943. Mr. Kauffmann has served in various capacities in the petroleum industry, occupying the posts of President of International Petroleum Co., Esso Inter-American and Esso Europe. He is a Director of the Chase Manhattan Corporation, the United Fund of Greater New York, the International Executive Service Corporation and the American Petroleum Institute.

Mr. Zeph Stewart, Professor of Greek and Latin and Chairman of the Department of Classics at Harvard University, was born in Jackson, Michigan, on January 1, 1921. He received his B.A. from Yale in 1942, was a Junior Fellow at Harvard from 1949 to 1951

and has been a member of the Harvard faculty since 1953. Professor Stewart has served as a Trustee of Radcliffe College, the Hotchkiss School and the Loeb Classical Library. His publications include *The Ancient World* and *Essays on Religion and the Ancient World*, which he edited.

Mr. James D. Wolfensohn is a General Partner of Salomon Brothers. Born in Australia in December, 1933, he holds B.A. and LL.B. degrees from the University of Sydney and an M.B.A. degree from the Harvard Graduate School of Business. Mr. Wolfensohn is Chairman of the Executive Committee of Carnegie Hall Corporation; Member of the Board of the Metropolitan Opera Association; President of the International Federation of Multiple Sclerosis Societies; and Trustee of the New York Landmarks Conservancy.

Dr. Robert Solow of M.I.T. submitted his resignation as a Trustee of the Institute, and the Board recorded its deep appreciation for his many contributions, particularly to the work of the Review Committee and the Governance Committee.

The Trustees were pleased to accept, with particular gratitude, a most generous gift from Mr. Harold K. Hochschild, a Trustee Emeritus. Mr. Hochschild has presented his Princeton residence to the Institute; in future it will be known as Mary Marquand House and will be used as the Institute's guest house and center for small Institute conferences.

Howard C. Petersen
Chairman

Report of the Director

Soon after the incorporation of the Institute for Advanced Study on May 20, 1930, the Institute's first Director, Dr. Abraham Flexner, published Bulletin Number One, devoted to a description of the organization and purpose of the Institute. Additional Bulletins appeared from time to time until 1946.

In subsequent years, a Report of the Director was issued by Dr. J. Robert Oppenheimer in 1954 and by Dr. Carl Kaysen in 1976. In the autumn of 1977, I instituted the first of two Director's Letters designed to acquaint alumni and friends with current activities at the Institute.

Building on these earlier forms of communication with a larger public, the Institute will henceforth publish Annual Reports. In the spirit of previous Bulletins, Reports of the Director and Director's Letters, the Annual Report will provide a continuing chronicle of the development of the Institute which in 1980 celebrates its fiftieth anniversary.

The year under review has been marked by important changes in the life of the Institute. It has been a time of loss and nostalgia, of renewal and hope, as our second half-century approaches.

On January 14, 1978, Kurt Gödel died in Princeton in his seventy-first year. There are those who believe that his was the most brilliant mind of the twentieth century. When Harvard University gave him an honorary degree, the citation described him as "discoverer of the most significant mathematical truth of this century, incomprehensible to laymen, revolutionary for philosophers and logicians." Professor Gödel was first named a visiting member at the Institute in 1933 and joined the Faculty in 1953. He retired as Professor Emeritus in 1976.

Minot C. Morgan, Jr., died in Princeton on January 21, 1979, after twenty-five years as general manager and comptroller of the Institute. On the occasion of his retirement from the Institute on September 1, 1978, the Trustees formally recorded their "deep appreciation for his many years of faithful, efficient, and exemplary stewardship." The Institute was fortunate indeed to have benefited from the service of one so widely known for his integrity and fairness. All those who worked with him were touched by the quality of his devotion to the institution which by his many contributions he did so much to build.

The personal worlds of these two men were of course widely separated, yet in quite different ways they both represented the Institute in the minds of many. Just as the world of thought owes much to Professor Gödel, the microcosm of that world which is the Institute is indebted to Mike Morgan. I record here our sense of pride in their accomplishments and our deep sympathy for their families.

For these and other reasons it was a year of looking back as well as forward. The Einstein Centennial Celebration for which the Institute willingly assumed a major responsibility vividly reminded us of what we as an institution owe to those who preceded us here. The realization that our fiftieth anniversary was little more than a year away emphasized our responsibility to those who will one day take our places. By celebrating the past, we prepare the future. With all of his distaste for pomp and ceremony, Albert Einstein would, I hope, have understood and perhaps approved the complexity of our motives.

Kurt Gödel (1906-1978)

In 1931, as a young man 25 years of age at the University of Vienna, Kurt Gödel revolutionized the study of the foundations of mathematics. He was the foremost logician of the century, a man without peers in this subject. His achievements in mathematical logic were immense and completely changed the nature and possibilities of the discipline. He was the first to demonstrate that the axiomatic method, a powerful technique initiated by Euclid, possesses inherent limitations. More specifically, he showed that there is no general mechanical procedure for testing the truth of mathematical statements. This result has had profound implications for philosophy.

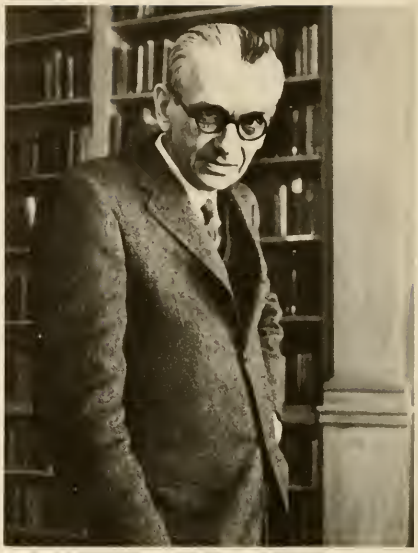
In the history of mathematical logic, these achievements remain singular and monumental. No indemonstrability within mathematics proper had ever been definitively established before Gödel. After his work, the subject of logic would never again be the same.

One of the most important consequences of Gödel's work was the precise characterization of algorithms or effective computation procedures. Another major achievement of Gödel's occurred in 1938. Two conjectures in the field of set theory, the Axiom of Choice and the Continuum Hypothesis, had resisted all attempts at proof. Gödel showed that neither could be disproved from the accepted axioms of set theory.

Gödel also had a continuing interest in the foundation of physics. In this field he made a singular contribution to cosmology by providing a solution of Einstein's field equation of a previously unsuspected character, leading to the "rotating universe" model.

The far-reaching consequences of his work may best be illustrated by the following statement of the distinguished mathematician Dr. Felix E. Browder of the University of Chicago:

The great abstract logical work of Gödel had a striking outcome. In analyzing the formal machinery of Gödel's description of what could be obtained by step-by-step procedures, the brilliant young English logician Alan Turing identified the results of such procedures—the general recursive functions—with the outcomes of what could be computed on a machine in general. *It is with this analysis, and its impact on the minds of such men as John von Neumann and others, that the theoretical concept and the analysis of the digital computer in the modern sense began. It remains true to this very day that the theoretical description of what can be computed in general and its more penetrating analysis are rooted in that soil of mathematical logic which Gödel turned over for the first time in his memoir of 1931.*



Alfred Eisenstaedt, courtesy of Time-Life Books

Professor Gödel was born on April 28, 1906, in Brünn, Czechoslovakia. He received his Ph.D. at the University of Vienna in 1930, and from 1933 to 1938 he was Privat Dozent at the University of Vienna.

On March 3, 1978, a memorial service for Professor Gödel was held at the Institute where he spent the last forty years of his life.

The memorial took the form of three talks on aspects of Gödel's life and work. Professor André Weil of the Institute presided, and the speakers were Professors Hao Wang of Rockefeller University, Simon Kochen of Princeton University and Hassler Whitney of the Institute.

Minot C. Morgan, Jr. (1913-1979)

On May 12, 1978, the Faculty of the Institute presented Minot C. Morgan, Jr., with a parchment scroll as a token of their gratitude for what he meant to them and to the Institute:

For twenty-five years you have been much more than a General Manager. Friendly and accessible to all alike, you have helped us and our visiting colleagues find their way through the innumerable personal crises incidental to academic life in a strange land. Whenever anyone was in real trouble, whether it was medical, marital, financial, political, or just getting caught in the entanglements of the immigration and taxation bureaucracies, you were the one to whom we could always turn for generous and effective action. You more than anybody else personify the warm and human atmosphere that has made the Institute a place beloved of its alumni all over the world.

Born in Summit, New Jersey, in 1913, Mr. Morgan attended the Hotchkiss School, Princeton University and Columbia University, from which he received an M.A. degree. A member of the Princeton class of 1935, he joined the University's administrative staff in 1940 after having served as instructor in English, history and Latin at the Hun School. Mayor of Princeton Borough in 1945, he was director of student aid and employment when he left the University to join the Institute.

A memorial service was held at the Princeton University Chapel on Saturday, January 27, 1979. Mr. Morgan is survived by his wife, the former Virginia Starr Myers, six children and a number of grandchildren.

The Einstein Centennial Celebration

The National Einstein Centennial Celebration, sponsored and organized by the Institute for Advanced Study, where Albert Einstein lived and worked from the time of his arrival in the United States in 1933 until his death in 1955, began on March 4, 1979, in Princeton, New Jersey, with the issuing of an Einstein commemorative stamp by the United States Postal Service.

The Einstein Centennial Symposium, the principal feature of the National Celebration, was held at the Institute from March 4 through March 9, 1979. It was a historic gathering of an extraordinary group of the world's leading physicists, including many Nobel laureates, in addition to historians and philosophers of science and other distinguished participants from various sectors of society.

The primary objective of the Symposium was to enable the scientific and scholarly community to understand more fully Einstein's thought and influence and the continuing relevance of his work in a number of specific fields. A secondary objective of the Celebration as a whole was to demonstrate the character and impact of Einstein's life and work for that much larger audience—teachers, students and interested citizens—for whom Einstein was both a scientific leader, shaping our understanding of the world, and a spiritual leader, responding to the historical crises of his time with humility, compassion, a deep sense of social responsibility and an unflagging devotion to human rights.

The Symposium began on Sunday evening, March 4. Guests at the opening night dinner were welcomed by Howard C. Petersen, Chairman of the Institute's Board of Trustees. "It is most fitting that the Einstein Centennial should open a period of commemoration at the Institute," Mr. Petersen said. "Next year, 1980, will mark our fiftieth anniversary, and tonight as we honor Albert Einstein we also remember Kurt Gödel and

Marston Morse, Hermann Weyl and John von Neumann, Erwin Panofsky and Millard Meiss, Oswald Veblen and J. Robert Oppenheimer—these and others who were his colleagues and who did so much to create this unique institution."

In my opening address to the Symposium, I noted "how rarely we are given the kind of historical opportunity to celebrate simultaneously great genius and the good man in whom it arose." I then went on to describe Albert Einstein's encounter with America and remarked that Einstein's decision to join the Institute coincided with the coming to power of the Nazis in Germany and the subsequent migration of European intellectuals to America.

J. Richardson Dilworth, President and Vice Chairman of the Institute's Board, then accepted on behalf of the Institute the Einstein Memorial Sculpture, *Arrival*, by Jacques Lipchitz. The bronze sculpture, which the artist described as "the specific feeling of escape from the horror of the Fascists to the refuge of the United States," was donated by philanthropist Joseph H. Hazen from his private collection.

The principal speaker of the evening was Jürgen Schmude, Federal Minister of Education and Science of the Federal Republic of Germany. Dr. Schmude announced a gift of 1,250,000 DM from his country to the Institute to make possible the appointment each year for the next five years of one senior and two junior scholars to carry out research in areas related to the work and to the tradition of Albert Einstein.

"This gift is not to be understood as a late attempt to claim the genius of Einstein for Germany," said Dr. Schmude. "Rather it is meant as a token of our respect for Albert Einstein, which includes acknowledgment and understanding of his attitude toward Germany. It includes the expression of regret that fate did not permit reconciliation with the Germany of today. With this gift we—the government and the people of Germany—hope to make a contribution to the world-wide commemoration of Einstein, the international scientist and a great member of world humanity."

As a special feature of the evening's program, the Albert Einstein Award was presented to Tullio Regge of the Faculty of the Institute for Advanced Study and of the University of Turin. The award, which consists of $15,000 and a gold medal bearing the likeness of Albert Einstein, was presented to Professor Regge on behalf of the Lewis & Rosa Strauss Memorial Fund of Washington, D.C., by Dr. Philip Handler, President of the National Academy of Sciences.

The next four days were spent in scholarly examination of both the historical context and the contemporary importance of Einstein's intellectual achievements. Serving as chairmen of the various sessions of the Symposium were Professors E. Amaldi, Hans A. Bethe, P. A. M. Dirac, Robert H. Dicke, Julian Schwinger, Dennis Sciama, Victor F. Weisskopf and C. N. Yang. Fourteen papers on topics ranging from "Experimental Challenges Posed by Einstein's General Theory of Relativity" to "Beyond the Black Hole" were presented by Professors S. S. Chern, George B. Field, Stephen W. Hawking, Gerald Holton, Martin J. Klein, Yuval Ne'eman, A. Pais, W. K. H. Panofsky, Martin J. Rees, Dennis Sciama, Irwin I. Shapiro, John Stachel, John Archibald Wheeler and Eugene P. Wigner.

Each paper was followed by specific commentaries and a period of general discussion. Such commentaries were provided by Professors Freeman J. Dyson, R. Jost, Thomas S. Kuhn, Arthur I. Miller, Charles W. Misner, Peter van Nieuwenhuizen, P. J. E. Peebles, E. M. Purcell, Tullio Regge, W. L. W. Sargent, W. G. Unruh and David T. Wilkinson. Participating in panel discussions were Professors Stephen L. Adler, Valentine Bargmann, Peter G. Bergmann, Freeman J. Dyson, Marvin L. Goldberger, Banesh Hoffmann, Ernst G. Straus, Steven Weinberg and C. N. Yang.

Symposium participants continued their celebration of the Einstein Centennial into

the evenings with concerts by the Juilliard and Emerson String Quartets and a lecture by Professor Felix Gilbert on the social and political developments in "Einstein's Europe."

At the Symposium's closing dinner on Thursday, March 9, the Honorable Brendan T. Byrne, Governor of New Jersey, announced the establishment of an endowed Einstein Chair at the Institute by the State of New Jersey. The evening's featured speaker was Frank Press, Science and Technology Adviser to the President. Dr. Press brought the following message from President Jimmy Carter:

THE WHITE HOUSE

WASHINGTON

The Albert Einstein Centennial

March 14, 1979, marks the one hundredth anniversary of the birth of Albert Einstein -- a man who profoundly influenced the shape of science and the course of history.

Albert Einstein set the tone for nearly a century of physics. He took a science that could no longer explain phenomena through the concepts of Newton and greatly expanded its viewpoint. His insights form the basis of much of our Twentieth Century comprehension and control of matter and energy. We are still following the path he outlined, and his genius remains a powerful stimulus and guide for future scientific discovery.

But Albert Einstein left his mark on humanity by more than just his brilliant scientific achievements. He will be remembered by all of us for the simplicity of his life, the humility and willingness with which he shared his talents and the dedication with which he pursued the greatest good of all mankind.

He believed that it was the nature of man to inquire thoroughly and endlessly. In a lecture at Oxford he stated: "The deeper we search, the more we find there is to know, and as long as human life exists, I believe it will always be so." And he believed such search was worthwhile. "The most incomprehensible thing about the world is that it is comprehensible," he said.

Einstein abhored oppression. He fled from it in his native land and found freedom and friendship in the United States. His gentle nature led him towards pacificism, but he was at the same time deeply committed to the defense of freedom and rights of free people everywhere.

He sought and found order, understanding and beauty in the universe. He gave his findings freely to all the world. Our tallest tribute to him in this centennial year of his birth is to reaffirm our commitment to build vigorously on his enduring legacy of scientific discovery and social progress.

Jimmy Carter

Dr. Press's remarks were broadcast live to the nation on National Public Radio.

The entire proceedings of the Symposium, including both commentary and general discussion, will be published in 1980 by Addison-Wesley. The panel discussion "Working with Einstein," which featured the reminiscences of four of Einstein's colleagues, was filmed for WNET, the New York City area's public television station, and was telecast on Channel 13 in the summer of 1979.

Other components of the National Einstein Centennial Celebration are now on view throughout the nation. The Einstein Centennial Traveling Exhibit, prepared for the Institute by the American Institute of Physics, consists of sixteen panels which place Einstein in the context of the scientific tradition which he revolutionized, the various movements he espoused and the communities of intellectuals and scholars with which he was associated. Individual copies of the exhibit have been distributed to State Humanities Councils to circulate within each state.

Albert Einstein: The Education of a Genius, a film narrated by Peter Ustinov which relates the development of Einstein's thought to the circumstances of his childhood and early education, was also distributed to each of the State Humanities Councils.

Albert Einstein: 1879-1979, a centennial exhibit co-sponsored by the Institute for Advanced Study and the Smithsonian Institution, includes sections on original portraits of Einstein; on Einstein's life and personality; on his scientific work; on his influence on human affairs; and on the experimental testing and confirmation of his theories. The exhibition opened in March, 1979, at the National Museum of History and Technology in Washington, D.C., where it will remain on view until March, 1980.

The Albert Einstein Permanent Exhibit at San Francisco's Exploratorium is an interpretive exhibit on the way in which the human understanding of nature progresses. Organized for the Einstein Centennial by Exploratorium director Frank Oppenheimer, it will become part of the Exploratorium's permanent display.

The Albert Einstein Memorial, a cluster of endowed professorships and fellowships at the Institute for Advanced Study, will constitute a living academic memorial to the great scientist and humanitarian who was the foremost member of the Institute's Faculty.

Academic programs

The most meaningful measure of the contribution of the Institute to international scholarship and research is the work done by its Faculty and members. Continuing recognition of the achievements of Institute Faculty and long-term members is demonstrated by the following list of recent honors and awards.

Enrico Bombieri has been elected an Honorary Member of the London Mathematical Society;

Armand Borel has been awarded the Brouwer Medal at the 200th anniversary meeting of the Dutch Mathematical Society;

Christian Habicht has been elected to membership in the German Archaeological Institute;

Albert O. Hirschman has been awarded an honorary degree of Doctor of Laws by Rutgers University;

Irving Lavin has been elected to membership in the American Academy of Arts and Sciences;

Bernard Lewis has been awarded the Harvey Prize of the Technion-Israel Institute of Technology. The previous year's Harvey Prize was awarded to Freeman Dyson;

Atle Selberg has been elected to the Norwegian Academy of Science at Trondheim;

Hassler Whitney has been awarded the National Medal of Science by President Carter for founding and bringing to maturity the discipline of differential topology;

Harry Woolf has been elected chairman of the Board of Trustees of the Fermi National Accelerator Laboratory.

During 1978-79 there were 170 members and 16 visitors at the Institute. Eighty-five of the members—half of the group—were under the age of 35. Sixteen of them were women. Taken together, they came from 96 universities in 21 countries. The names, academic backgrounds and fields of interest of this year's members and visitors are described in the pages which follow.

Among the many scholars of note who have joined our community recently, special mention should be made of Dr. Abba Eban of Israel; Professor Joseph E. Stiglitz of All Souls College, Oxford, who is the Oskar Morgenstern Distinguished Fellow at Mathematica; and Professors Wen-tsün Wu, Bo-ju Jiang and Jing-run Chen of the Department of Mathematics of Academia Sinica in Peking.

Harry Woolf
Director

The School of Historical Studies

Faculty

Marshall Clagett
John H. Elliott
James F. Gilliam
Christian Habicht
Irving Lavin
Kenneth M. Setton
Morton White

Professors Emeriti

Andrew Alföldi
Harold F. Cherniss
Felix Gilbert
George F. Kennan
Benjamin D. Meritt
Homer A. Thompson

Members with Long-term Appointments

Herman H. Goldstine
Thomas S. Kuhn
Bernard Lewis
Otto E. Neugebauer

The School of Historical Studies

Over the years the School of Historical Studies has mirrored the varied interests of its individual Faculty and visiting members, but certain developments have been more or less continuous for close to half a century. These have stressed Greek and Roman antiquity, medieval history and the history of art. In more recent times such main currents of inquiry have been augmented by interests in the history of mathematics and of the sciences, modern European and American history, the history of modern philosophy and the history of modern diplomacy.

The traditional aspects of the historian's craft are the work of narration and interpretation, of establishing legitimate connections among the varied experiences of human beings and their organizations, and of bringing the proven documents and the tested witnesses to bear on events to be described at least as asymptotically true. This continues to characterize the historian at work at the Institute as elsewhere. In doing so it stresses the role of the individual scholar as master of the entire endeavor, so that whether one is concerned with the transmission of Archimedes' thought in the Middle Ages, the complex relationship between the papacy and the Levant over several centuries, the philosophy of the American Revolution, or the relationship between Spain and its American empire, the historian at the Institute does not generally engage in group projects.

Cooperation of course does occur as well as occasional collaboration; master-disciple relationships, the peer level exchanges, the seminars and lectures common to academic interchange everywhere also characterize the life of historians at the Institute. Additionally, the Institute's considerable impact on the course of historical scholarship has been obtained and multiplied through the influence acquired and spread by visiting members who have come and gone over the years and who now number close to a thousand.

Academic Activities, 1978-79

Faculty

Marshall Clagett has published volume 3 of his *Archimedes in the Middle Ages;* volume 4 has been delivered to the American Philosophical Society for publication. His text of "Francesco of Ferrara's *Questio de proportionibus motuum*" has appeared in the Italian publication *Annali dell'istututo e Museo di storia della scienza di Firenze.*

John H. Elliott, in collaboration with visiting member Jonathan Brown of the Institute of Fine Arts at New York University, has finished *The Age of the Buen Retiro: Arts and Politics at the Court of Philip IV of Spain.*

James F. Gilliam has written two articles on late Roman historiography and a note on a literary papyrus. During the spring term of 1979 he will be the Sather Professor at Berkeley.

Christian Habicht's book on Hellenistic Athens in the third century B.C. will appear this year (Beck, Munich). Though five chapters of a sequel have been drafted, he is now turning to a chapter on the Seleucids for the new *Cambridge Ancient History,* volume 7. Professor Habicht has been named the Sather Professor at Berkeley for 1982-83.

Irving Lavin has recently completed *Bernini and the Unity of the Visual Arts,* to be pub-

lished by the Morgan Library and the Oxford University Press.

The second volume of Kenneth M. Setton's *Papacy and the Levant, 1204-1571* has been published by the American Philosophical Society.

Morton White's article "Oughts and Cans" appeared in a volume entitled *The Idea of Freedom* published by the Oxford University Press. He is also working on a sequel to his *Philosophy of the American Revolution*. His *Social Thought in America* has been published in a Serbo-Croatian translation.

Professors Emeriti

Andrew Alföldi is completing a volume on Julius Caesar, to be published by the German Archaeological Institute.

Harold F. Cherniss continues his work on Plato and Aristotle.

Felix Gilbert is working on a book dealing with finances, law and diplomacy in the Late Renaissance.

George F. Kennan completed and sent to press the first volume of a projected two-volume work on the origins of the Franco-Prussian alliance of 1894, to be published by the Princeton University Press.

Benjamin D. Meritt published several articles dealing with the history of ancient Greece.

Homer A. Thompson was the Norton Lecturer for the Archaeological Institute of America during the year. He gave fifteen lectures in the fall of 1977 and seven more in April of 1978. He has completed two articles having to do with the Agora excavations.

Members and Visitors

The School was host to 46 long-term, term and annual visiting members in 1978-79. During the summer of 1978 it also provided facilities for 11 summer visitors. Twenty members came from foreign countries including Japan, Spain, Italy, Australia, Israel, England, Denmark, Germany, France, Switzerland and Canada. Fields of members ranged from Greek and Roman history and archaeology, history of art, medieval astronomy, papyrology, Byzantine history, to modern history and American intellectual history.

Brief examples of the work of the members must suffice.

Margaret Gilbert of Princeton, New Jersey, worked on the philosophy of social science, stressing Weber and Durkheim.

Anthony A. Long of the University of Liverpool is completing a book on Hellenistic philosophy.

Michael J. Osborne of the University of Lancaster used the Institute's epigraphical materials for Attic prosopography.

Eric G. Turner of University College, London, prepared an edition of large fragments of a lost Greek play recently discovered.

Serge H. Lancel of the University of Grenoble completed two works, one on the excavation of Carthage, the other on Saint Augustine and African heretics.

Graeme W. Clarke of the University of Melbourne prepared a social and historical commentary on the letters of another African bishop (Saint Cyprian).

Deborah H. Samuel of York University, Toronto, prepared a social and economic study of an Egyptian village.

James B. Pritchard of the University of Pennsylvania Museum completed a report of his excavations of a Phoenician city.

Wilbur R. Knorr of Brooklyn College prepared a new analysis of Archimedes' mathematical thought.

David E. Pingree of Brown University edited two medieval works on science and magic, preserved in several languages.

John W. Barker, Jr., of the University of Wisconsin studied the "Zealots" in fourteenth-century Thessaloniki.

Nicoara Beldiceanu of the École Pratique des Hautes Études concentrated on fifteenth- and sixteenth-century Ottoman Turkish law and administration.

Makoto Saito of the University of Tokyo made a comparative study of early American political development with aspects of the political development of Japan in a similar period.

Paul M. Kennedy of the University of East Anglia is working on two books on Anglo-German relations from 1850 to 1970.

Thomas N. Nipperdey of the University of Munich is writing a book on the main problems of German history between 1790 and 1949.

Jordi Nadal of the University of Barcelona has prepared studies of technological advances in Spanish history in modern times and the demographic history of Spain.

The project of Thomas L. Haskell of Rice University has been prison reform and moral responsibility in nineteenth-century America.

All members and visitors at the Institute are independent scholars and concentrate on their own subjects. But the contacts and exchanges with one another are often fruitful and stimulating, whether in the same field or one at a distance. Henry A. Millon and Craig Hugh Smyth, distinguished art historians at the Massachusetts Institute of Technology and the Harvard center at Villa I Tatti respectively, this year collaborated on Michelangelo's study for St. Peter's. Professor Elliott's collaboration with Jonathan Brown has already been noted. In addition to such collaborative projects, there are formal colloquia—lectures followed by discussions—on a monthly basis in art history in which Princeton University's department takes part, and roughly eight to ten times each term in classical studies, which scholars in the area attend. Some of the members regularly give papers at the meetings of the Institute's School of Social Sciences; others occasionally attend. Virtually all visiting members keep in regular touch with at least one member of the Faculty.

The School of Historical Studies

Members with Long-term Appointments, Members and Visitors, 1978-79

In the section which follows, the information was obtained from material provided by the members and visitors.

Members with Long-term Appointments

Herman H. Goldstine. *History of computers and computation; theory of computing machines.*

Born September 13, 1913, Chicago, Illinois. University of Chicago, BS 1933, MS 1934, PhD 1936; honorary degrees.

University of Chicago, Research Associate and Instructor 1936-39; University of Michigan, Instructor and Associate Professor 1939-42; US Army/US Government, in charge of development of ENIAC and of EDVAC; IBM Corporation, Research Planning Staff 1958, Thomas J. Watson Research Center, Director of Mathematical Sciences 1958-65, Data Processing Division, Director of Scientific Development 1965-67, Consultant to Director of Research 1967-69, IBM Fellow 1969-; Institute for Advanced Study, Electronic Computer Project 1946-57, School of Natural Sciences, Member with Long-term Appointment 1971-, School of Historical Studies, Member with Long-term Appointment 1977-.

Thomas S. Kuhn. *History of modern physics.*

Born July 18, 1922, Cincinnati, Ohio. Harvard University, BS 1943, MA 1946, PhD 1949; honorary degrees.

American-British Laboratory, OSRD, Radio Research Laboratory 1943-45; Harvard Society of Fellows, Junior Fellow 1948-51; Harvard University, Assistant Professor of General Education and History of Science 1951-56; University of California-Berkeley, Professor of History of Science 1961-64; Princeton University, Professor of History of Science 1964-68, M. Taylor Pyne Professor of History of Science 1968-79; Institute for Advanced Study, Schools of Historical Studies and Social Science, Member with Long-term Appointment 1972-79; New York Institute for the Humanities, Fellow 1978-79.

Bernard Lewis. *Islamic history.*

Born May 31, 1916. London, England. University of London, BA 1936; University of Paris, Diplôme des Études Semitiques 1937; University of London, PhD 1939.

University of London, School of Oriental and African Studies, Assistant Lecturer in Islamic History 1938, Lecturer 1940, Senior Lecturer 1946, Reader 1947, Professor of the History of the Near and Middle East 1949-74; University of California-Los Angeles, Visiting Professor 1955-56; Columbia University, Visiting Professor 1960; Indiana University, Visiting Professor 1963; Princeton University, Visiting Professor 1964, Cleveland E. Dodge Professor of Near Eastern Studies 1974-; Institute for Advanced Study, Member 1969, Member with Long-term Appointment 1974-.

Otto E. Neugebauer. *History of exact sciences in antiquity.*

Born May 26, 1899, Innsbruck, Austria. University of Göttingen, PhD 1926; University of St. Andrews, LLD 1938; honorary degrees.

University of Göttingen, Assistant Professor 1927-33; founder and joint editor of *Quellen und Studien zur Geschichte der Mathematik, Astronomie, und Physik* 1930-38; University of Copenhagen, Research Professor 1933-39; University of Cambridge, W. Rouse Ball Lecturer 1939; Cornell University, Messenger Lecturer 1949; Brown University, Professor of the History of Mathematics and Professor Emeritus 1939-69; Institute for Advanced Study, School of Historical Studies, Member 1950-55, 1959-60, Member with Long-term Appointment 1960-, School of Natural Sciences, Member 1950, 1952, 1954, 1956, 1958, Member with Long-term Appointment 1960-.

Members

J. Javier Arce. *Late Roman history and archaeology.*

Born April 21, 1945, Zaragoza, Spain. Instituto "Goya," AB 1964; University of

Salamanca, MA 1969; University of Granada, PhD 1975.

University of Madrid, Assistant Professor of Classical Archaeology 1970; Instituto de Arqueologia, Consejo Superior de Investigaciones Cientificas, Researcher 1972-.

John Walton Barker, Jr. *Byzantine history.*

Born October 7, 1933, Brooklyn, New York. Brooklyn College, AB 1955; Rutgers University, MA 1956, PhD 1961.

Rutgers University, research and teaching assistantships 1955-59; Harvard University, Dumbarton Oaks Center for Byzantine Studies, Fellow 1959-62; University of Wisconsin-Madison, Assistant Professor of History 1962-68, Associate Professor 1968-71, Professor 1971-.

Nicoara Beldiceanu. *Ottoman Turkish history of the fifteenth and sixteenth centuries.*

Born February 25, 1920, Bucharest, Rumania. University of Bucharest, Diplôme de bachelier 1939, Licenciè ès lettres 1943; University of Munich, Docteur ès lettres 1955; University of Paris, Sorbonne, Docteur en histoire 1963, Docteur d'état ès lettres 1973.

University of Bucharest, Assistant 1945-46; Centre Nationale de la Recherche Scientifique, Stagiaire de recherche 1955-59, Attaché de recherche 1959-63, Chargé de recherche 1963-66, Maître de recherche 1967-; University of Paris, Sorbonne, École Pratique des Hautes Études 4e Section, Chargé de conférences 1965-.

Miklòs Boskovits. *Thirteenth-century Italian painting.*

Born July 26, 1935, Budapest, Hungary. University of Budapest, MA 1959, PhD 1961.

University of Budapest, Research Fellow 1963-68; Harvard University, Villa I Tatti, Research Fellow 1970-73; University of Florence, Lecturer 1972-.

Jonathan Brown. *History of Spanish art and architecture.*

Born July 15, 1939, Springfield, Massachusetts. Dartmouth College, AB 1960; Princeton University, MA 1963, PhD 1964.

Princeton University, Instructor 1965-66, Assistant Professor 1966-71, Associate Professor 1971-73; New York University, Institute of Fine Arts, Associate Professor of Fine Arts 1973-77, Acting Director 1973-74, Director 1974-77, Professor 1977-.

Graeme Wilbur Clarke. *Late Roman church history.*

Born October 31, 1934, Nelson, New Zealand. University of Oxford, BA 1959; University of New Zealand, MA 1956; University of Melbourne, LittD 1976.

Australian National University, Lecturer 1957, 1961-63; University of Western Australia, Senior Lecturer 1964-65; Institute of Classical Studies, London, Nuffield Foundation Dominion Fellow 1966, Commonwealth Fellow 1973; Monash University, Associate Professor 1967-68; University of Melbourne, Professor of Classical Studies, 1969-, Department Chairman 1969-72, 1974-76, Associate Dean, Faculty of Arts, 1970-72, Deputy Dean 1977.

Abba Eban. *The development of modern diplomacy.*

Born February 2, 1915, Cape Town, South Africa. University of Cambridge, MA; honorary degrees.

Middle East Arab Center, Chief Instructor 1944; Provisional Government of Israel, Representative to the United Nations 1948, Permanent Representative 1949-59; Ambassador to the United States 1950-59; Government of Israel, Minister without portfolio 1959-60, Minister of Education 1960-63, Deputy Prime Minister 1963-66, Minister of Foreign Affairs 1966-74; elected to Knesset 1959; Weizmann Institute of Science, President 1958-66; Columbia University, Guest Professor 1974; Haifa University, Guest Professor 1975.

Margaret Patricia Gilbert. *Philosophy of social science.*

Born March 29, 1942, Mursley, England. University of Cambridge, AB 1965; University of Oxford, BPhil 1967; Universities of Cambridge and Oxford, MA 1967.

Manchester University, Lecturer 1967-71; University of California-Davis, Lecturer 1970-71; University of Oxford, St. Anne's College, Fulford Research Fellow 1971-72; University of Reading, Lecturer 1971-73; University of Oxford, St. Hilda's College, McIlrath Research Fellow 1972-76; Princeton University, Visiting Fellow 1974, Visiting Assistant Professor 1975; University of California-Los Angeles, Visiting Assistant Professor 1975.

Bernard R. Goldstein. *Medieval astronomy.*

Born January 29, 1938, New York, New York. Columbia College, BA 1958; Columbia University, MA 1961; Brown University, PhD 1963.

Yale University, Assistant Professor, Associate Professor 1965-72; University of Pittsburgh, Associate Professor of Jewish Studies and of History and Philosophy of Science 1973-; Brown University, Visiting Professor 1975.

Ivor Grattan-Guinness. *History of science.*

Born June 23, 1941, Bakewell, England. University of London, MSc 1966; University of Oxford, MA 1967; University of London, PhD 1969.

E.M.I. Electronics, Ltd., industrial mathematician 1962-63; Middlesex Polytechnic, Assistant Lecturer 1964-71, Principal Lecturer in Mathematics 1971-.

Thomas L. Haskell. *American intellectual history; prison reform and moral responsibility in nineteenth-century America.*

Born May 26, 1939, Washington, DC. Princeton University, BA 1961; Stanford University, PhD 1973.

Rice University, Instructor of History 1970-72, Assistant Professor 1972-77, Associate Professor 1977-.

Margaret C. Jacob. *Intellectual history.*

Born June 9, 1943, New York, New York. St. Joseph's College, BA 1964; Cornell University, MA 1966, PhD 1969.

University of South Florida, Assistant Professor 1968-69; University of East Anglia, Lecturer 1969-71; Baruch College, Associate Professor 1971-; Harvard University, Research Associate 1978.

Kristian Jeppesen. *Archaeology.*

Born December 20, 1924, Frederiksberg, Denmark. Royal Academy of Arts, Copenhagen, BA 1949; University of Copenhagen, MA 1952; University of Aarhus, PhD 1959.

Architect with Danish excavations at Bahrain 1954-55; University of Copenhagen, Senior Scholarship 1955-58; University of Aarhus, Professor 1959-; Director of excavations at Halicarnassus 1966-.

Lilly L. Kahil. *Iconographical studies in Greek art.*

Born July 2, 1926, Zurich, Switzerland. University of Paris, Sorbonne, Licence ès Lettres 1947; University of Dijon, Diplôme d'Études Supérieures classiques 1948; University of Paris, Sorbonne, Doctorat ès Lettres 1954.

Universities of Fribourg and Paris X, Professor of Classical Archaeology 1957-; LIMC Foundation (Switzerland), Secretary General of the *Lexicon Iconographicum Mythologiae Classicae*, 1973-; Institute for Advanced Study, Member first term of academic years 1954-55, 1967-68, 1974-75, 1977-78, 1978-79, Visitor first term of academic year 1976-77.

Paul M. Kennedy. *Anglo-German relations, 1860-1914; British foreign policy since 1850.*

Born June 17, 1945, Wallsend, United Kingdom. Newcastle University, BA 1966; University of Oxford, DPhil 1970.

University of Bonn, Theodor Heuss Research Fellow 1968-69; University of East Anglia, Lecturer in History 1970-75, Reader 1975-.

Wilbur Richard Knorr. *History of ancient mathematics.*

Born August 29, 1945, Brooklyn, New York. Harvard College, BA 1966; Harvard University, MA 1968, PhD 1973.

Harvard University, Teaching Fellow 1968-71; University of California-Berkeley, Assistant Professor 1971-73; University of Cambridge, NATO Postdoctoral Fellow (NSF) 1974-75; Brooklyn College, Assistant Professor 1975-.

Serge H. Lancel. *Roman North Africa; church history and archaeology.*

Born September 5, 1928, Havana, Cuba. École Normal Superieur, élève 1949; École Française de Rome, membre 1953, Agrégé de Grammaire 1952; University of Paris, Sorbonne, Docteur ès-Lettres 1972.

University of Paris, Sorbonne, Assistant 1958-62; University of Madagascar, Tananarive, Chargé d'enseignement et directeur des fouilles de Tipasa 1963-65; University of Grenoble, Maître de conférences, Professeur 1965-.

Anthony Arthur Long. *Greek philosophy and Greek tragedy.*

Born August 17, 1937, Manchester, England. University of London, BA 1960, PhD 1964.

University of Otago (New Zealand), Lecturer 1961-64; University of Nottingham, Lecturer 1964-66; University College, London, Lecturer

1966-71; Institute for Advanced Study, Member 1969-70; University of London, Reader 1971-73; University of Munich, Visiting Professor 1973; Joint Editor of *Classical Quarterly* 1975-; University of Liverpool, Gladstone Professor of Greek 1977-.

Bryce D. Lyon. *Medieval history.*

Born April 22, 1920, Bellevue, Ohio. Baldwin-Wallace College, BA 1942; Cornell University, PhD 1949.

University of Colorado, Assistant Professor 1949-51; Harvard University, Assistant Professor 1951-56; University of Illinois-Urbana, Associate Professor 1956-59; University of California-Berkeley, Professor 1959-65; Brown University, Professor 1965-.

Minor M. Markle III. *Greek history.*

Born May 10, 1935, Jonesboro, Arkansas. Miami (Ohio) University, BA 1956; University of Oxford, MA 1959; Princeton University, PhD 1967.

Miami (Ohio) University, Instructor 1961-67; University of Virginia, Assistant Professor 1968-74; Center for Hellenic Studies, Fellow 1976-77; Johns Hopkins University, Visiting Assistant Professor 1977-78.

Christian Meier. *Ancient history.*

Born February 16, 1929, Stolp/Pommern, Germany. University of Heidelberg, PhD 1956.

University of Heidelberg, Wiss. Assistent, Seminar F. Alte Geschichte 1957-59; University of Frankfurt, Wiss. Assistent, Seminar F. Alte Geschichte 1960-63; University of Freiburg, Privat Dozent 1963-66; University of Basel, Professor 1966-68, 1973-76; University of Köln, Professor 1968-73.

Henry Armand Millon. *History of art.*

Born February 22, 1927, Altoona, Pennsylvania. Tulane University, AB 1947, BS 1949, BArch 1953; Harvard University, AM 1954, MArch 1955, PhD 1964.

American Academy in Rome, Fellow 1958-60; Massachusetts Institute of Technology, Assistant Professor, Associate Professor 1960-69, Professor 1969-74, 1977-; American Academy in Rome, Director 1974-77.

Keith P. F. Moxey. *History of art.*

Born January 4, 1943, Buenos Aires, Argentina. University of Edinburgh, BA 1965; University of Chicago, MA 1968, PhD 1974.

Tufts University, Instructor 1971-74, Assistant Professor 1974; University of Virginia, Assistant Professor 1974-76, Associate Professor of Art History and Department Chairman 1976-.

Jordi Nadal. *Modern Spanish history.*

Born March 14, 1929, Cassá de la Selva, Spain. University of Barcelona, PhD 1957.

Toulouse University, Fellow 1953; Almo Collegio Borromeo (Italy), Fellow 1955; University of Liverpool, Lecturer 1958-59; University of Barcelona, Lecturer 1956-67; University of Valencia, Professor 1968-69; Barcelona Autónoma University, Professor of Economic History 1970-.

Bezalel Narkiss. *History of art.*

Born December 14, 1926, Jerusalem, Israel. Hebrew University, Jerusalem, MA 1951; University of London, BA 1959, PhD 1962.

University of London, Warburg Institute, Junior Fellow 1960-63; Harvard University, Dumbarton Oaks Center for Byzantine Studies, Fellow 1970; Hebrew University, Lecturer 1963, Senior Lecturer 1969, Chairman, Department of Art History 1971-74, Professor of Art History 1973-, Chairman, Institute of Fine and Performing Arts 1975-.

Thomas N. Nipperdey. *Modern German history.*

Born October 27, 1927, Cologne, Germany. University of Cologne, PhD 1953.

University of Göttingen, Privat Dozent 1961-63; University of Karlsruhe, Professor 1963-67; Free University of Berlin, Professor 1967-71; Institute for Advanced Study, Member 1970-71; University of Munich, Professor 1971-; University of Oxford, St. Antony's College, Fellow 1974-75.

Michael John Osborne. *Attic prosopography.*

Born January 25, 1942, Eastbourne, England. University of Oxford, BA 1965, MA 1967; University of Leuven, PhD 1977.

University of Bristol, Lecturer 1965-66; University of Lancaster, Lecturer 1966-; University of Munich, British Academy Visiting Fellow 1973; University of Leuven, Visiting Professor 1975; University of Oslo, Visiting Professor 1973, 1976.

Lotte Brand Philip. *History of art.*

Born May 27, 1910, Hamburg, Germany. University of Freiburg, PhD 1938.

Bryn Mawr College, 1958-59; New York

University, 1959-60; City University of New York, Queens College, Professor 1960-.

David E. Pingree. *History of astronomy, astrology and magic.*

Born January 2, 1933, New Haven, Connecticut. Harvard University, BA 1954, PhD 1960.

Harvard University, Junior Fellow 1960-63; University of Chicago, Assistant Professor, Associate Professor 1963-66, Professor 1966-71; Institute for Advanced Study, Member 1968-69; Brown University, Professor 1971-.

James B. Pritchard. *Biblical archaeology.*

Born October 4, 1909, Louisville, Kentucky. Asbury College, AB 1930; University of Pennsylvania, PhD 1942.

Crozer Theological Seminary, Professor 1942-54; Church Divinity School of Pacific, Professor 1954-62; University of Pennsylvania, Professor of Religious Thought 1962-; University of Pennsylvania, University Museum, Curator of Biblical Archaeology 1962-, Associate Director 1967-76, Director 1976-77; American University of Beirut, Visiting Professor 1966-67.

Felipe Ruiz-Martin. *Spanish history.*

Born August 23, 1915, Valladolid, Spain. Universidad de Valladolid, MA 1931; Universidad de Madrid, PhD 1945.

Universidad de Bilbao, Catedrático de Historia Económica 1960-73; Universidad Autónoma de Madrid, Catedrático de Historia Económica 1973-77.

Makoto Saito. *American intellectual history.*

Born February 15, 1921, Tokyo, Japan. Tokyo Imperial University, LLB 1942.

University of Tokyo, Faculty of Law, Assistant Professor 1950, Hepburn Professor of American History and Government 1959-, Dean 1972-74; Japanese Association for American Studies, Vice-President 1976-.

Deborah Hobson Samuel. *Papyri and Roman Egypt.*

Born November 16, 1938, New York, New York. Barnard College, BA 1960; Yale University, MA 1962, PhD 1965.

Smith College, Instructor 1965-66; Trinity College, Toronto, Instructor 1966-67; York University, Toronto, Instructor 1966-67, Assistant Professor 1967-71, Associate Professor of Classics and Humanities 1971-, Director of Classical Studies 1971-73, 1974-75, 1977-.

A. Dudley Shapere. *Philosophy of science.*

Born May 27, 1928, Harlingen, Texas. Harvard College, BA 1949; Harvard University, MA 1955, PhD 1957.

Ohio State University, Instructor 1957-60; University of Chicago, Assistant Professor 1960-65; Rockefeller University, Visiting Associate Professor 1965-66; University of Chicago, Associate Professor 1965-67, Professor 1967-72; Harvard University, Visiting Professor 1968; University of Illinois-Urbana, Professor 1972-75; University of Maryland, Professor of Philosophy 1975-.

Craig Hugh Smyth. *Michelangelo's design for St. Peter's.*

Born July 28, 1915, New York, New York. Princeton University, BA 1938, MFA 1941, PhD 1956.

National Gallery of Art, Senior Museum Aide 1941-42; Central Art Collecting Point, Munich, Officer-in-charge and Director 1945-46; Frick Collection, Lecturer and Research Assistant 1946-49; New York University, Institute of Fine Arts, Assistant Professor, Professor 1950-73, Acting Director 1951-53, Director 1953-73; American Academy in Rome, Art Historian in Residence 1959-60; Biblioteca Hertziana, Rome, Visiting Scholar 1971-72; Institute for Advanced Study, Member 1970-71; Harvard University, Villa I Tatti, Professor and Director 1973-.

John David Summers. *History of art.*

Born May 28, 1941, Sandpoint, Idaho.

Bryn Mawr College, Lecturer 1968-70; University of Pittsburgh, Assistant Professor 1970-72, Associate Professor 1972-.

Joseph Szövérffy. *Medieval Latin secular lyrics.*

Born June 19, 1920, Clausenbourgh, Transylvania. University of Budapest, BA 1939, MA 1943, PhD 1943; University of Fribourg, Dr. phil. habil. 1950.

University of Alberta, Assistant Professor, Associate Professor 1959-62; Yale University, Associate Professor 1962-65; Boston College, Professor and Director of Graduate Studies in German 1965-70; Harvard University, Visiting Professor 1968; State University of New York-Albany, Professor and Department

Chairman, Comparative Literature 1970-77; Harvard University, Dumbarton Oaks Center for Byzantine Studies, Visiting Scholar 1977-78.

Richard J. A. Talbert. *Roman history.*
Born April 26, 1947, Purley, England. University of Cambridge, BA 1968, MA 1972, PhD 1972.
Queen's University, Belfast, Assistant Lecturer, Lecturer 1970-.

Leonardo Taran. *Greek philosophy.*
Born February 22, 1933, Galarza, Argentina. University of Buenos Aires, Lawyer 1958; Princeton University, PhD 1962.
University of Wisconsin, Junior Fellow 1962-63; Center for Hellenic Studies, Junior Fellow 1963-64; University of California-Los Angeles, Assistant Professor 1964-67; Institute for Advanced Study, Member 1966-67; Columbia University, Associate Professor of Greek and Latin 1967-71, Professor 1971-, Department Chairman 1976-.

Eric Gardiner Turner. *Papyrology.*
Born February 26, 1911, Sheffield, England. University of Oxford, BA 1934, MA 1939; University of Brussels, honorary PhD 1965.
University of Aberdeen, Lecturer in Classics 1936-48; University of London, Institute of Classical Studies, Director 1953-63; University College, London, Reader 1948-50, Professor 1950-.

Denis van Berchem. *Roman history.*
Born December 19, 1908, Geneva, Switzerland. University of Geneva, PhD 1939.
University of Lausanne, Professor 1939-48, Professeur Honoraire 1951-; University of Geneva, Professor 1949-51, 1963, Rector 1966, Professeur Honoraire 1976; University of Bâle, Professor 1956-63; Institute for Advanced Study, Member 1965-66; British Academy, Oxford, Visiting Professor 1976.

Visitors

S. D. Goitein. *Medieval Islamic and Jewish history.*
Born April 3, 1900, Burgkunstadt, Bavaria. University of Frankfurt, PhD 1923.
Hebrew University, Lecturer, Professor 1928-57; University of Pennsylvania, Professor 1957-70, Affiliated Professor 1970-71; Institute for Advanced Study, Visitor 1971-.

J. Lionel Gossman. *Historiography of the eighteenth and nineteenth centuries.*
Born May 31, 1929, Glasgow, Scotland. University of Glasgow, MA 1951; University of Oxford, PhD 1958.
University of Glasgow, Assistant Lecturer 1957-58; Johns Hopkins University, Assistant Professor 1958-62, Associate Professor 1962-66, Professor 1966-76; Princeton University, Professor 1977-.

The School of Mathematics

Faculty

Enrico Bombieri
Armand Borel
Harish-Chandra
(*IBM von Neumann Professor*)
Robert P. Langlands
John W. Milnor
Deane Montgomery
Atle Selberg

Professors Emeriti

Arne Beurling
André Weil
Hassler Whitney

The School of Mathematics

Perhaps more than any other subject, pure mathematics is a cumulative science, for theories once proven remain part of its living body. They may change in the light of new insights and give rise to unexpected patterns of reasoning, but they do not vanish. Obviously, the historical context of the mathematics tradition, reaching back into ancient epochs and multiple cultures as well as its foliation through time into an ever wider set of specialized forms and designs, has produced the same specializations and difficulties of communication common to the history of other great disciplines. However, from time to time, their fragmentation finds its counterforce in unifying theories that bring hitherto unrelated divisions together and, under such unexpected and usually parsimonious insights, render accessible to a wider community enormous fields of knowledge with intellectual efficiency and aesthetic rewards.

For this rhythm of extension and accretion to succeed, communication and exchange that maximize matching, and resonance, and even confrontation are absolutely essential. Over time, various centers have created the locus for such possibilities. The international focus of mathematical discussion in the first part of this century took place at the University of Göttingen. When it was extinguished, the Institute for Advanced Study rekindled the flame, bringing within its fold Europeans such as Hermann Weyl and John von Neumann, and adding to their presence such American luminaries as Oswald Veblen and Marston Morse. The proximity of a strong mathematics group at Princeton University also played a part in relocating and centering the new School in a benign and sympathetic environment.

As in the other Schools, formal organization is minimal. Although problems are not selected for team research, seminars, discussion groups, formal lectures and informal gatherings abound in a mélange that reflects thematic concentration and individual predilections. Reflecting the interests of the permanent Faculty over time, the School has been primarily concerned with five areas broadly understood: topology; analysis and global analysis; Lie groups, algebraic groups, automorphic functions and number theory; algebraic geometry; and logic. Logic as a field of inquiry was dominated by the singular figure of Kurt Gödel. His recent death has not only removed one of the greatest minds of the twentieth century, but diminished the Institute's interest in maintaining a distinctive activity in this area.

One feature of the School of Mathematics which differentiates it from the other Schools within the Institute is its commitment to a publishing endeavor. The School participates formally in the editing of the *Annals of Mathematics*, the leading mathematical journal in the United States. Among other contributions, the aperiodic Hermann Weyl Lectures given at the Institute are published in the *Annals of Mathematics Studies*. Essentially educational and informative, the series consists of a broad survey of recent work by experts in a given area for the benefit of those in other fields or specialties. In fact, this serves as a device by means of which the Faculty itself encourages communication among the various subdivisions of mathematics and,

equally, seeks to stimulate research in areas beyond the Faculty's own range.

Academic Activities, 1978-79

Finite groups, introduced into mathematics in the early nineteenth century, are of major importance in geometry and number theory, and they also possess great intrinsic interest. All finite groups are built out of the finite simple groups, whose study was given a tremendous impetus by the 1963 paper of W. Felt and J. Thompson. Since then there has been a tremendous amount of work devoted to the problem of completely classifying these groups, and a program to this end was formulated by D. Gorenstein in 1972. The experts feel that it will soon be complete and, in an attempt to foster their work, several of them were brought together at the Institute during the past year, including among others Thompson and Gorenstein themselves as well as B. Fischer of the University of Bielefeld in Germany and M. Aschbacher of the California Institute of Technology, perhaps the two most important figures in the field at the moment.

The problem of classification could not have been seriously broached without the development of the theory of algebraic groups, in which Armand Borel of the Faculty has played a prominent role. The two domains continue to overlap and it was appropriate that there were several members active in the study of algebraic groups. Seminars were held in both areas, and there was considerable interaction of the specialists attending, not only with each other but also with some algebraic geometers as well as with those studying infinite-dimensional representations, who held seminars of their own.

There were also two seminars which formed spontaneously because of a concentration of young visitors in two areas: transformation groups, in which the Faculty's Deane Montgomery has been one of the major figures, and differential geometry. Differential geometry, in particular, has been greatly advanced of late, especially by S.-T. Yau, who will be at the Institute in 1979-80 together with several other prominent geometers. This work has been applied recently, in conjunction with that of W. Thurston of Princeton University, to the solution of an outstanding conjecture about transformation groups due to P. A. Smith.

A number is said to be transcendental if it is the root of no polynomial equation whatsoever with ordinary integers as coefficients. It is usually enormously difficult to show that a given number is transcendental. For example, the transcendency of π, from which the impossibility of squaring the circle follows, took over two millennia to establish. One of the striking mathematical events of 1978 was the proof, by Apéry of France, of the transcendence of another important mathematical constant. Enrico Bombieri of the Faculty has taken up Apéry's ideas and has greatly extended their range of applicability. During the fall term, Professor Bombieri lectured on the results of his work in this area. André Weil also delivered a series of lectures on the history of mathematics in India. These were attended not only by mathematicians but also by some members of the School of Historical Studies.

Finally, the School of Mathematics was able to take advantage of the new policies of the Chinese government to invite three Chinese visitors. It was particularly fortunate in securing the presence of Professor Jingrun Chen, foremost among the few Chinese mathematicians able to carry out research of the highest quality despite the events of the past two decades.

The School of Mathematics

Members and Visitors, 1978-79

In the section which follows, the information was obtained from material provided by the members and visitors.

Members

Alan C. Adolphson. *Number theory; algebraic geometry.*

Born January 21, 1951, Bellingham, Washington. Western Washington University, BA 1971; Princeton University, PhD 1974.

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Born May 30, 1940, Hinsdale, Illinois. California Institute of Technology, BA 1962, PhD 1966.

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University of California-Irvine, Lecturer 1976-77; Göttingen, Alexander von Humboldt Stiftung stipendium 1977-78.

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CNRS, Paris, Attaché puis Chargé 1970-74; University of Paris VI, Maître de conférences 1975-.

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University of California-Berkeley, Graduate Fellowships 1976-78.

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University of Cambridge, Frank Knox Memorial Fellowship 1972-73; University of California-Berkeley, National Science Foundation Graduate Fellowship 1973-76; University of Pennsylvania, Instructor 1976-77, Assistant Professor of Mathematics 1977-.

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University of Chicago, Instructor 1968-70; Yale University, Assistant Professor 1970-71; University of Virginia, Associate Professor 1972-78, Professor 1978-; University of Michigan, Visiting Associate Professor 1974-75.

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City University of New York, York College, Instructor 1971-73; City University of New York, Lehman College, Adjunct Lecturer 1974-75; University of Illinois-Urbana, Visiting Lecturer 1975-77; University of Minnesota, Assistant Professor 1977-.

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University of California-Berkeley, Teaching Assistant/Research Assistant 1973-77; Institute for Advanced Study, Member 1977-78.

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University of Utah, Teaching Fellow 1971-75, Graduate Research Fellow 1973-75; University of Florida, Visiting Assistant in Mathematics 1974; University of Texas-Austin, Instructor in Mathematics 1975-; Institute for Advanced Study, Member 1977-78.

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Syracuse University, Assistant Professor, Associate Professor, Professor 1943-58; Yeshiva University, Belfer Graduate School of Science, Dean, Distinguished University Professor 1958-77; Institute for Advanced Study, Member 1947-48, Visitor 1977-78.

Morikuni Goto. *Topology.*
Born June 30, 1920, Tokyo, Japan. Tokyo University, MA 1943; Nagoya University, PhD 1949.
Nagoya University, Assistant Professor 1948-51; Tokyo University of Education, Assistant Professor 1951-52; Institute for Advanced Study, Member 1952-53, 1953-54; University of Pennsylvania, Assistant Professor, Professor 1957-.

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Born July 23, 1943, New York, New York.

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Massachusetts Institute of Technology, Instructor 1967-69; Rutgers University, Assistant Professor 1969-73, Associate Professor 1973-.

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The School of Natural Sciences

Faculty

Stephen L. Adler
John N. Bahcall
Roger Dashen
Freeman J. Dyson
Tullio Regge
Marshall N. Rosenbluth

Permanent Member

Julian H. Bigelow

Members with Long-term Appointments

Charles R. Alcock
Herman H. Goldstine
Otto E. Neugebauer
Claudio Teitelboim
Scott D. Tremaine

The School of Natural Sciences

The Faculty of the School of Natural Sciences which J. Robert Oppenheimer had assembled during his directorship began to disperse in the 1960s, with only two professors—Freeman J. Dyson and Tullio Regge—remaining from that period. Between 1967 and 1971, four new professors were appointed —Marshall Rosenbluth in plasma physics, Stephen L. Adler and Roger Dashen in high energy physics, and John N. Bahcall in astrophysics. The present Faculty gives the School both a wider range and a more intimate engagement with experimental work than was the case in earlier years.

In spite of the dramatic change in the composition of the Faculty, the School continues to function very much in the manner and style which Dr. Oppenheimer had established. Members and visitors are brought to the Institute each year, chosen by the School's Faculty and reflecting either their interests or their sense of interesting intellectual areas, even if they are not directly involved in a given field itself. Members and Faculty alike are free to devote their time to their own research, with mutual criticism and frequent collaboration the normal pattern, but there are no formal rules or requirements. Seminars are established as needed, often jointly with the faculty of nearby universities, and there are scheduled and unscheduled luncheons for extensive discussion. Since physics is basically an experimental science, the permanent Faculty maintains substantial connections to scientific institutions elsewhere, whether the major national laboratories (such as the Stanford Linear Accelerator Center, Brookhaven or Fermilab) or optical and radio telescope facilities (such as those at Kitt Peak, Green Bank or Socorro) or equivalent institutionalized centers in other subdisciplines of the physical sciences. Additionally, they frequently lecture at various universities or, as consultants to government or industry, participate in the process that sets the direction and develops the instrumentation for the advancing frontiers of science. This balances the theoretical orientation of the Institute for Advanced Study and offsets the absence here of laboratories and experimental facilities vital to the whole of science.

Bounded by design and tradition as well as by budgetary realities, the School has come to concentrate on three fundamental areas: the physics of the very small (meaning elementary particle physics, high energy physics and field theory), the physics of the very large (astrophysics and general relativity) and the physics of the very complex finite systems (statistical mechanics and the many-body problem as well as plasma physics).

Within the category embraced by the physics of the very small is a family of fascinating problems and processes. The problem of resolving the increasingly finer properties of the structure of matter has called for smaller and smaller probing fingers or wavelengths. In turn, this has demanded larger and larger probing energies so that high energy physics, the physics of the big machines, has become synonymous with the physics of elementary particles. From a theoretical point of view this requires the simultaneous reconciliation of quantum mechanics with Einstein's special relativity, that is, of defining a reality in which the transformation of matter into energy holds, according to the famous formula $E=mc^2$, even

though according to quantum mechanics there is an uncertainty in determining the energy of a system because an arbitrarily large number of particles is involved which leads to systems with infinite degrees of freedom. Quantum electrodynamics, which is the system describing the interaction between electrons and photons (or in field language, the interaction of the electron with the electromagnetic field), is one response to this situation. Unfortunately, it has not proved adequate to the task of dealing with the four basic types of particle interactions: the electromagnetic, the strong forces which hold the nucleus together, the weak forces responsible for β-decay in radioactivity, and gravitation. At present, the work in particle physics and field theory is concentrated on a theory which is a generalization of quantum electrodynamics, called quantum chromodynamics, which in turn is believed to be one of the best candidates for an acceptable theory of the strong interaction force. The history and discussion of modern particle theory at the Institute are thus an attempt to find ways of developing a satisfactory theoretical understanding of particles and their interactions.

In dealing with the physics of the very large, which is the second major area of interest within the School of Natural Sciences, the astronomer faces problems whose conditions are separate and distinct from the general practice of science. Unlike the physicist who deals with the very small, the astronomer has no access to controlled laboratory experiments. His knowledge is derived from the careful study of signals from distant objects, which up to the Second World War were exclusively optical in character. The new technologies which were spawned during the war bloomed rapidly in the years that followed, broadening the spectrum of observable phenomena to include the radio spectrum, the infrared, the ultraviolet, x-ray and gamma-ray astronomy and even the possibility of neutrino and gravitational radiation.

Changing observational methods have also led to the discovery or prediction of new astronomical objects such as neutron stars (which Oppenheimer predicted), black holes, pulsars (later identified as neutron stars), quasi-stellar objects such as quasars as well as the continuing study of old familiars such as novae, supernovae and white dwarfs. Of equal interest has been the study of the interstellar medium, important because of its influence on the transmission of radiation signals, and the cosmic black body radiation, which is believed to be the remains of radiation which once filled the universe in an earlier, hotter stage of its expansion. For astrophysicists, general relativity theory thus assumes great importance as they come to grips with the gravitational effects of very large masses. Small well-known derivations from Newtonian predictions within the solar system have been delineated by general relativity theory, but its greatest importance lies in the physics of neutron stars, black holes and theories of cosmic evolution. These revolutionary developments in astronomy have rekindled the interest in general relativity so that Einstein's work remains at the edge of contemporary science as a vigorous research frontier.

Under these rather sweeping rubrics, the work of the School of Natural Sciences concentrates on particular areas: neutrino astronomy, galactic evolution, Cepheid variables, supernovae, compact x-ray sources, neutron stars and black holes. Additionally, quasars as the most distant objects, and the recently discovered rings of Uranus as some of the nearest, have occupied the research attention of the astrophysics group. The group also specializes in predicting what the Space Telescope (to be launched about 1984) will see at the very faint levels of light and in the new parts of the spectrum that will be accessible from this first permanent international observatory in space.

The third major subject, the physics of very complex finite systems, divides into two areas. These are statistical mechanics and the many-body problem, which is concerned

with various physical properties of matter in bulk such as stability, thermodynamic properties and the like; and plasma physics, which examines the special properties of matter present at very high temperatures when the atoms have been stripped of their electrons by concentrated thermal collisions. The study of such plasmas has a double relevance for they are both astrophysically interesting and terrestrially important, relating in the first instance to the structure of stars and in the second to the possible exploitation of nuclear fusion as a useful energy source. Two patterns of research have developed on this subject at the Institute, reflecting the manner in which plasmas of appropriate density and confinement are created. One set of interests deals with magnetically confined plasmas, where the containment is brought about by different geometric arrangements of magnetic fields; a second set deals with inertially confined plasmas, where the plasma confinement occurs as the result of an implosion induced by laser irradiation.

Academic Activities, 1978-79

Work in particle physics and field theory this year has continued to focus on the theory called quantum chromodynamics (QCD). Quantum chromodynamics is essentially a generalization of quantum electrodynamics (which describes the electric force, and all of atomic physics and chemistry) to the case where the force field has a hidden symmetry degree of freedom, colloquially called "color." Mathematically, the hidden symmetry is expressed through invariance of the equations under a non-Abelian gauge group, a type of structure first studied by C. N. Yang and R. L. Mills in 1954, during the period when Professor Yang was on the Institute's Faculty.

One area of major excitement in QCD this past year has stemmed from the observation of G. Sterman, S. Weinberg and others that there are large classes of measurable quantities, particularly those related to the production of particle jets, for which one can make rigorous calculations by using the development of QCD into a perturbation (power-series) expansion in a small coupling parameter. Sterman (of the State University of New York-Stony Brook) has been at the Institute for the 1978-79 academic year and has continued this important line of work, with a particular emphasis on extending the class of predictable reactions to cross sections weighted for experimental efficiencies. A second area of substantial effort has involved lattice spin and gauge theories, which are mathematical analogs of QCD in which the space-time continuum is replaced by a discrete lattice. It is hoped that the study of lattice models will elucidate the mechanism by which quarks (the QCD analog of electrons) are confined by the color force within protons and neutrons. Lattice theories are also of intrinsic interest because of their connection with a large body of recent work on the statistical mechanics of phase transitions. During this past academic year, a collaboration composed of S. Elitzur (Tel-Aviv University), R. B. Pearson (Fermi National Accelerator Laboratory) and J. Shigemitsu (Cornell University), all Institute members, resolved a puzzle in lattice spin theories by discovering the mechanism by which the phase behavior of the Ising model (2 spin orientations) changes to that of the x-y rotor model (continuous spin orientation) as one progresses through a sequence of models, called z_p models, in which each spin has p possible orientations.

A third area of substantial effort in QCD has been the continuing work of Roger Dashen of the Faculty and collaborators, and along different lines of Stephen L. Adler, also of the Faculty, to understand the nonperturbative mechanism responsible for quark confinement. Professor Dashen's work this past year has focused on trying to establish a connection between fundamental properties of QCD, as studied by using path integral methods, and the phenomenological

"bag" models of confinement. Professor Adler's work during the 1978-79 academic year has focused on studying the properties of particular types of classical gauge-theory solutions, the so-called monopole solutions, which may be relevant to an analysis of the quark force problem using concepts drawn from classical electrostatics.

Other areas of work in particle physics and field theory have included the study of strong field problems in quantum electrodynamics (W. Dittrich from the University of Tübingen), the investigation of black hole solutions in supergravity (C. Teitelboim, a long-term member at the School), the investigation of tunneling effects in quantum gravity (M. J. Perry of the University of Cambridge) and the analysis of lower-dimensional field-theory models (A. Jevicki of the City University of New York).

The research topics pursued in the astrophysics group have varied from the very near (the recently discovered rings of Uranus) to the most distant objects known in the universe (quasars). Because of the introduction of new observing techniques, including space probes, exciting discoveries are being made in many different fields of astronomy. Members of the astrophysics group often work almost simultaneously on several important and rapidly developing problems.

The research during the past year of Scott D. Tremaine (a long-term member at the School) is an example of how investigations of the very near are combined with studies of the very far. Much of his work has been an exploration of the dynamics of particle and gas disks (thin rings or disks of matter moving around a massive central object), largely in collaboration with Peter Goldreich of the California Institute of Technology. The topic of gas disks is important and fashionable in astronomy because of observations of the rings of Jupiter, Saturn and Uranus, the detection of accretion disks in x-ray and other binary star systems, and a recently popular theory that quasars, the most energetic objects known in the universe, are powered by massive black holes that attract matter from surrounding gas disks. Tremaine and Goldreich have shown that a point mass orbiting near a disk will tend to repel the disk; this effect may explain the narrow rings seen around Uranus. In collaboration with B. Paczynski from the Institute of Astronomy in Poland, Tremaine has begun work on the possibility that some quasar properties may be explained by stars embedded in an accretion disk.

The future applications of the Space Telescope are the subject of an intensive collaboration between John Bahcall of the School's Faculty and Raymond Soneira of Princeton University. The theme of their work is "the universe at faint magnitudes." They are attempting to predict what the Space Telescope will "see" when observations of objects 100 times fainter than are now detectable with earth-based telescopes become available in about 1984. Bahcall and Soneira have just finished predicting the distribution of faint stars using a detailed model of the galaxy. Their work suggests what studies are likely to be most fruitful for ground-based observers now and for Space Telescope observers in the future.

Other especially interesting areas of research in astrophysics by Institute members have included the relativistic hydrodynamics of extragalactic radio sources (Paul R. Shapiro of Harvard University), the characteristic emission-line shapes for masers formed around stars (Charles Alcock, a long-term member, and Randy R. Ross of the University of Colorado), the ratio of emission-line strengths from quasars (Julian H. Krolik from the University of California-Berkeley, with J. Kwan from Bell Laboratories), the jets in double radio sources (Willem A. Baan of the Massachusetts Institute of Technology), exact solutions to a non-linear diffusion problem arising in population genetics and the theory of slow flame propagation (William I. Newman of Cornell University), the correlation of galaxies and radio sources (Malcolm S. Longair of the University of Cambridge) and

the uncertainties in predicting the solar neutrino fluxes (John Bahcall with S. Lubow and R. Ulrich of the University of California-Los Angeles).

Plasma physics activity was at a relatively low level during the academic year 1978-79 since Marshall Rosenbluth was on sabbatical leave for one semester. However, Professor Rosenbluth did obtain some important results while he was at the Institute in the fall. The stability properties of toroidal confinement systems in the limit of vanishingly small central holes, the so-called spheromak, were investigated by means of a novel energy principle including effects of finite resistivity. Properties of stochastic magnetic field configurations were studied. In particular, for the first time in such ergodic situations, an explicit formula was derived for the rate at which magnetic field lines exponentially diverge from each other. Numerical work verified the analytic formulation. Some studies were also made of properties of free electronic lasers. In the academic year 1979-80, a large plasma physics group will join Professor Rosenbluth on his return to the Institute.

In addition to those School activities shown in the Record of Events which follows, astrophysics seminars were held roughly every week. Speakers included Larry Smarr, William H. Press and Paul Schechter, all of Harvard University; Paul Joss and Thomas A. Zang, both from the Massachusetts Institute of Technology; Sverre Aarseth of the University of Cambridge; Kimmo A. Innanen of York University, Toronto; Anthony Readhead from the California Institute of Technology; Edwin Salpeter of Cornell University; and P. Schwartz of Yale University, as well as speakers from the Institute and Princeton University. Furthermore, an informal luncheon discussion was held each Tuesday during the year.

The School of Natural Sciences

Permanent Member, Members with Long-term Appointments, Members and Visitors, 1978-79

In the section which follows, the information was obtained from material provided by the members and visitors.

Permanent Member

Julian H. Bigelow. *Applied mathematics; electronic computers; experimental physics.*

Born March 19, 1913, Nutley, New Jersey. Massachusetts Institute of Technology, AB 1934, MA 1935.

Industrial positions 1936-41; Massachusetts Institute of Technology, Research Associate 1941-42, Instructor 1942-43; Columbia University, OSRD, Statistical Research Group, Associate Director 1943-46; Institute for Advanced Study, Electronic Computer Project, Head of Experimental Group 1946-51, School of Mathematics, Member 1951-70, School of Natural Sciences, Permanent Member 1970-; University of California-Los Angeles, Visitor 1966-67; Neuro Science Research Group (Brookline, Massachusetts) 1969-70.

Members with Long-term Appointments

Charles R. Alcock. *Astrophysics.*

Born June 15, 1951, Windsor, England. University of Auckland, BS 1973; California Institute of Technology, PhD 1978.

California Institute of Technology, Graduate Research Fellow 1973-78; Institute for Advanced Study, Member with Long-term Appointment 1977-.

Herman H. Goldstine. See page 27 for biographical entry.

Otto E. Neugebauer. See page 27 for biographical entry.

Claudio Teitelboim. *Relativity.*

Born April 15, 1947, Santiago, Chile. Universidad de Chile, Santiago, BA 1969; Princeton University, MA 1971, PhD 1973.

Universidad de Chile, Teaching Assistant 1966-68, Memorista 1968-69, Ayudante de Investigacion (on leave) 1969-70, Investigador Asociado (on leave) 1970-73; Princeton University, Research Assistant 1969-70, Teaching Assistant 1970-71, Research Associate 1973-74, Assistant Professor 1974-; Institute for Advanced Study, Member 1975-78, Member with Long-term Appointment 1978-.

Scott D. Tremaine. *Astrophysics.*

Born May 25, 1950, Toronto, Canada. McMaster University, BS 1971; Princeton University, MA 1973, PhD 1975.

California Institute of Technology, Research Fellow 1975-77; Institute for Advanced Study, Member with Long-term Appointment 1977-.

Members

Willem A. Baan. *Astrophysics.*

Born August 13, 1947, Bleskengraaf, The Netherlands. TE Delft (The Netherlands), Engr. 1971; Massachusetts Institute of Technology, MA 1973, PhD 1977.

National Aerospace Laboratory (The Netherlands), Research Associate 1971; Massachusetts Institute of Technology, NASA International Fellow 1971-73, Teaching and Research Assistant 1973-.

Thomas I. Banks. *Elementary particles and field theory.*

Born April 19, 1949, New York, New York. Reed College, BA 1969; Massachusetts Institute of Technology, PhD 1973.

Tel-Aviv University, Postdoctoral Fellow 1973-75, Lecturer 1975-.

Itzhak Bars. *Particle physics.*

Born August 31, 1943, Izmir, Turkey. Robert

College, Istanbul, BS 1967; Yale University, MA 1969, PhD 1971.

University of California-Berkeley, Assistant Research Physicist 1971-73; Stanford University, Assistant Professor 1973-75; Yale University, Assistant Professor 1975-.

Shmuel Elitzur. *Field theory.*

Born September 27, 1944, Jerusalem, Israel. Hebrew University, BS 1968, MA 1971; Tel-Aviv University, PhD 1977.

Yitzhak Frishman. *Particle physics.*

Born September 13, 1938, Zamosc, Poland. Hebrew University, BSc 1962, MSc 1964; Weizmann Institute, PhD 1967.

Stanford Linear Accelerator Center, Research Associate 1966-68, Visiting Associate Professor 1972; Institute for Advanced Study, Member 1968-69, second term 1972-73, 1974-75, Visitor 1977; Weizmann Institute, Assistant Professor 1969-72, Associate Professor, Professor 1972-.

Antal Jevicki. *Extended-Hadron models; field theory.*

Born May 21, 1951, Subotica, Yugoslavia. University of Belgrade, BS 1972; City University of New York, MA 1973, PhD 1976.

City University of New York, City College, Graduate Fellowship 1972-76, Research Assistant 1973-76; Institute for Advanced Study, Member 1976-77, 1977-78; Brown University, Assistant Professor 1979-.

John B. Kogut. *Particle physics.*

Born March 6, 1945, Brooklyn, New York. Princeton University, BS 1967; Stanford University, MS 1968, PhD 1971.

Stanford University, National Science Foundation Predoctoral Fellow 1967-71; Institute for Advanced Study, Member 1971-73; Cornell University, Laboratory of Nuclear Studies 1974-.

Joel Koplik. *Elementary particle theory.*

Born October 31, 1948, Brooklyn, New York. Cooper Union, BS 1969; University of California-Berkeley, PhD 1974.

Columbia University, Research Associate 1974-76; Institute for Advanced Study, Member 1976-77.

Julian H. Krolik. *Astrophysics.*

Born April 4, 1950, Detroit, Michigan. Massachusetts Institute of Technology, BS 1971; University of California-Berkeley, PhD 1977.

Institute for Advanced Study, Member 1977-78; Massachusetts Institute of Technology, Postdoctoral Scientist 1979-.

Miguel Lagos. *Relativity.*

Born March 5, 1946, Santiago, Chile. University of Chile, MA, PhD.

Comision Chilena de Energia Nuclear, Associate Researcher 1973-76; Universidad Catolica de Chile, Associate Professor 1976-.

Jean-Jacques Loeffel. *Mathematical physics.*

Born October 15, 1932, Bienne, Switzerland. ETH, Zurich, MA 1957, PhD 1962.

ETH, Assistant for Advanced Calculus 1959-62; CERN, Fellow 1962-64; University of Washington, Research Assistant Professor 1964; New York University, Courant Institute, Associate Research Scientist 1964-66; Institute for Advanced Study, Member 1966-67; University of Orsay, Paris, Joliet-Curie Fellow 1967-68; University of Lausanne, Lecturer 1968-70, Professor 1970-.

Malcolm S. Longair. *Astrophysics.*

Born May 18, 1931; British citizenship. University of St. Andrews, BA 1963; University of Cambridge, PhD 1967.

University of Cambridge, Cavendish Laboratory, Professor 1978-.

William I. Newman. *Astrophysics.*

Born August 28, 1949, Edmonton, Alberta, Canada. University of Alberta, BS 1971, MA 1972; Cornell University, MA 1975, PhD 1978.

Cornell University, Graduate Research Assistant 1972-73, 1976-78, Graduate Fellowship 1973-76.

Roger G. Newton. *Mathematical physics.*

Born November 30, 1924, Germany. Harvard University, BA 1949, MA 1950, PhD 1953.

Institute for Advanced Study, Member 1953-55; Indiana University, Assistant Professor 1955-58, Associate Professor 1958-60, Professor 1960-, Chairman, Department of Physics 1973-; Ohio State University, Visiting Professor 1958; University of Rome, Visiting Professor 1962-63; University of Montpellier, CNRS Fellow 1971-72; University of Geneva, Visiting Professor 1972.

F. Robert Ore, Jr. *Particle physics.*

Born August 6, 1952, Fort Monmouth, New

Jersey. Massachusetts Institute of Technology, BS 1974, PhD 1978.

Massachusetts Institute of Technology, Teaching Assistant 1974-76, Research Assistant 1976-78, Research Associate 1978.

Robert B. Pearson. *Particle physics.*

Born June 27, 1949, Los Angeles, California. University of California-Irvine, BS 1971; Stanford University, PhD 1975.

Stanford University, National Science Foundation Fellow 1971-74; Fermi National Accelerator Laboratory, Research Associate 1975-77; Institute for Advanced Study, Member 1977-78; University of California-Santa Barbara, Institute of Theoretical Physics, Research Associate 1979-.

Malcolm J. Perry. *Relativity.*

Born November 13, 1951, Birmingham, England. University of Oxford, BS 1973; University of Cambridge, MA 1977, PhD 1978.

University of Cambridge, King's College, Research Fellow 1977-, DAMTP, SRC Research Fellow 1977-; Princeton University, Assistant Professor 1979-.

Randy R. Ross. *Astrophysics.*

Born November 15, 1945, Seattle, Washington. George Washington University, BS 1967; University of Wisconsin, MA 1968; University of Colorado, PhD 1978.

University of Wisconsin, Woodrow Wilson Fellow 1967-68; Jamestown (New York) Community College, Instructor 1968-70, Assistant Professor 1970-73; University of Colorado, Graduate Fellow 1974-76, 1977-78, Boettcher Foundation Fellow 1976-77.

Paul R. Shapiro. *Astrophysics.*

Born August 2, 1953, New Haven, Connecticut. Harvard College, BA 1974; Harvard University, PhD 1978.

Harvard University, National Science Foundation Predoctoral Fellowship in Astronomy 1974-77; Harvard-Radcliffe College, South House, Resident Tutorship in Astronomy and Physics 1975-78, Parker Fellowship 1977-78.

Junko Shigemitsu. *High energy physics.*

Born March 19, 1949, Japan. Sophia University, Tokyo, BS 1973; Cornell University, PhD 1978.

Neal J. Snyderman. *Quantum field theory.*

Born January 1, 1949, Philadelphia, Pennsylvania. University of Pennsylvania, BS 1970; Brown University, MA 1973, PhD 1976.

State University of New York-Stony Brook, Institute for Theoretical Physics, Research Associate 1975-77; Institute for Advanced Study, Member 1977-78; Stanford Linear Accelerator Center, Research Associate 1979-.

Raymond M. Soneira. *Astrophysics.*

Born July 10, 1949, New York, New York. Columbia College, BS 1972; Princeton University, MA 1974, PhD 1978.

CBS Television Network, Engineering and Development Department, Consultant 1967-70; Princeton University, Cyclotron Laboratory, Assistant in Research 1972-73, Introductory Physics Laboratory, Assistant in Instruction 1973-74, Gravitation Research Group, Assistant in Research 1974-77.

George F. Sterman. *Particle physics.*

Born June 2, 1946, Washington, D.C. University of Chicago, BS 1968; University of Maryland, PhD 1974.

University of Illinois-Urbana-Champaign, Research Associate 1974-76; State University of New York-Stony Brook, Institute for Theoretical Physics, Research Associate 1976-.

Visitors

Mark Azbel. *Thermodynamics of irregular one-dimensional systems (DNA, RNA, and other long molecules).*

Born May 12, 1932, Poltava, U.S.S.R. Kharkov University, BA 1950, MA 1953, PhD 1955.

Physical-Technical Institute, Kharkov, Senior Researcher 1955-64; Kharkov University, Professor 1958-64; Moscow University, Professor 1964-72; Landau Institute for Theoretical Physics, Director of Department 1965-72; Tel-Aviv University, Professor 1973-.

Kenneth M. Case. *Neutron diffusion; field theory; relativistic wave equations.*

Born September 23, 1923, New York, New York. Harvard University, MA 1945, PhD 1948.

Los Alamos Scientific Laboratory, Physics Staff 1944-45, Consultant 1948-; University of Michigan, Assistant Professor of Physics 1950-52,

Professor of Chemistry 1953-67; Rockefeller University, Professor of Physics 1967-; Institute for Advanced Study, Member 1948-49, 1949-50, 1956-57, Visitor 1969-70, 1975-76, 1976-77.

Patricio Cordero. *Relativity.*

Born December 3, 1941, Santiago, Chile. University of London, PhD 1967.

University College, London, Research Assistant 1967-68; International Center for Theoretical Physics (Italy), Visiting Scientist 1968; University of Chile, Professor 1968-.

Walter Dittrich. *Particle physics.*

Born November 24, 1935, Kiel, Germany. University of Göttingen, BS 1961, MS 1963; University of Munich, PhD 1968.

Massachusetts Institute of Technology, Instructor 1969-70; Institute for Advanced Study, Visitor 1972-73; University of Tubingen, Institute for Theoretical Physics, Professor 1972-.

Jamal T. Manasseh. *Particle physics.*

Born February 23, 1945, Haifa, Israel. American University of Beirut, BA 1966; Columbia University, MA 1968, PhD 1969.

Institute for Advanced Study, Member 1970-71, 1971-72, first term 1974-75, first term 1976-77, Visitor second term 1975-76, 1976-77, 1977-78; American University of Beirut, Assistant Professor 1970-72; Columbia University, Assistant Professor.

Vladmir Višnjić. *Particle physics.*

Born November 4, 1946, Belgrade, Yugoslavia. University of Belgrade, BS 1967, MA 1972; University of Bonn, PhD 1978.

Anna Zytkow. *Astrophysics.*

Born February 21, 1947, Poland. University of Warsaw, PhD 1972.

Polish Academy of Sciences, Copernicus Astronomical Center, Assistant 1970-71, Senior Assistant 1972, Research Associate 1973-; University of Cambridge, Institute of Theoretical Astronomy, Visiting Fellow summer 1973, summer 1974; California Institute of Technology, postdoctoral study 1974-76.

The School of Social Science

Faculty

Clifford Geertz
Albert O. Hirschman
(1907 Foundation Professor)

Members with Long-term Appointments

Thomas S. Kuhn
Bernard Lewis

The School of Social Science

In terms of its formal existence, the School of Social Science is the youngest of the Institute's four divisions. Although its roots go back to 1935 to what was then the School of Economics and Politics at the Institute, its creation as an enduring program came with a permanent academic appointment in 1970-71 and its formulation as a School in 1973. This process of moving from program to School, from experimental venture to institutionalization, is an essential characteristic of growth at the Institute. To the tenured appointments of Clifford Geertz, an anthropologist, and Albert O. Hirschman, an economist, were added long-term visiting appointments: five years for William H. Sewell, Jr., a social historian with an interest in eighteenth- and nineteenth-century France, and three years for Quentin Skinner, a political theorist who has now completed his term at the Institute and has been appointed to the Chair of Political Sciences at the University of Cambridge.

The School of Social Science pursues an operational pattern parallel to that of other Institute Schools, combining a rather small number of permanent Faculty with a larger group of visiting annual members. These are drawn from an ever wider pool of possibilities created by individuals who initiate their own applications as well as by those who respond to invitations issued by the School. As a whole, the School has been slowly expanding, with a professorship soon to be filled and a growing number of members. The Schools of Social Science and Historical Studies have shared long-term appointments: Thomas S. Kuhn in the history of science, who held a five-year appointment before his departure for M.I.T., and Bernard Lewis in Middle Eastern studies, who holds an indefinite standing appointment of this sort in a tripartite arrangement involving the School of Social Science, the School of Historical Studies and Princeton University.

The School of Social Science does not normally attempt to take on large-scale statistical or quantitative studies. Such work has been done at the Institute but it is not central to its purposes. Furthermore, the School does not select certain social problems and, seeking their solutions, come up with prescriptions for this or that social malaise. This does not mean that such uses may not be made of work accomplished at the Institute. Indeed, an interest in policy questions has characterized the work of some members of the School and will surely occur again in the future. However, the main focus of the School is interpretive in nature, investigating the meanings of social behavior and delineating the determinants of social change. As such it is resolutely multi-disciplinary, cross-cultural and internationally comparative, drawing its data from historical as well as contemporary problems, exploiting ethnographic as well as quantitative sources.

In a sense, the empirical findings of the social sciences are employed to criticize and to refine both methodology and theory in the contemporary human sciences. Thus the School, while giving credit to the long-dominant quantitative approach in American social science, nevertheless shares in the growing numbers of reservations expressed about it; that is, that its methods are narrow and overspecialized, that its procedures lead to a warping present-mindedness and that both combine to create an unjustified scientism, incapable of producing a legitimate, durable set of solutions to the pressing social and economic problems of our time.

This intellectual posture demonstrates one

of the roles of the Institute for Advanced Study as part of the seamless fabric of higher education and research—to use, when warranted, its private security and intellectual freedom for an independent position in, and critical assessment of, the academic accomplishment embraced by its areas of expertise.

Academic Activities, 1978-79

As is now traditional, the principal intellectual communication not only among the members of the School, but also between these members and a group of members of the School of Historical Studies, took place during the weekly luncheon seminars. These seminars covered a wide spectrum of topics as can be seen from the Record of Events presented in a subsequent section of the Annual Report. Four of the twenty seminars were given by members of the School of Historical Studies and two by members of Princeton University; the remainder were given by the Faculty and members of the School of Social Science. The seminars were remarkably well attended; discussions were lively and spilled over into subsequent informal conversations and exchanges.

The focus for this past year, 1978-79, was on new trends in economic thought. The seminars brought together a number of economists who are in some way dissatisfied with neoclassical economics and are attempting to break new theoretical ground. The members included Harvey Leibenstein (Harvard) whose work on "X-efficiency" has been the most serious critique to date of the neoclassical theory of the firm; Richard Day (Southern California) who is attempting to formalize adaptive economic processes in which maximizing behavior is the exception rather than the rule; Victor Goldberg (University of California-Davis) who worked on economic relationships (as in franchising) based on continuing contact rather than on a one-time encounter; Gordon Winston (Williams) who has questioned the way time enters into standard economic thinking, with regard to both production and consumption theory; and Antonio de Castro (University of Campinas, Brazil) who is attempting to formulate a theory of technical process in primary exporting economies. In addition to this core group, Joseph Stiglitz, a mathematical economist from Oxford and the first recipient of the newly instituted Oskar Morgenstern Fellowship of Mathematica, Inc., was associated with the Institute as a visitor during the first term while holding that fellowship.

The School of Social Science

Members with Long-term Appointments, Members and Visitors, 1978-79

In the section which follows, the information was obtained from material provided by the members and visitors.

Members with Long-term Appointments

Thomas S. Kuhn. See page 27 for biographical entry.

Bernard Lewis. See page 27 for biographical entry.

Members

Persio Arida. *Conceptual preconditions of technological change.*

Born March 1, 1952, São Paolo, Brazil. University of São Paolo, BA 1975; Massachusetts Institute of Technology, PhD candidate 1976-.

FAPESP (Fundação de Amparo a Pesquisa do Estado de São Paolo), Fellow 1975; Institute for Advanced Study, Assistant to Professor Albert O. Hirschman 1978-79.

Richard Hollis Day. *Adaptive economics.*

Born August 14, 1933, Ames, Iowa. Iowa State University, BA 1955; Harvard University, MA 1961, PhD 1961.

University of Wisconsin, Assistant Professor 1962-64, Associate Professor 1965-68, Professor 1968-77; University of Göttingen, Fulbright Lecturer 1967-68; Rockefeller Study Center, Bellagio, Scholar in residence 1974; Harvard University, Honorary Resident Associate 1975-76; University of Southern California, Professor 1977-.

Antonio Barros de Castro. *Technological development in nineteenth-century Brazil.*

Born February 11, 1938, Rio de Janeiro, Brazil. Faculdade de Nacional de Ciências Econômicas, BA 1959; University of Campinas, PhD 1976.

United Nations ECLA-ILPES, Rio de Janeiro, economist 1963-69; United Nations ILPES, Santiago, economist 1970-72; University of Cambridge, Academic Visitor 1973-74; University of Campinas, Professor 1974-77; FINIP, Rio de Janeiro, Research Coordinator 1977-.

Victor P. Goldberg. *Relational exchange.*

Born November 26, 1941, Washington, D.C. Oberlin College, BA 1963; Yale University, MA 1964, PhD 1970.

University of California-Davis, Acting Assistant, Lecturer and Assistant Professor of Economics 1967-71, Assistant Professor and Assistant Researcher 1971-74; Institute of Governmental Affairs, Associate Professor and Associate Research Economist 1974-75, 1977-78; Virginia Polytechnic Institute and State University, Center for Study of Public Choice, Postdoctoral Fellow 1975-76; University of California-Berkeley, Law School, Visiting Professor 1976-77; University of California-Davis, Associate Professor 1976-.

Stephen F. Gudeman. *Anthropological economics.*

Born June 29, 1939, Chicago, Illinois. Harvard College, BA 1961; University of Cambridge, MA 1963, PhD 1970.

University of Minnesota, Assistant Professor 1969-74, Associate Professor 1974-.

Stephen T. Holmes. *Benjamin Constant and political theory.*

Born February 21, 1948, St. Louis, Missouri. Denison University, BA 1969; Yale University, MA 1971, PhD 1976.

University of Rome, Fulbright Fellow 1969-70; University of Heidelberg, Deutscher Akademischer Austauschdienst Fellow 1973-74; Yale University, Acting Instructor 1975-76, Instructor 1976-77; Wesleyan University, Postdoctoral Teaching Fellow 1977-78; Harvard University, Assistant Professor 1978-.

Toby E. Huff. *Science, faith and rationality in Islam.*

Born April 24, 1942, Portland, Maine. Northeastern University, BA 1965; Northwestern University, MA 1967; New School for Social Research, PhD 1971.

Suffolk University, Instructor 1968-71; Southeastern Massachusetts University, Assistant Professor of Sociology 1971-; University of California-Berkeley, NEH Postdoctoral Fellow in residence 1976-77.

Francisco Leal-Buitrago. *Political parties and the origin of the state in Colombia.*

Born August 1, 1937, Bogotá, Colombia. Universidad Nacional de Colombia, BA 1967, MA 1969; University of Wisconsin, PhD 1974.

Universidad Nacional de Colombia, Graduate Assistant 1967-68; Universidad de los Andes, Professor 1968-71, Director of Graduate Program in Political Science 1974-.

Harvey Leibenstein. *X-efficiency, sociobiology and public enterprise.*

Born August 7, 1922, Russia. Northwestern University, BA 1945, MA 1946; Princeton University, PhD 1951.

Rand Corporation, Consultant 1954-55; Social Science Research Council, Faculty member and Research Fellow 1959-60; University of California-Berkeley, Assistant Professor 1951-60, Professor of Economics 1960-67; Harvard University, Andelot Professor of Economics and Population 1967-; United Nations Secretariat, Population Division, Consultant 1973-76.

Melvin Richter. *The concept of despotism.*

Born April 6, 1921, Revere, Massachusetts. Harvard College, BA 1943; Harvard University, PhD 1953.

City University of New York, Instructor, Professor 1956-; Columbia University, Visiting Professor 1964, 1969, 1970; Princeton University, Visiting Professor 1966, 1972; University of Oxford, Nuffield College, Visiting Professor 1972; Harvard University, Summer School, Visiting Professor 1974.

Joan W. Scott. *Working class culture and the working class family in nineteenth-century France.*

Born December 18, 1941, New York, New York. Brandeis University, BA 1962; University of Wisconsin, MA 1964, PhD 1969.

University of Chicago, Lecturer 1969-70; University of Illinois-Chicago Circle, Assistant Professor 1970-72; Northwestern University, Assistant Professor 1972-74; University of North Carolina, Associate Professor 1974-77, Professor 1977-.

William H. Sewell, Jr. *Social history of modern Europe.*

Born May 15, 1940, Stillwater, Oklahoma. University of Wisconsin, BA 1962; University of California-Berkeley, MA 1963, PhD 1971.

University of Chicago, Instructor in History 1968-71, Assistant Professor 1971-75; Institute for Advanced Study, Member 1971-72, Long-term Member 1975-80.

Quentin R. D. Skinner. *Political ideas of the sixteenth and seventeenth centuries.*

Born November 26, 1940, Oldham, England. University of Cambridge, BA 1962, MA 1965.

University of Cambridge, Christ's College, Official Fellow, 1962, Assistant Lecturer in History 1965-67, Lecturer in History 1967-68, Professor of Political Science 1978-; Australian National University, Research School of Social Science, Visiting Fellow 1970; Royal Historical Society, Fellow 1971; Institute for Advanced Study, School of Historical Studies, Visitor 1974-75, School of Social Science, Long-term Member 1976-79.

Gordon C. Winston. *Temporality in economic theory.*

Born February 9, 1929, San Francisco, California. Whitman College, BA 1950; Stanford University, MA 1961, PhD 1964.

Stanford University, Instructor 1962-63, Visiting Assistant Professor 1964; Williams College, Assistant Professor, Professor 1963-74, Orin Sage Professor of Political Economy 1974-; Bennington College, Faculty 1964; Yale Pakistan Project, Karachi, Senior Research Adviser 1966-67, Head of Project 1970; World Bank, ILO, Geneva, Senior Consultant 1972-74, External Collaborator 1976.

Visitors

Karen I. Blu. *Ethnicity and race in the southern U.S.A.*

Born August 20, 1941, Oak Park, Illinois. Bryn

Mawr College, BA 1963; University of Chicago, MA 1965, PhD 1972.

University of Chicago, University Fellow 1963-64; National Institute of Mental Health Predoctoral Fellow 1964-68; City University of New York, City College, Lecturer 1968-71; Smithsonian Institution, National Endowment for the Humanities Postdoctoral Fellow 1971-72; City University of New York, Baruch College, Assistant Professor 1972-77; New York University, Assistant Professor 1977-.

Joseph E. Stiglitz. *Mathematical economics and applications.*

Born February, 1943, U.S.A. Amherst College, BA 1964; Massachusetts Institute of Technology, PhD 1966.

Massachusetts Institute of Technology, Assistant Professor of Economics 1966-67; University of Canterbury (New Zealand), Visiting Professor 1967; University of Cambridge, Gonville and Caius College, Tapp Research Fellow 1966-70; Yale University, Cowles Foundation, Assistant Professor 1967-68, Associate Professor 1968-70, Professor of Economics 1970-74; University of Oxford, St. Catherine's College, Visiting Fellow 1973-74; Stanford University, Professor of Economics 1974-76; University of Oxford, Drummond Professor of Political Economy 1977-79; Princeton University, Professor of Economics 1979-.

Publications of the Faculty and Professors Emeriti: A Selection

Faculty

Stephen L. Adler

Classical algebraic chromodynamics. *Phys. Rev. D* 17: 3212.

"No-hair" theorems for the Abelian Higgs and Goldstone models. *Phys. Rev. D* 18: 2798.

Theory of static quark forces. *Phys. Rev. D* 18: 411.

Classical quark statics. *Phys. Rev. D* 19: 1168.

Small deformations of the Prasad-Sommerfeld solution. *Phys. Rev. D* 19: 2997.

Global structure of static Euclidean SU(2) solutions. *Phys. Rev. D* 20: 1386.

Algebraic chromodynamics. *Phys. Lett.* 86*B*: 203.

John N. Bahcall

Solar neutrino experiments. *Rev. of Mod. Phys.* 50: 881-904.

Masses of neutron stars and black holes in x-ray binaries. *Ann. Rev. Astron. Astrophys.* 16: 241-64.

[with B. Cleveland, R. Davis, Jr., I. Dostrovsky, J. C. Evans, Jr., W. Frati, G. Friedlander, K. Lande, K. Rowley and J. Weneser] A proposed solar neutrino experiment using ^{71}Ga. *Phys. Review Letters* 40: 1351.

Theoretical introduction to the ^{37}Cl solar neutrino experiment. Proceedings of informal conference on the status and future of solar neutrino research (1978), Brookhaven National Laboratory 50879, vol. 1, p. 55.

Capture rates for various solar neutrino detectors. Proceedings of informal conference on the status and future of solar neutrino research (1978), Brookhaven National Laboratory 50879, vol. 1, p. 223.

[with M. Milgrom] Apparent superluminal expansion velocities in the dipole magnetic field model. *Nature* 274: 349.

Solar neutrinos: theory versus observation. *Space Science Reviews* 24: 227-51.

Theoretical introduction to the ^{37}Cl solar neutrino experiment. *Comments on Astrophysics*, vol. 8, no. 2, p. 37.

[with C. R. O'Dell] Space telescope observatory. NASA technical memorandum TM-78301.

[with H. Primakoff] Neutrino-antineutrino oscillations. *Phys. Rev. D* 18: 3463-66.

Enrico Bombieri

On exponential sums in finite fields, II. *Inventiones mathematicae* 47 (1978): 29-39.

[with F. Catanese] The tricanonical map of a surface with $K^2 = 2$, $P_g = 0$. *Studies in Math.* No. 8, Tata Institute, Bombay, 1978, 279-90.

Recent progress in the theory of minimal surfaces. *L'Enseignement mathématique* 25 (1979): 1-8.

Armand Borel

On the development of Lie group theory. *Math. Centrum* tract 100/101 (1978), Amsterdam.

Marshall Clagett

Archimedes in the Middle Ages, Vol. 3. Philadelphia: American Philosophical Society, 1978.

Roger F. Dashen

[with D. J. Gross and C. G. Callan] Toward a theory of the strong interactions. *Phys. Rev. D* 17: 2717.

[with C. G. Callan, D. J. Gross, F. Wilczek, A. Zee] The effect of instantons on the heavy quark potential. *Phys. Rev. D* 18: 4864.

Dynamical effects of instantons and merons. Talk given in January 1978, at Orbis Scientiae, Coral Gables, Florida. Published in *New frontiers in high-energy physics* (B. Kursunoglu *et al.*, eds.). New York: Plenum Publishing Corporation.

[with C. G. Callan and D. J. Gross] Phase transitions in QCD as tunneling through singular barriers. *Phys. Lett. 77B*: 270.

[with C. G. Callan and D. J. Gross] A theory of Hadronic structure. *Phys. Rev. D* 19: 1826.

[with C. Callan and D. Gross] Semiclassical methods in quantum chromodynamics: toward a theory of Hadron structure. In *Quantum chromodynamics* (La Jolla Institute, 1978), eds. William Frazer and Frank Henyey, pp. 269-339. New York: American Institute of Physics, 1979. This book is part of the *AIP Conference Proceedings*, edited by Hugh Wolfe, no. 55.

Freeman J. Dyson

[with E. Lieb and B. Simon] Phase transitions in quantum spin systems with isotropic and non-isotropic interactions. *Journal of Statistical Physics* 18: 335.

Variation of constants. In *Current trends in the theory of fields: a symposium in honor of P. A. M. Dirac*, ed. J. E. Lannutti and P. K. Williams, pp. 163-68. New York: American Institute of Physics, 1978.

Image processing and live optics. Talk given at ESO Conference on Optical Telescopes of the Future, December 1977, at CERN, Geneva. Published in the conference proceedings, edited by F. Pacini, pp. 439-44, Geneva, 1978.

James Arthur Lectures on Time and Its Mysteries. New York University, 1978 series.

Time without end: physics and biology in an open universe. *Rev. Mod. Phys.*, July, 1979.

John H. Elliott

Memoriales y Cartas del Conde Duque de Olivares, Vol. 1. Madrid: Altaguara, 1978.

Clifford Geertz

[with Hildred Geertz and Lawrence Rosen] *Meaning and Order in Moroccan Society*. New York: Cambridge University Press, 1979.

James F. Gilliam

"A Citation of Didymus." *Zeitschrift für Papyrologie und Epigraphik* 35 (1979): 41-42.

Review of *Roman Military Records on Papyrus*, by R. O. Fink. *Bulletin of the American Society of Papyrologists* 15 (1978): 227-30.

Review of *The Florida Ostraka: Documents from the Roman Army in Upper Egypt*, by R. S. Bagnall. *American Journal of Philology* 100 (1979): 339-40.

Christian Habicht

Ehrung von Richtern aus Metropolis. (*Stele. Volume dedicated to the memory of N. Kondoleon.*) Athens, 1978, pp. 44-47.

Zwei Angehörige des lynkestischen Königshauses, *Ancient Macedonia* 2, Thessalonika 1977 [1978], 511-16.

Untersuchungen zur politischen Geschichte Athens im 3. Jahrhundert v. Chr., VESTIGIA 30, 1979, Munich, C. H. Beck, 164 pp.

Makkabäerbuch, 2d ed., 1979 Gütersloh, G. Mohn (Jüdische Schriften aus hellenistisch-römischer Zeit I.3, pp. 165-285).

Harish-Chandra

Admissible invariant distributions on reductive p-adic groups, in Lie theories and their applications. *Queen's Papers in Pure and Applied Math.*, no. 48 (1978), pp. 281-347, Queen's University, Kingston, Ontario.

Albert O. Hirschman

"Beyond Asymmetry: Critical Notes on Myself as a Young Man and on Some Other Old Friends." *International Organization*, Winter 1978.

"Exit, Voice, and the State." *World Politics*, October 1978.

Irving Lavin

"On the Pedestal of Bernini's Bust of the Savior." *The Art Bulletin* 60 (1978), no. 3, 547.

Tullio Regge

[with Yuval Ne'eman] Gravity and supergravity as gauge theories on a group manifold. *Phys. Lett. 74B* (1978), 54.

Marshall N. Rosenbluth

[with D. P. Chernin] Ion losses from end-stoppered mirror-trap. *Nuclear Fusion* 18: 47.

Mode crossing in a Lagrangian system. *Physics of Fluids* 21: 297.

[with A. B. Rechester] Electron heat transport in a tokamak with destroyed magnetic surfaces. *Phys. Rev. Lett.* 40: 38.

[with G. Ara, B. Basu, B. Coppi, G. Laval and B. V. Waddell] Magnetic reconnection and m=1 oscillations in current-carrying plasmas. *Annals of Physics* 112: 443.

[with M. N. Bussac, P. H. Rutherford and R. B. White] The effect of ion collisional viscosity on resistive interchange stabilities. Presented at the 28th annual meeting of the American Physical Society, Division of Plasma Physics, November 1978, in Colorado.

[with M. N. Bussac, H. P. Furth, M. Okabayashi and A. Todd] Low-aspect-ratio limit of the toroidal reactor: the Spheromak. PPPL Report No. 1472 (1978).

[with P. H. Rutherford] Stability limit on beta in a tokamak using the collisionless energy principle. PPPL Report No. 1418 (1978).

[with D. A. Monticello and R. B. White] Feedback stabilization of magnetic islands in tokamaks. Presented at the 7th International Conference on Plasma Physics and Controlled Nuclear Fusion Research, August 1978, in Innsbruck.

[with N. A. Krall, S. Hamasaki, J. B. McBride, N. T. Gladd, P. H. Ng, H. H. Chen, J. D. Huba, R. C. Davidson, R. E. Aamodt, Y. C. Lee, C. S. Liu, D. R. Nicholson and D. P. Chernin] Drift wave stability and transport theory in fusion systems. IAEA-CN-37-S-3 Report (1978).

[with E. A. Williams and J. R. Albritton] Effect of spatial turbulence on parametric instabilities. *Physics of Fluids* 22: 139.

[with R. N. Sudan] Stability of axisymmetric field-reversed equilibria of arbitrary ion gyroradius. *Fluids of Physics* 22: 282.

[with M. N. Bussac] MHD stability of Spheromak. *Nuclear Fusion* 19: 489.

[with A. B. Rechester and R. B. White] Calculation of the Kolmogorov entropy for motion along with a stochastic magnetic field. *Phys. Rev. Lett.* 42: 1247.

Kenneth M. Setton

The Papacy and the Levant, 1204-1571, Vol. 2, *The Fifteenth Century*. Philadelphia: American Philosophical Society, 1978.

Morton White

The Philosophy of the American Revolution. New York: Oxford University Press, 1978.

"Memories of Benjamin Nelson." *The Psychoanalytic Review* 65 (1978): 197-99.

"Oughts and Cans." In *The Idea of Freedom: Essays in Honor of Isaiah Berlin*, edited by Allan Ryan, pp. 211-19. New York: Oxford University Press, 1979.

Professors Emeriti

Andrew Alfoldi

"Redeunt Saturnia Regna VII: Frugifer-Triptolemos im ptolemäischrömischen Herrscherkult." *Chiron* 9 (1979).

"Aion in Merida und Aphrodisias." *Madrider Beiträge* 6 (1979).

Felix Gilbert

The End of the European Era: 1890 to the Present. 2d ed. New York, 1979.

"Parteipolitik in den Italienischen Stadtrepubliken der Renaissance: Prolog zum modernen Parteienstaat?" *Vom Staat des Ancien Regime zum Modernen Parteienstaat: Festschrift für Theodor Schieder*. Munich and Vienna, 1978, pp. 9-25.

Review of *Petrarca und die Geschichte*, by Eckhard Kessler. *Renaissance Quarterly* 31 (1978): 608-609.

Bismarckian Society's Image of the Jew. The Leo Baeck Memorial Lecture 22 given in 1978 in New York.

Review of *Germany 1866-1945*, by Gordon A. Craig, and *The German Problem Reconsidered: Germany and the World Order, 1870 to the Present*, by David Calleo, in *The New York Review of Books*, 25 January 1979.

George F. Kennan

"A Last Warning: Reply to My Critics." *Encounter* 51, no. 1 (July 1978), 15-18.

Perceptions: Relations between the United States and the Soviet Union. Statement. U. S. Congress.

Senate. Committee on Foreign Relations. Washington: U. S. Government Printing Office, 1978.

"The Mystery of the Ferdinand Documents." *Jahrbücher für Geschichte Osteuropas* 26 (1978) H. 3. Wiesbaden: Franz Steiner Verlag.

"Ethics and Foreign Policy: An Approach to the Problem." *Foreign Policy and Morality: Framework for a Moral Audit*. New York: Council on Religion and International Affairs, 1979.

"The Franco-Russian Alliance of 1894." In *Was die Wirklichkeit lehrt* [Festschrift for Golo Mann on his 70th birthday]. Frankfurt: S. Fischer Verlag, 1979.

Benjamin D. Meritt

"The Chronology of the Peloponnesian War II." *Proceedings of the American Philosophical Society* 122: 287-93.

"Ten Years and a Few Days." *American Journal of Philology* 100 (1979): 107-10.

"The Omitted Day in Athens and the Mysteries." *Zeitschrift für Papyrologie und Epigraphik* 35 (1979): 145-51.

Homer A. Thompson

"Some Hero Shrines in Ancient Athens." *Athens Comes of Age: from Solon to Salamis*. Princeton, 1978, pp. 96-106.

"A Golden Victory." *A Portfolio Honoring Harold Hugo for His Contribution to Scholarly Printing*. Essay no. 3. Meriden, Connecticut. 1978.

Review of *Megara Hyblaea*, Vol. 1: *Le Quartier de l'agora Archaique*, by Georges Vallet *et al. Classical World* 71 (1978): 122f.

Review of *The Stones of Athens*, by R. E. Wycherley. *Archaeology* 31 (1978): 63-65.

Review of *Parthenon and the Mycenaean City on the Heights*, by J. A. Bundgaard. *A. J. A.* 82 (1978): 256-58.

André Weil

Oeuvres Scientifiques—Collected Works: Vol. 1 *(1926-1951)*; Vol. 2 *(1951-1964)*; Vol. 3 *(1964-1978)*. New York: Springer-Verlag, 1979.

Record of Events, 1978-79

September 28

School of Mathematics

Topology Seminar: "Open Books and Whitehead Torsion."
Jean-Claude Hausmann, University of Geneva; Member, School of Mathematics, IAS.

October 2

School of Mathematics

Members Seminar: "Certain Exponential Sums and Their Associated L-functions."
Alan C. Adolphson, University of Washington; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 3."
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Classical Quark Statics."
Stephen L. Adler, Professor, School of Natural Sciences, IAS.

October 5

School of Mathematics

Topology Seminar: "Cell-like Decompositions of S^3."
Michael P. Starbird, University of Texas; Member, School of Mathematics, IAS.

School of Historical Studies

Art History Colloquium: "The Antamoro Chapel in S. Girolama della Carità in Rome: Drawings by Juvarra and an Unknown Draftsman."
Henry A. Millon, Massachusetts Institute of Technology; Member, School of Historical Studies, IAS.

October 9

School of Mathematics

Members Seminar: "Classification of Compact Complex Surfaces of General Type."
Christiaan A. M. Peters, University of Leiden; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 3" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Semi-classical Quantization for Spin Systems."
Antal Jevicki, City University of New York; Member, School of Natural Sciences, IAS.

October 10

School of Mathematics

Transformation Groups Seminar: "Finite Group Actions on Disks."
Robert A. Oliver, Stanford University; Member, School of Mathematics, IAS.

October 11

School of Historical Studies

Colloquium in Classical Studies: "The Lost Beginning of Menander's 'Misoumenos': A Chapter in Women's Liberation."
Eric G. Turner, University College, London; Member, School of Historical Studies, IAS.

October 12

School of Mathematics

Topology Seminar: "Minimal Sets for Flows on Three-Dimensional Manifolds."
Michael Handel, Princeton University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "The European State: Acquisition of a Concept."
Quentin Skinner, Long-term Member, School of Social Science, IAS.

October 13

School of Natural Sciences

Theoretical Physics Seminar: "Instanton Effects in QCD."
Roger Dashen, Professor, School of Natural Sciences, IAS.

October 16

School of Mathematics

Members Seminar: "The Finite Simple Groups and Their Classification."
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 3" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

October 17

School of Mathematics

Lecture Series: "Primitive Ideals and Group Representations."
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

October 18

School of Historical Studies

Colloquium in Classical Studies: "Thrasyboulos and the Foreigners Who Helped to Restore the Democracy."
Michael J. Osborne, University of Lancaster; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Finite Group Actions on Disks" (continued).
Robert A. Oliver, Stanford University; Member, School of Mathematics, IAS.

October 19

School of Mathematics

Topology Seminar: "Denjoy's Theorem for Maps of the Interval."
Guest lecturer: J. Guckenheimer, New York University, Courant Institute.

Finite Groups of Lie Type Seminar: "2-modular Representations of Groups of Even Characteristic."
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Concept of Total Domination in Political Thought."
Melvin Richter, City University of New York; Member, School ot Social Science, IAS.

October 23

School of Mathematics

Marston Morse Memorial Lecture: "Equivariant Morse Theory and Stable Bundles."
Guest lecturer: R. Bott, Harvard University.

Finite Simple Groups Lecture: "Trivalent Graphs."
Guest lecturer: D. Goldschmidt, University of California-Berkeley.

October 24

School of Mathematics

Lecture Series: "Primitive Ideals and Group Representations" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

October 25

School of Historical Studies

Colloquium in Classical Studies: "The Mausoleum of Halicarnassus in the Light of Recent Discoveries."
Kristian Jeppesen, University of Aarhus; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Smooth Multiaxial 0(n)-actions."
Guest lecturer: W. C. Hsiang, Princeton University.

October 26

School of Mathematics

Topology Seminar: "Immersions and Embeddings of Spheres in Manifolds."
Lawrence L. Larmore, California State University-Dominguez Hills; Member, School of Mathematics, IAS.

Finite Groups of Lie Type Seminar: "2-modular Representations of Groups of Even Characteristic" (continued).
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Europe 1848-1914, as an Ancien Regime."
Guest lecturer: Arno Mayer, Princeton University.

October 27

School of Natural Sciences

Theoretical Physics Seminar: "Solutions of the Gravitational Equations, Including Relativistic Stellar Collapse and Collisions."
Guest lecturer: Larry Smarr, Harvard Observatory.

October 30

School of Mathematics

Members Seminar: "The Structure of Moduli Space for Riemann Surfaces."
William J. Harvey, University of London, King's College; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "A Theorem of R. Niles."
Richard Lyons, Rutgers University; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Quantum Gravity: I. Hawking Effect and Semi-classical Methods."
Malcolm J. Perry, University of Cambridge; Member, School of Natural Sciences, IAS.

October 31

School of Mathematics

Lecture Series: "Primitive Ideals and Group Representations" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

November 1

School of Historical Studies

Colloquium in Classical Studies: "Macedonian Arms and Tactics Under Alexander the Great."
Minor Markle III, Johns Hopkins University; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Equivariant Classifying Spaces."
Guest lecturer: S. Waner, Princeton University.

November 2

School of Mathematics

Special Lecture: "Scalar Curvature in Geometry and General Relativity."
Guest lecturer: R. Schoen, New York University, Courant Institute.

Finite Groups of Lie Type Seminar: "2-modular Representations of Groups of Even Characteristic" (continued).
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "The Rise and Fall of the First of the 'Total Institutions': The Oxbridge Tutorial System, 1550-1750."
Guest lecturer: Lawrence Stone, Princeton University.

November 3

School of Mathematics

Lecture Series: "Irrational Numbers and Ordinary Differential Equations."
Enrico Bombieri, Professor, School of Mathematics, IAS.

November 6

School of Mathematics

Members Seminar: "On the Stochastic Integral (almost no prerequisites needed)."
Claude Dellacherie, University of Strasbourg; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "A Theorem of R. Niles" (continued).
Richard N. Lyons, Rutgers University; Member, School of Mathematics, IAS.

November 7

School of Mathematics

Lecture Series: "Primitive Ideals and Group Representations" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

November 8

School of Historical Studies

Colloquium in Classical Studies: "Members' Attendance in the Senate of Imperial Rome."
R. J. A. Talbert, Queen's University, Belfast; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Finite Group Actions on Simply Connected Manifolds."
Amir R. Assadi, Princeton University; Member, School of Mathematics, IAS.

Differential Geometry Seminar: "Some Rigidity Theorems for Minimal Submanifolds of the Sphere."
Doris Fischer-Colbrie, University of California-Berkeley; Member, School of Mathematics, IAS.

November 9

School of Mathematics

Topology Seminar: "Algebraic K-theory of 1-connected Spaces."
Guest lecturer: D. Burghelea, Rutgers University.

Finite Groups of Lie Type Seminar: "2-modular Representations of Groups of Even Characteristic" (continued).
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

November 10

School of Mathematics

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

School of Natural Sciences

Theoretical Physics Seminar: "Weak Interactions of Ultra-heavy Fermions."
Guest lecturer: Miguel Furman, Lawrence Berkeley Laboratory.

November 13

School of Mathematics

Members Seminar: "The Local Structure of Characters."
Dan M. Barbasch, Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 2."
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

November 15

School of Historical Studies

Colloquium in Classical Studies: "French Excavations at Carthage."
Serge Lancel, University of Grenoble; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Equivariant Stratification of Differential Transformation Groups."
Takao Matumoto, Kyoto University; Member, School of Mathematics, IAS.

Differential Geometry Seminar: "Isometry Groups of Nonpositively Curved Manifolds."
Patrick Eberlein, University of North Carolina; Member, School of Mathematics, IAS.

School of Natural Sciences

Special Theoretical Physics Seminar: "Structure of the Massive Thirring Model."
Guest lecturer: Hugh Bergknoff, Fermilab.

November 16

School of Mathematics

Topology Seminar: "The Smith Conjecture."
Guest lecturer: W. Thurston, Princeton University.

Lecture Series: "Primitive Ideals and Group Representations" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

Finite Groups of Lie Type Seminar: "2-modular Representations of Groups of Even Characteristic" (continued).
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Time and Timing in Economic Analysis."
Gordon Winston, Williams College; Member, School of Social Science, IAS.

November 17

School of Mathematics

Lecture Series: "Irrational Numbers and Ordinary Differential

Equations" (continued).
Guest lecturer: B. Dwork, Princeton University.

November 20

School of Mathematics

Members Seminar: "The Minkowski-Siegel Theorem in the Analytic Theory of Quadratic Forms."
David M. Cohen, University of California-Irvine; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 2" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Quantum Gravity: II. Gravitational Instantons—Some Examples."
Malcolm J. Perry, University of Cambridge; Member, School of Natural Sciences, IAS.

November 21

School of Mathematics

Transformation Groups Seminar: "Immersions of Lie Groups."
Morikuni Goto, University of Pennsylvania; Visitor, School of Mathematics, IAS.

November 27

School of Mathematics

Members Seminar: "Some Remarks about Subvarieties of Abelian Varieties."
Ziv Ran, University of California-Berkeley; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 2" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Quantum Gravity: III. Gravitational Instantons—Some General Theorems."
Malcolm J. Perry, University of Cambridge; Member, School of Natural Sciences, IAS.

November 28

School of Natural Sciences

Theoretical Physics Seminar: "Irreducible Gauge of a Consolidated Salam-Weinberg Model."
Guest lecturer: Yuval Ne'eman, Tel-Aviv University.

November 29

School of Mathematics

Transformation Groups Seminar: "Smooth Actions of SO(3) and G_2 on Homotopy Spheres."
Guest lecturer: M. Davis, Columbia University.

Differential Geometry Seminar: "Asymptotic Geometry of Teichmüller Space."
Steven Kerckhoff, Princeton University; Member, School of Mathematics, IAS.

November 30

School of Mathematics

Lecture Series: "Primitive Ideals and Group Representations" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Discovery and Explanation: Notes on the Methodology of the Social Sciences."
Toby E. Huff, Southeastern Massachusetts University; Member, School of Social Science, IAS.

December 1

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)."
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

December 4

School of Mathematics

Members Seminar: "Uniqueness of the Fischer-Griess Monster."
John G. Thompson, University of Cambridge; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 2" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Solution to the Ising Model Using Integrals Over Anticommuting Variables."
Guest lecturer: S. Samuel, University of California-Berkeley.

December 6

School of Historical Studies

Colloquium in Classical Studies: "The Aion of Aphrodisias."
Andrew Alföldi, Professor Emeritus, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Weight System of Smooth SO(3) Actions on Disks."
Robert A. Oliver, Stanford University; Member, School of Mathematics, IAS.

Differential Geometry Seminar: "The Analytic Compactification of the Moduli Space of Riemann Surfaces and the Geometry of Certain Hyperbolic 3-manifolds."
Albert Marden, University of Minnesota; Member, School of Mathematics, IAS.

December 7

School of Historical Studies

Art History Colloquium: "Venice and the Emergence of the High Renaissance in Florence: Observations and Questions."
Craig Hugh Smyth, Harvard University, Villa I Tatti; Member, School of Historical Studies, IAS.

School of Mathematics

Topology Seminar: "$PSL_2(\mathbf{C})$ and Incompressible Surfaces."
Guest lecturer: P. Shalen, Courant Institute and Rice University.

Lecture Series: "Primitive Ideals and Group Representations" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

Finite Groups of Lie Type Seminar: "Conjugacy in Groups of Lie Type."
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Analyzing Urban Violence in Byzantine History."
John W. Barker, University of Wisconsin; Member, School of Historical Studies, IAS.

December 8

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

School of Natural Sciences

Theoretical Physics Seminar: "Baryons in the 1/N Expansion."
Guest lecturer: E. Witten, Harvard University.

December 11

School of Historical Studies

Colloquium in Classical Studies: "Artemis and Iphigeneia."
Lilly Kahil, Universities of Paris and Fribourg; Member, School of Historical Studies, IAS.

School of Mathematics

Members Seminar: "Index Theorem and Group Representations, I."
Alain Connes, University of Paris; Member, School of Mathematics, IAS.

Finite Simple Groups Seminar: "e(G) = 3" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Renormalizing Electromagnetic Mass-Splittings."
Guest lecturer: John Collins, Princeton University.

December 13

School of Mathematics

Transformation Groups Seminar: "Semi-free Actions and the Projective Class Groups."
Ian Hambleton, McMaster University; Member, School of Mathematics, IAS.

Differential Geometry Seminar: "Foliations of Lorentz Manifolds and the Initial Value Problem in General Relativity."
Murray R. Cantor, University of Texas; Member, School of Mathematics, IAS.

December 14

School of Mathematics

Topology Seminar: "Shape Theory and Topological Embeddings."
Gerard Venema, University of Texas; Member, School of Mathematics, IAS.

Lecture Series: "Primitive Ideals and Group Representations" (continued).
Dan Barbasch, Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

Finite Groups of Lie Type Seminar: "Conjugacy in Groups of Lie Type" (continued).
Edward T. Cline, Jr., Clark University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Information and Competition."
Joseph E. Stiglitz, University of Oxford; Visitor, School of Social Science, IAS.

December 15

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

Differential Geometry Seminar: "Hyperbolic Geometry."
Guest lecturer: Troels Jørgensen, University of Minnesota.

December 18

School of Mathematics

Members Seminar: "Index Theorem and Group Representations, II."
Henri Moscovici, INCREST, Rumania; Member, School of Mathematics, IAS.

Finite Simple Groups: "e(G) = 3" (continued).
Michael Aschbacher, California Institute of Technology; Member, School of Mathematics, IAS.

December 20

School of Mathematics

Transformation Groups Seminar: "Equivariant Rational Homotopy Theory."
Georgia Triantafillou, University of Bonn; Member, School of Mathematics, IAS.

December 21

School of Mathematics

Lecture Series: "Primitive Ideals and Group Representations" (continued).
Dan Barbasch, Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

January 8

School of Natural Sciences

Seminar: "Twistors and Hadrons."
Guest lecturer: Lane Hughston, University of Oxford.

January 11

School of Social Science

Seminar: "Benjamin Constant on Ancient and Modern Liberty."
Stephen Holmes, Harvard University; Member, School of Social Science, IAS.

January 12

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

January 15

School of Mathematics

Members Seminar: "Moduli of Principal Bundles."
Annamalai Ramanathan, Tata Institute, India; Member, School of Mathematics, IAS.

Finite Groups Seminar: "Intrinsic 2-components of Chevalley Type."
Morton E. Harris, University of Minnesota; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Phase Structure of Z_N Spin and Gauge Theories."
Robert B. Pearson, Fermilab; Member, School of Natural Sciences, IAS.

January 16

School of Mathematics

Transformation Groups Seminar: "An Equivariant Wall Obstruction Theory."
Guest lecturer: J. Baglivo, Fairfield University.

Algebraic Groups Seminar: "Extensions of Representations of Algebraic Groups."
Leonard L. Scott, Jr., University of Virginia; Member, School of Mathematics, IAS.

January 18

School of Mathematics

Topology Seminar: "Surgery Obstruction Groups for Finite 2-groups."
Ian Hambleton, McMaster University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Some Reflections on the History of Utopia."
Thomas Nipperdey, University of Munich; Member, School of Historical Studies, IAS.

January 19

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

School of Natural Sciences

Theoretical Physics Seminar: "Phases and Continuum Limits of Some Lattice Gauge Models."
John Kogut, University of Illinois-Urbana; Member, School of Natural Sciences, IAS.

January 22

School of Mathematics

Members Seminar: "Transfers in Some Fields of Mathematics."
Tomoyuki Yoshida, Hokkaido University; Member, School of Mathematics, IAS.

Finite Groups Seminar: "On Groups with a PSL(2,q) 2-component."
Morton E. Harris, University of Minnesota; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Space-Time Foam."
Malcolm J. Perry, University of Cambridge; Member, School of Natural Sciences, IAS.

Seminar: "Phases and Continuum Limits of Some Lattice Gauge Models" (continued).
John Kogut, University of Illinois-Urbana; Member, School of Natural Sciences, IAS.

January 23

School of Mathematics

Algebraic Groups Seminar: "Extensions of Representations of Algebraic Groups" (continued).
Leonard L. Scott, Jr., University of Virginia; Member, School of Mathematics, IAS.

January 24

School of Historical Studies

Colloquium in Classical Studies: "The Archaic Constitution of Ephesus and Parallels."
Denis van Berchem, Universities of Lausanne and Geneva; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Circle Actions on Spheres with Codimension 4 Fixed Point Sets."
Ronald Fintushel, Tulane University; Member, School of Mathematics, IAS.

January 25

School of Mathematics

Topology Seminar: "Vector Fields in the Plane."
Michael F. Singer, North Carolina State University; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "A Theoretical Approach to Epochal Change and Economic Chaos."
Richard H. Day, University of Southern California; Member, School of Social Science, IAS.

January 26

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

January 29

School of Mathematics

Members Seminar: "Cohomological Representations of Algebraic Groups."
Henning H. Andersen, Massachusetts Institute of Technology and Aarhus University, Denmark; Member, School of Mathematics, IAS.

January 30

School of Mathematics

Finite Groups Seminar: "On the Simple Groups Associated with the Minimal Conjugacy Family."
Luis Puig, CNRS, France; Member, School of Mathematics, IAS.

Algebraic Groups Seminar: "On the Structure of Weyl Modules."
Henning H. Andersen, Massachusetts Institute of Technology and Aarhus University, Denmark; Member, School of Mathematics, IAS.

January 31

School of Historical Studies

Colloquium in Classical Studies: "Athenian Democracy after 403 B.C."
Guest lecturer: Peter J. Rhodes, Durham University and Center for Hellenic Studies.

School of Mathematics

Transformation Groups Seminar: "On 3-manifolds Admitting Orientation-Reversing Involutions."
Akio Kawauchi, Osaka University; Member, School of Mathematics, IAS.

February 1

School of Mathematics

Topology Seminar: "Notions of Algebraic Measure and 'Calculability' in Algebraic Topology."
Wen-tsün Wu, Academia Sinica, Peking; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Feminine Allegory, People's Theater and Municipal Socialism in Late Nineteenth-Century France."
Joan W. Scott, University of North Carolina; Member, School of Social Science, IAS.

February 2

School of Natural Sciences

Theoretical Physics Seminar: "The Gluon Field Around Quarkonium."
Guest lecturer: Serge Rudaz, Cornell University.

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

February 5

School of Mathematics

Members Seminar: "Characteristic Classes of Solutions of Nonlinear Differential Equations."
Toru Tsujishita, Osaka University; Member, School of Mathematics, IAS.

February 6

School of Mathematics

Algebraic Groups Seminar: "Hyperalgebras in the Representation Theory of Algebraic Groups."
Brian Parshall, University of Virginia; Member, School of Mathematics, IAS.

Finite Groups Seminar: "Local Block Theory."
Jonathan L. Alperin, University of Chicago; Member, School of Mathematics, IAS.

February 7

School of Historical Studies

Colloquium in Classical Studies: "Some Vulgar Latin Letters in the Correspondence of Cyprian."
Graeme W. Clarke, University of Melbourne; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Some Horocycle Flows."
S. Mary Rees, University of Warwick; Member, School of Mathematics, IAS.

Special Lecture: "Relative Lie Algebra Cohomology for Representations of Complex Semi-simple Groups."
Guest lecturer: T. Enright, University of California-San Diego.

February 8

School of Historical Studies

Art History Colloquium: "Quello che non è sia: the Renaissance View of Renaissance Painting."
David Summers, University of Pittsburgh; Member, School of Historical Studies, IAS.

School of Mathematics

Topology Seminar: "K_0K_1 and Strange Compacta."
Steven C. Ferry, University of Kentucky; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Technological Change and Slavery: Two Early Innovations in Sugar Production in Brazil."
Antonio B. de Castro, University of Campinas; Member, School of Social Science, IAS.

February 9

School of Mathematics

Lecture Series: "Pell's Equation (History and Prehistory)" (continued).
André Weil, Professor Emeritus, School of Mathematics, IAS.

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

February 12

School of Natural Sciences

Seminar: "Space-Time Foam" (continued).
Malcolm J. Perry, University of Cambridge; Member, School of Natural Sciences, IAS.

February 13

School of Mathematics

Algebraic Groups Seminar: "Hyperalgebras in the Representation Theory of Algebraic Groups, II."
Brian Parshall, University of Virginia; Member, School of Mathematics, IAS.

Finite Groups Seminar: "Local Block Theory" (continued).
Luis Puig, CNRS, France; Member, School of Mathematics, IAS.

February 14

School of Historical Studies

Colloquium in Classical Studies: "Cicero and Roman Politics 63-57 B.C."
Christian Meier, Ruhr-Universität Bochum; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Actions of Diffeomorphism Groups of Surfaces."
William J. Harvey, University of London, King's College; Member, School of Mathematics, IAS.

February 15

School of Mathematics

Topology Seminar: "Homotopy Idempotents."
Ross Geoghegan, State University of New York-Binghamton; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "The 'Fool of Love': A Chapter in the History of the Fool as Moralist."
Keith Moxey, University of Virginia; Member, School of Historical Studies, IAS.

February 16

School of Mathematics

Lecture Series: "Irrational Numbers and Ordinary Differential Equations" (continued).
Enrico Bombieri, Professor, School of Mathematics, IAS.

School of Natural Sciences

Theoretical Physics Seminar: "Static Model of the Quark Potential."
Guest lecturer: Roscoe Giles, Massachusetts Institute of Technology.

February 19

School of Natural Sciences

Seminar: "Decomposition Theorem."
Malcolm J. Perry, University of Cambridge; Member, School of Natural Sciences, IAS.

February 20

School of Mathematics

Algebraic Groups Seminar: "Hyperalgebras in the Representation Theory of Algebraic Groups, III."
Brian Parshall, University of Virginia; Member, School of Mathematics, IAS.

Finite Groups Seminar: "Local Block Theory, II."
Luis Puig, CNRS, France; Member, School of Mathematics, IAS.

February 21

School of Historical Studies

Colloquium in Classical Studies: "Platonism as Ignorance: the Academy of Arkesilaos."
Anthony A. Long, University of Liverpool; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Ends of Manifolds and Applications to Topological Group Actions."
Guest lecturer: F. Quinn, Virginia Polytechnic Institute.

February 22

School of Social Science

Seminar: "Cultural Theories of Production and the Meaning of Produced Objects."
Stephen Gudeman, University of Minnesota; Member, School of Social Science, IAS.

February 26

School of Mathematics

Members Seminar: "Hilbert Transform Inequalities and the Moment Problem."
Cora S. Sadosky-Goldstein, Central University, Venezuela; Member, School of Mathematics, IAS.

February 27

School of Mathematics

Transformation Groups Seminar: "Smooth Circle Actions on Homotopy CP^4."
Guest lecturer: D. James, Rutgers University.

Algebraic Groups Seminar: "Hyperalgebras in the Representation Theory of Algebraic Groups" (concluded).
Brian Parshall, University of Virginia; Member, School of Mathematics, IAS.

Finite Groups Seminar: "Local Block Theory, III."
Luis Puig, CNRS, France; Member, School of Mathematics, IAS.

February 28

School of Historical Studies — Colloquium in Classical Studies: "Socnopaiou Nesos: an Egyptian Village in the Early Roman Period."
Deborah H. Samuel, York University, Toronto; Member, School of Historical Studies, IAS.

March 2

School of Natural Sciences — Theoretical Physics Seminar: "Baryon Asymmetry and Cosmology."
Guest lecturer: Leonard Parker, University of Wisconsin.

March 6

School of Mathematics — Finite Groups Seminar: "Examples for Some New Concepts in Representation Theory."
Jonathan L. Alperin, University of Chicago; Member, School of Mathematics, IAS.

March 9

School of Natural Sciences — Special Theoretical Physics Seminar: "S-Matrix Elements in the Presence of Yang-Mills or Gravitational Instantons."
Guest lecturer: Stephen W. Hawking, University of Cambridge.

March 12

School of Mathematics — Members Seminar: "Falsely Ruled Surfaces."
William E. Lang, Harvard University; Member, School of Mathematics, IAS.

March 13

School of Mathematics — Algebraic Groups Seminar: "Structure Theorems for Linear Algebraic Groups."
Armand Borel, Professor, School of Mathematics, IAS.

Finite Groups Seminar: "The B-conjecture Revisited."
Daniel Gorenstein, Rutgers University; Member, School of Mathematics, IAS.

March 14

School of Historical Studies — Colloquium in Classical Studies: "The Classical Component in Mediaeval Magic."
David E. Pingree, Brown University; Member, School of Historical Studies, IAS.

School of Mathematics — Transformation Groups Seminar: Lecture.
Guest lecturer: S. Cappell, New York University, Courant Institute.

March 15

School of Mathematics — Topology Seminar: "The Q-construction, Thom Spectra and Buildings."
Guest lecturer: C. Giffen, University of Virginia.

School of Social Science — Seminar: "The Confraternity of Proletarians: Revolutionary

Language and the Emergence of Class Consciousness in France in the 1830s."
William H. Sewell, Jr., Long-term Member, School of Social Science, IAS.

March 16

School of Natural Sciences

Theoretical Physics Seminar: "New Ideas in Grand Unified Theories."
Guest lecturer: Howard Georgi, Harvard University.

March 19

School of Mathematics

Finite Group Theory Seminar: "Aschbacher Blocks."
Guest lecturer: R. Solomon, Ohio State University.

Members Seminar: "Automorphic Forms on Covering Groups of GL(2)."
Yuval Z. Flicker, University of Cambridge; Member, School of Mathematics, IAS.

Finite Group Theory Seminar: "The B-conjecture Revisited, II."
Daniel Gorenstein, Rutgers University; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "External Field Problems in QED."
Walter Dittrich, University of Tübingen; Member, School of Natural Sciences, IAS.

March 20

School of Mathematics

Finite Group Theory Seminar: "Odd Standard Components."
Guest lecturer: L. Finkelstein, Wayne State University.

Algebraic Groups Seminar: "Structure Theorems for Linear Algebraic Groups" (continued).
Armand Borel, Professor, School of Mathematics, IAS.

Finite Group Theory Seminar: "The B-conjecture Revisited, III."
Daniel Gorenstein, Rutgers University; Member, School of Mathematics, IAS.

March 21

School of Historical Studies

Colloquium in Classical Studies: "The Persian Policy of the Emperor Constantius II."
Javier Arce, Instituto Espanol de Arquelogia, Madrid; Member, School of Historical Studies, IAS.

School of Mathematics

Transformation Groups Seminar: "Structure Theorems for Equivariant Surgery Obstructions and Applications."
Guest lecturer: H. Dovermann, University of Chicago.

March 22

School of Mathematics

Topology Seminar: "Least Number of Fixed Points in a Homotopy Class."

Bo-ju Jiang, Peking University; Member, School of Mathematics, IAS.

Special Lecture: "Kazhdan-Lusztig Character Formulas for Semisimple Lie Groups."
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Cane Sprees, Tigers, and P-rades, or What's an Anthropologist Doing in Princeton."
Karen I. Blu, New York University; Visitor, School of Social Science, IAS.

March 26

School of Mathematics

Special Transformation Groups Seminar: "Compact Lie Group Actions with Few Orbit Types."
Guest lecturer: W. Y. Hsiang, University of California-Berkeley.

Members Seminar: "de Rham Subcomplexes of Pullback Path Fibrations."
Kuo-Tsai Chen, University of Illinois; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Comparison of SU(2) and Z(2) Lattice Gauge Theories."
Guest lecturer: Gerhard Mack, Institute for Theoretical Physics, Hamburg.

March 27

School of Mathematics

Algebraic Groups Seminar: "Structure Theorems for Linear Algebraic Groups" (continued).
Armand Borel, Professor, School of Mathematics, IAS.

Finite Groups Seminar: "Involuntary Generators for Some Sporadic Groups."
Bernd Fischer, University of Bielefeld; Member, School of Mathematics, IAS.

March 28

School of Mathematics

Transformation Groups Seminar: "The Oozing Problem for Closed Manifolds."
Guest lecturer: S. Cappell, New York University, Courant Institute.

Special Lecture: "Homology of Locally Symmetric Spaces and Construction of Automorphic Forms."
Guest lecturer: J. Millson, University of Toronto.

March 29

School of Mathematics

Topology Seminar: "Is the Universe Simply Connected?"
John Milnor, Professor, School of Mathematics, IAS.

Special Lecture: "Kazhdan-Lusztig Character Formulas for Semisimple Lie Groups" (continued).
David A. Vogan, Jr., Massachusetts Institute of Technology; Member, School of Mathematics, IAS.

School of Social Science

Seminar: "The Franchise Relationship and Collective Action."
Victor P. Goldberg, University of California-Davis; Member, School of Social Science, IAS.

March 30

School of Natural Sciences

Theoretical Physics Seminar: "Beyond the Saddle-Point Approximation."
Guest lecturer: William Crutchfield, State University of New York-Stony Brook.

April 2

School of Mathematics

Members Seminar: "Undecidable Diophantine Problems."
Jan J. Denef, Princeton University; Member, School of Mathematics, IAS.

School of Natural Sciences

Seminar: "Block Spinning Ising Gauge Theory in 2 + 1 Dimensions."
Guest lecturer: Stuart Raby, Stanford University.

April 3

School of Mathematics

Algebraic Groups Seminar: "Moduli of Bundles."
Annamalai Ramanathan, Tata Institute, India; Member, School of Mathematics, IAS.

Finite Groups Seminar: "Construction of a Character Table."
Bernd Fischer, University of Bielefeld; Member, School of Mathematics, IAS.

April 5

School of Historical Studies

Art History Colloquium: "The Defense of a Regime and the *Surrender of Breda* by Velazquez."
Jonathan Brown, New York University, Institute of Fine Arts; Member, School of Historical Studies, IAS.

School of Mathematics

Differential Geometry Seminar: "Jacobi Tensor Fields."
Guest lecturer: John O'Sullivan, Pennsylvania State University.

School of Social Science

Seminar: "The Anglican Origins of Modern Science (the Metaphysical Foundations of the Whig Constitution)."
Margaret C. Jacob, City University of New York, Baruch College; Member, School of Historical Studies, IAS.

April 6

School of Natural Sciences

Seminar: "Lattice Gauge Theories and the Dynamical Origins of PAC."
Guest lecturer: Marvin Weinstein, Stanford Linear Accelerator Center.

April 9

School of Natural Sciences

Seminar: "Experiments with a Gauge-Invariant Ising System."
Guest lecturer: L. Jacobs, Brookhaven Laboratory.

April 10

School of Mathematics

Transformation Groups Seminar: "Inefficiently Embedded Surfaces in 4-manifolds."
Guest lecturer: S. Weinstraub, Louisiana State University.

April 11

School of Mathematics

Transformation Groups Seminar: "Extension of Finite Group Actions from Certain Submanifolds of the Disks."
Amir H. Assadi, Princeton University; Member, School of Mathematics, IAS.

April 13

School of Natural Sciences

Theoretical Physics Seminar: "Non-Abelian Singular Magnetic Monopoles."
Guest lecturer: Richard Brandt, New York University.

April 17

School of Mathematics

Special Lecture: "Contributions of Chinese Ancient Geometry."
Wen-tsun Wu, Academia Sinica, Peking; Member, School of Mathematics, IAS.

April 19

School of Social Science

Seminar: "Capitalism and the Humanitarian Sensibility (Some Comments on D. B. Davis' Problem of Slavery in the Age of Revolution)."
Thomas L. Haskell, Rice University; Member, School of Historical Studies, IAS.

April 23

School of Natural Sciences

Seminar: "Global Structure of Static Euclidean SU(2) Solutions."
Stephen L. Adler, Professor, School of Natural Sciences, IAS.

April 26

School of Social Science

Seminar: "Ideology and the Free Rider Problem."
Guest lecturer: Douglas North, University of Washington.

April 27

School of Natural Sciences

Theoretical Physics Seminar: "Gauge Hierarchies in Unified Theories."
Itzhak Bars, Yale University; Member, School of Natural Sciences, IAS.

April 30

School of Natural Sciences

Seminar: "Quantum Technicolor Dynamics."
Guest lecturer: S. Dimopoulos, Columbia University.

May 3

School of Historical Studies

Art History Colloquium: "The Garden of Earthly Delights and the Art of Hieronymous Bosch."
Lotte Brand Philip, City University of New York, Queens College; Member, School of Historical Studies, IAS.

May 4

School of Mathematics

Special Lecture: "Oscillatory Integrals and Asymptotics for Harmonic Oscillators."
Guest lecturer: L. Carleson, Mittag-Leffler Institute.

May 8

School of Natural Sciences

Special Theoretical Physics Seminar: "Current Algebra Theorems for the U(1) Goldstone Boson."
Guest lecturer: E. Witten, Harvard University.

May 10

School of Social Science

Seminar: "Characterizing Social Science: Notes on Weber's Concept of 'Social Action.' "
Margaret Gilbert, Princeton, New Jersey; Member, School of Historical Studies, IAS.

May 11

School of Natural Sciences

Special Theoretical Physics Seminar: "Current Algebra Theorems for the U(1) Goldstone Boson."
Guest lecturer: E. Witten, Harvard University.

May 14

School of Natural Sciences

Seminar: "Ternary Algebras as Building Blocks of Lie Algebras and Lie Superalgebras."
Itzhak Bars, Yale University; Member, School of Natural Sciences, IAS.

May 21

School of Natural Sciences

Seminar: "Conformal Coupling of Gravitational Waves to Curvature in General Relativity and Supergravity."
Guest lecturer: L. P. Grischuk, Sternberg Astrophysical Institute, Moscow.

May 25

School of Natural Sciences

Theoretical Physics Seminar: "Null Surface Dynamics."
Guest lecturer: Roman L. Znajek, University of Cambridge, Institute of Astronomy, and University of Texas-Austin.

In addition, the following events of interest to the Institute community were presented by the Archaeological Institute of America.

December 6	Lecture Series: "The Central Group in the West Pediment of the Parthenon." Guest lecturer: Erika Simon, Institut für Archäologie, University of Würzburg.
February 13	Lecture Series: "Roman Gaul: the Creation of a Provincial Society." Guest lecturer: Edith Mary Wightman, MacMaster University.
March 13	Lecture Series: "How Persian Is Archaemined Art?" Guest lecturer: Ann E. Farkas, Brooklyn College.
April 3	Lecture Series: "Life and Work in Minoan Villages and Villas." Guest lecturer: Peter M. Warren, University of Bristol.

Report of the Treasurer

The market value of the Institute's securities, mortgages, receivables ($68,310,373) and uninvested cash ($107,545) totaled $68,417,918 on June 30, 1979. This represents a substantial increase of $10,893,407 over the comparable total for June 30, 1978.

During the fiscal year, total operating expenditures were $6,611,615. After applying specific gifts and grants of $1,637,303 against these expenditures, the Institute was required to provide $4,974,312 from endowment resources. This represents approximately 7.3% of the June 30, 1979, endowment market value, as compared to a total yield for fiscal year 1979 of 25.9%.

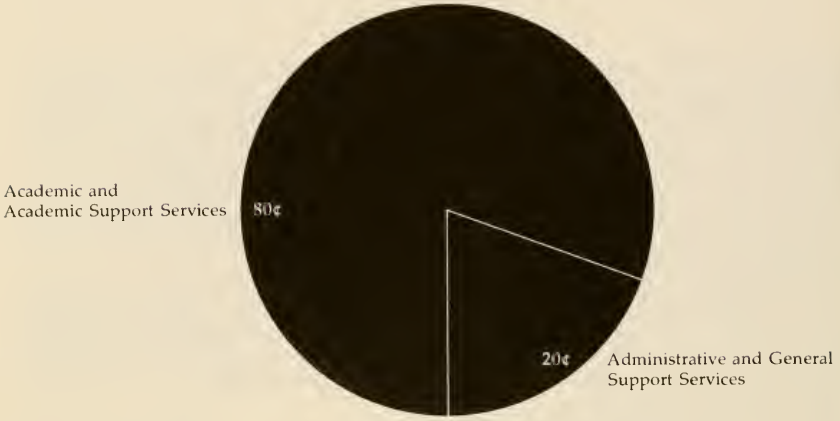
The performance of the Institute's portfolio is measured annually by Hamilton, Johnston & Co., Inc. Over the twelve-year period ending June 30, 1979, dividend and interest income and net realized and unrealized gains combined for a total average annual rate of return on Institute investments of 9.7%. Over the past three years, the average annual rate of return was 13.3%. For fiscal 1979, the annual rate of return was 25.9%, as noted above.

The financial statements of the Institute for Advanced Study are audited by Deloitte Haskins & Sells. The auditors' opinion letter and statements for the fiscal year ended June 30, 1979, follow this report.

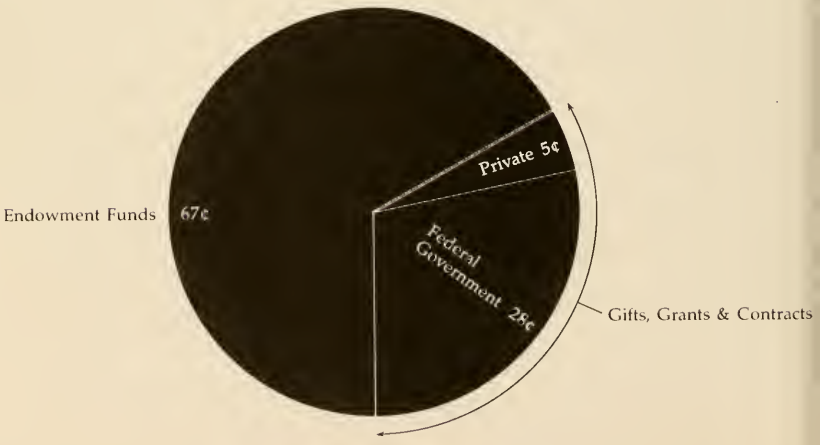
Ralph E. Hansmann
Treasurer

OPERATIONS

THE INSTITUTE EXPENSE DOLLAR
FISCAL YEAR 1979



THE INSTITUTE INCOME DOLLAR
FISCAL YEAR 1979



Deloitte
Haskins + Sells

111 Madison Avenue
Morristown, New Jersey 07960
(201) 540-0940
Cable DEHANDS

August 10, 1979

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

Dear Sirs:

We have examined the financial statements of the Institute for Advanced Study - Louis Bamberger and Mrs. Felix Fuld Foundation as of June 30, 1979 and for the year then ended, listed in the foregoing table of contents. Our examination was made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, such financial statements present fairly the financial position of the Institute at June 30, 1979 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 applied on a basis consistent with that of the preceding year after giving retroactive effect to the changes, with which we concur, in the method of accounting for depreciation and restricted operating fund revenue as described in Note A to the financial statements.

Yours truly,

Deloitte Haskins + Sells

Institute for Advanced Study
Louis Bamberger and Mrs. Felix Fuld Foundation

Exhibit A

Balance Sheet, June 30, 1979

ASSETS

Operating Funds:	
Cash	$ 97,192
Accounts and notes receivable	78,712
Government receivable	111,780
Accrued income on investments	367,847
Deferred charges	88,160
Total operating funds	$ 743,691
Endowment and Similar Funds (Note B):	
Cash	$ 107,545
Marketable securities	57,943,106
Mortgages and notes receivable	1,070,767
Total endowment and similar funds	$59,121,418
Plant Funds:	
Cash	$ 15,000
Land, buildings and improvements, equipment and library books (including rare book collection) (Note C)	10,596,637
Total plant funds	$10,611,637

LIABILITIES AND FUND BALANCES

Operating Funds:	
Accounts payable, accrued expenses, etc.	$ 51,065
Deferred restricted revenue (Note G)	332,307
Fund balance (Exhibit B) - unrestricted	360,319
Total operating funds	$ 743,691
Endowment and Similar Funds:	
Fund balances (Exhibit B):	
Endowment funds - restricted	$14,829,470
Quasi-endowment funds - unrestricted	44,291,948
Total endowment and similar funds	$59,121,418
Plant Funds:	
Mortgages on farmland, 4% - 5-1/4%, payable in annual instalments to 1979	$ 70,000
2-3/4% Apartment Bonds (Note D)	690,000
6-1/4 % note payable, payable in instalments to 1984 (Note D)	73,772
Plant funds balance (Exhibit B)	9,777,865
Total plant funds	$10,611,637

See Summary of Significant Accounting Policies and Notes to Financial Statements.

Louis Bamberger and Mrs. Felix Fuld Foundation

Exhibit B

Statement of Support and Revenue, Expenses, Capital Additions, and Changes in Fund Balances for the Year Ended June 30, 1979

	Operating Funds		Plant	Endowment &	Total
	Unrestricted	Restricted	Funds	Similar Funds	All Funds
Support and Revenue:					
Endowment income	$ 2,555,842	$ 793,472			$ 3,349,314
Gifts		1,127,057			1,127,057
Grants	291,484	218,762			510,246
Total support and revenue	2,847,326	2,139,291			4,986,617
Expenses:					
School of Mathematics	535,008	421,671	$ 29,879		986,558
School of Natural Sciences	524,963	327,182	18,303		870,448
School of Historical Studies	799,240	211,441	43,610		1,054,291
School of Social Science		474,639	33,674		508,313
Library	270,394		56,774		327,168
Director's Special Purpose Fund (including the Albert Einstein Centennial Celebration Fund totalling $338,000)	18,939	406,958			425,897
Administration and General	1,637,996		49,273		1,687,269
Auxiliary Activities:					
Dining Hall expenses net of $71,597 of revenue	119,702		39,952		159,654
Rental property expenses net of $313,394 of revenue	440,132	2,987	148,898		592,017
Total expenses	4,346,374	1,844,878	420,363		6,611,615
Excess (deficiency) of support and revenue over expenses before capital additions	(1,499,048)	294,413	(420,363)		(1,624,998)
Capital Additions:					
Gifts			11,000	$ 1,493,095	1,504,095
Realized net gains on investments				3,700,345	3,700,345
Total capital conditions			11,000	5,193,440	5,204,440
Excess (deficiency) of support and revenue over expenses after capital additions	(1,499,048)	294,413	(409,363)	5,193,440	3,579,442
Fund Balances at Beginning of Year:					
As previously reported	459,038	204,875	15,650,707	55,397,082	71,711,702
Retroactive effect of accounting changes (Note A)		(204,875)	(5,826,667)		(6,031,542)
As restated	459,038	- 0 -	9,824,040	55,397,082	65,680,160
Transfers:					
Proceeds from disposal of plant facilities	4,600		(4,600)		
Plant acquisitions and principal debt service payments	(367,288)		367,288		
Portion of quasi-endowment funds appropriated	1,768,684			(1,768,684)	
Portion of restricted endowment income transferred to quasi-endowment funds		(287,283)		287,283	
Transfer to bond and interest sinking fund	(500)		500		
Other - net	(5,167)	(7,130)		12,297	
Fund Balance at End of Year	$ 360,319	$ - 0 -	$ 9,777,865	$59,121,418	$69,259,602

See Summary of Significant Accounting Policies and Notes to Financial Statements.

Louis Bamberger and Mrs. Felix Fuld Foundation

Exhibit C

Statement of Changes in Financial Position for the Year Ended June 30, 1979

	Operating Funds	*Plant Funds*	*Endowment and Similar Funds*	*Total All Funds*
Resources Provided:				
Excess (deficiency) of support and revenue over expenses before capital additions	$(1,204,635)	$(420,363)		$(1,624,998)
Capital additions:				
Gifts		11,000	$ 1,493,095	1,504,095
Realized net gains on investments			3,700,345	3,700,345
Excess (deficiency) of support and revenue over expenses after capital additions	(1,204,635)	(409,363)	5,193,440	3,579,442
Items not using (providing) resources:				
Provision for depreciation		396,325		396,325
(Gain) on disposition of plant facilities		(1,487)		(1,487)
(Gain) on disposition of investments - net			(3,700,345)	(3,700,345)
Increase in deferred restricted revenue	127,432			127,432
Decrease in receivables			780,409	780,409
Decrease in deferred charges	41,765			41,765
Proceeds from sale of investments			66,673,751	66,673,751
Proceeds from long-term debt		79,079		79,079
Proceeds from sale of plant facilities		4,600		4,600
Total resources provided (used)	(1,035,438)	69,154	68,947,255	67,980,971
Resources Used:				
Increase in receivables	81,148			81,148
Purchase of equipment		327,535		327,535
Reduction of long-term debt		104,307		104,307
Purchases of investments			67,457,642	67,457,642
Decrease in accounts payable	15,985			15,985
Total resources used	97,133	431,842	67,457,642	67,986,617
Transfers:				
Proceeds from disposal of plant facilities	4,600	(4,600)		
Plant acquisitions and principal debt service payments	(367,288)	367,288		
Portion of quasi-endowment funds appropriated	1,768,684		(1,768,684)	
Portion of restricted endowment income transferred to quasi-endowment funds	(287,283)		287,283	
Portion of restricted operating funds transferred to quasi-endowment funds	(12,297)		12,297	
Transfer to bond and interest sinking fund	(500)	500		
Total transfers	1,105,916	363,188	(1,469,104)	
Increase (decrease) in cash	$ (26,655)	$ 500	$ 20,509	$ (5,646)

See Summary of Significant Accounting Policies and Notes to Financial Statements.

Summary of Significant Accounting Policies
June 30, 1979

Accrual Basis

The financial statements of the Institute have been prepared on the accrual basis. To the extent that operating funds are used to finance plant assets, the amounts so provided are accounted for as (1) expenditures, in the case of normal replacement of movable equipment and library books; and (2) principal debt service payments, in the case of required provisions for debt amortization and interest.

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 to specific purposes by action of the governing board. Externally restricted funds may only be utilized in accordance with the purpose established by the source of such funds and are in contrast with unrestricted funds over which the governing board retains full control to use in achieving any of its institutional purposes.

Endowment funds are subject to the restrictions of gift instruments requiring in perpetuity that the principal be invested and the income only be utilized. Quasi-endowment funds have been established by the governing board as endowment funds and any portion of these funds may be expended.

All gains and losses arising from the sale, collection, or other disposition of investments and other noncash assets are accounted for in the fund which owned such assets. Ordinary income derived from investments, receivables, and the like, is accounted for in the fund owning such assets, except for income derived from investments of endowment and similar funds, which income, if unrestricted, is accounted for as revenue in unrestricted operating funds, or if restricted, as deferred restricted revenue until used in accordance with the terms of the restriction.

Other Significant Accounting Policies

Other significant accounting policies are set forth in the financial statements and notes thereto. Also, see Note A for accounting changes.

Notes to Financial Statements
for the Year Ended June 30, 1979

A.

The accompanying financial statements are presented in accordance with the recommendations contained in Statement of Position No. 78-10 (the "SOP") of the American Institute of Certified Public Accountants titled, Accounting Principles and Reporting Practices for Certain Nonprofit Organizations. Financial statements in prior years were presented in accordance with the guidelines for colleges and universities. The change was made in the belief that the nature of the Institute's financial activities are more clearly presented in the new format. In connection with the change in reporting format, the Institute also adopted the recommendations of the SOP with respect to providing depreciation on its buildings and equipment and in accounting for restricted support and revenue, as explained below.

Effective July 1, 1978, the Institute retroactively adopted the policy of providing for depreciation on all its buildings and equipment, as contrasted with its former policy of only depreciating its automotive equipment. Depreciation has been computed on the straight-line method over the estimated useful life of the assets (buildings and improvements 20-40 years, equipment 3-6 years). The previously reported plant fund balance as of July 1, 1978

was reduced by $5,826,667 representing the cumulative provision for depreciation through such date.

In addition, the Institute retroactively changed its policy of accounting for operating funds restricted receipts. In prior years, these items were recorded as revenues and additions to the restricted operating fund balance upon receipt. Such transactions are now recorded initially as deferred restricted operating fund revenue and are reported as restricted operating revenues when expended for the purposes designated or transferred to quasi-endowment funds. Accordingly, the previously reported restricted operating fund balance as of July 1, 1978, amounting to $204,875, representing amounts reported as revenue in prior years, has been restated as deferred restricted revenue as of such date.

B.

Investments purchased by the Institute are recorded at cost; investments received by gift are carried at fair market value at the date of acquisition. Quoted market value of endowment and similar fund investments aggregated $68,310,373 at June 30, 1979.

Assets of endowment and similar funds, except non-marketable investments restricted for the School of Social Science having a book value of $2,500,000, are pooled with each individual fund subscribing to or disposing of units on the basis of the market value per unit on a quarterly basis. At June 30, 1979 each unit had a market value of $3,066.

The following tabulation summarizes changes in relationships between cost and market values of the pooled endowment fund investments:

	Pooled Assets			
	Market Value	*Carrying Value*	*Net Gains*	*Market Value Per Unit*
June 30, 1979	$65,810,373	$56,513,872	$ 9,296,501	$3,066
July 1, 1978	54,157,066	52,029,639	2,127,427	2,521
Unrealized appreciation for the year ended June 30, 1979.			7,169,074	$ 545
Realized net gains for the year ended June 30, 1979			3,700,345	
Net gain for the year ended June 30, 1979			$10,869,419	

Earnings per unit, exclusive of net gains, amounted to $148 for the year ended June 30, 1979.

C.

Physical plant and equipment are stated at cost at date of acquisition, less accumulated depreciation. The cost of library books, other than rare books purchased subsequent to June 30, 1947, has not been capitalized. It is not practicable to determine the value of such books. A summary of plant assets follows:

Land	$ 1,842,347
Building and improvements	13,182,037
Equipment	1,665,721
Library books	193,436
Total	16,883,541
Less accumulated depreciation	6,286,904
Net book value	$10,596,637

D.

The Institute for Advanced Study Apartment Bonds of 1956 are collateralized by (1) a first mortgage on the members' housing project with a book value of $2,193,299, (2) a first lien and pledge of gross revenues from the project and (3) United States Treasury Notes, 6.25% due November 15, 1979, with an aggregate face amount of $125,000.

The bonds, which mature serially on December 1 of each year, are payable $30,000 in 1979, increasing each December 1 with final payment due December 1, 1996 and are subject to redemption at various prices.

The note is payable in monthly instalments of $1,538, with final payment due January 1, 1984.

E.

Separate voluntary contributory retirement plans are in effect for faculty members and eligible staff personnel, both of which provide for annuities which are funded with the Teachers Insurance and Annuity Association and/or the College Retirement Equities Fund.

In addition to the voluntary retirement plans, the Board of Trustees or the Director has at various times authorized the payment of pensions to certain members, employees and the widow of a deceased member. Total pension payments which aggregated $24,200 for the year ended June 30, 1979 have been charged to expense, and no reserves have been provided for pensions payable in subsequent years.

F.

The Institute is the residuary beneficiary of a trust under the Will of George Placzek, Deceased, and upon the death of the life tenant will be entitled to receive the corpus thereof. The approximate market value of the assets under the fourth and fifth paragraphs of the Will, as re-

ported by the accountant for the Estate, aggregated $909,048 as of June 30, 1979 and are not included in the accompanying financial statements.

G.

Changes in deferred restricted revenue amounts are as follows:

	Specific Purpose Funds	*Government Contracts*	*Total*
Balances at beginning of year after retroactive adjustment	$ 165,050	$ 39,825	$ 204,875
Additions:			
Contributions	2,087,786		2,087,786
Grants		178,937	178,937
Total additions	2,087,786	178,937	2,266,723
Deductions:			
Funds expended during year	1,626,116	218,762	1,844,878
Transfer to quasi-endowment	287,283		287,283
Other transfers - net	7,130		7,130
Total deductions	1,920,529	$218,762	2,139,291
Balances at end of year	$ 332,307		$ 332,307

H.

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.

Donors

The Institute for Advanced Study gratefully acknowledges contributions of gifts, grants and pledges in the amount of $4,757,809.38 received between July 1, 1978, and June 30, 1979. Space limitations prohibit listing all of those who supported the Institute during this period. Following are the names of individuals and organizations who made contributions of $1,000 or more. To all of the contributors, the Institute expresses its deepest appreciation.

Individuals

Mr. and Mrs. Henry H. Arnhold
Ellen Weyl-Bär
Harold Berkowitz
Gerta Conner
Bern Dibner
J. Richardson Dilworth
Joseph L. Doob
Mr. and Mrs. Arthur D. Emil
Estate of William Axer Graham
Ralph E. Hansmann
Joseph H. Hazen
Richard McKee Henry
Stephen Kellen
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Harold F. Linder
T. S. Matthews
Brunson S. McCutchen
Margaret Meiss
Robert B. Meyner
Gabrielle Oppenheim-Errera
Cynthia Hazen Polsky and Leon, Alexander and Nicholas Polsky
Margaret Setton
Donald B. Straus
Frank E. Taplin
James D. Wolfensohn

Foundations

Amax Foundation, Inc.
Corning Glass Works Foundation
Arie and Ida Crown Memorial
Geraldine R. Dodge Foundation, Inc.
The Ford Foundation
The German Marshall Fund of the United States
Sibyl and William T. Golden Foundation
The Harkness Fellowships of the Commonwealth Fund of New York
The William and Flora Hewlett Foundation
Samuel H. Kress Foundation
Alfried Krupp von Bohlen und Halbach Stiftung
The Lucius N. Littauer Foundation
McDonnell Foundation, Inc.
The Andrew W. Mellon Foundation
The Ambrose Monell Foundation
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The Rockefeller Foundation
Henrietta Rinaldo Scheider Foundation, Inc.
The Scherman Foundation, Inc.
Fritz Thyssen Stiftung
The Raymond John Wean Foundation

Corporations

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Perkin-Elmer Corporation
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Carl Still Corporation
Union Carbide Corporation

Government agencies

National Endowment for the Humanities
National Science Foundation
U.S. Department of Energy
U.S. Office of Naval Research

State of New Jersey
Ministry of Education and Science,
Federal Republic of Germany