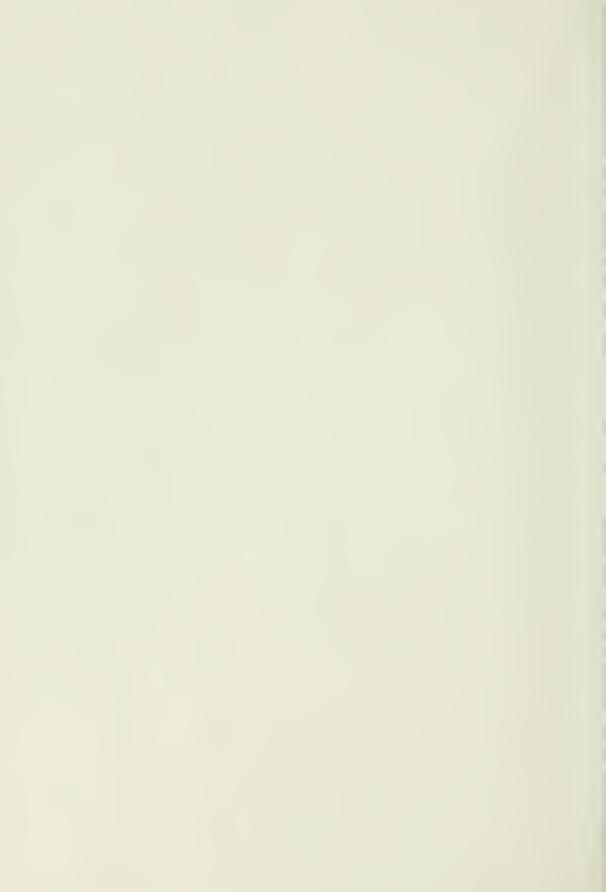# The Institute for Advanced Study

Annual Report 1983/84

The Institute for Advanced Study

Annual Report for the Fiscal Year
July 1, 1983–June 30, 1984

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

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 the fields of pure science and high scholarship to the utmost degree that the facilities of the institution and the ability of the faculty and students will permit." During the past half-century, these goals have been implemented by a Faculty of exceptional merit; by an annually renewed group of visiting members chosen from among the many who apply; 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 organization, 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 commonwealth of the mind. 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 Asia, 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 commitment 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 more than 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 one third 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 is a student in the narrow sense of being a degree candidate, the communal atmosphere and many opportunities for discussion with Faculty members and peers, both within and outside seminar meetings, are propitious to scholarly growth.

The Institute devotes special attention to young people of accomplishment and promise, offering them membership at a stage in their careers when independent work is of the highest importance to their intellectual development. These younger 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. Schools may, for limited periods of time, select certain themes or programmatic arrays under which members are encouraged to apply, but no concentration guarantees entry and no focus

excludes those outside it. The choice and conduct of research 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. Although the Institute has no administrative or organic connection with Princeton University, there has always been close collaboration between the two institutions on matters of common interest. 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 climate of Princeton, contributing to the development of what has become one of the world's great educational communities.

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. Subsidized, conveniently located housing is maintained for all visiting members, and transportation is regularly provided to the center of town.

Report of the Chairman

The life of a Board of Trustees is protean: not only do individuals change, but also the foci of concern. The earliest Board meetings of the Institute were preoccupied with the organization of the Board, the drafting of By-Laws, the choice of a site (Newark or its vicinity was preferred, but Princeton was chosen), and the implementation of the purpose set forth in the Founders' letter: "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." The Treasurer was authorized "to procure books of account and other stationery" and an office was leased in New York on East 42nd Street. Near that office, at the Uptown Club, the first annual meeting of the Members of the Corporation took place, on Tuesday, October 13, 1931. The following April, the total budget for 1932-33 was fixed at $32,050.

Now more than fifty years later we are light years removed from that budget. The successors of the original Trustees continue to meet, no longer in New York, but in Princeton twice a year; in addition, committees of the Board function throughout the year. Our concerns are inevitably less organizational than financial. The initial generous endowments of the Bamberger and Fuld families, supplemented by subsequent gifts, has been well-managed and currently amounts to some $114 million, but it is clearly no longer sufficient for the Institute's needs. These needs, and how to satisfy them, form part of our Board's deliberations, but only as they are required to preserve and fortify the Institute's original purpose which is and must be our paramount concern.

Over the past decades, it has seemed wise to the Trustees occasionally to review the entire composition, operation, and intellectual directions of the Institute and to consider its future. Previous reviews took place in 1956 and 1965, the most recent in 1976, under the chairmanship of Martin E. Segal. At our spring meeting James D. Wolfensohn, President of the Corporation and Vice-Chairman of the Board, agreed to chair a new planning and review committee. Its other members are: George B. Field, Michael V. Forrestal, Martin E. Segal, Donald B. Straus, and myself, *ex officio*. It is expected that the Committee's work will be largely accomplished during the next academic year, and that a report will be possible by the fall of 1985.

Two additional Board committees were established during the past year, both indicative of particular areas which the Board considers important for the Institute's progress. A Development Committee was formed under the chairmanship of Fletcher L. Byrom in order—in the words of the charge to that committee—"to enlarge private, foundation, and corporate support for the Institute; to suggest ways in which it might become better known to the general and academic public; to look to its future in terms of its endowment and expenditures." Additionally, a Review Committee for the Libraries was set up, under the chairmanship of Gladys K. Delmas, to look into the libraries' physical needs, acquisition policies and practices, relationship with outside libraries, computer data bases and other related matters.

This past year has witnessed the loss of two valued members of the Institute community. Elizabeth Augustus Whitehead, a Trustee, died

during the summer, and the following resolution was passed by the Board at its October meeting:

"It is with deepest sorrow and a sense of loss that the Trustees of the Institute record here their tribute to their former colleague, Elizabeth Augustus Whitehead, who died on August 3, 1983. She joined the Board of Trustees in 1972 and served, during the last nine years, as a member of the Executive Committee. To this committee she brought unique qualities of grace, intelligence, devotion and balance. Her questions were searching, her support unswerving. We will deeply miss her wise counsel and her glad presence even as we are grateful that she generously shared these with us for so many years."

On October 10, 1983, Harish-Chandra died, and the Board passed the following resolution in his memory.

"The Board of Trustees here records its profound sense of loss in the death of Harish-Chandra, Professor in the School of Mathematics since 1963. Gentle in nature, generous in spirit, brilliant in his perceptions, he gave liberally of himself to all who knew him. His personal kindness, his absence of any vanity or anger, his sense of simplicity combined with his deep respect for the elegant complexities of his field, affected our whole community in mind and heart. We will miss his companionship and mourn his loss as friend and leader in the world of mathematical learning which he did so much to advance."

Joining the Board for the first time in the fall was George B. Field. Professor Field is a theoretical astrophysicist who was born in Providence, Rhode Island, and received his B.S. in Physics from the Massachusetts Institute of Technology, and his Ph.D. in Astronomy from Princeton University. He has taught at Princeton University, California Institute for Technology, the University of California in Berkeley, Haverford College, and the University of Cambridge, England. Since 1972 he has been at Harvard University where he is now the Robert Wheeler Willson Professor of Applied Astronomy; concurrently, he serves as Senior Physicist at the Smithsonian Astrophysical Observatory. He is a former director of the Harvard College Observatory, the Smithsonian Astrophysical Observatory, and the Center for Astrophysics, all in Cambridge, Massachusetts. He received a Public Service Medal from NASA in 1977 and the Smithsonian Institution Certificate of Award for Exceptional Services also in 1977. In 1982 he was awarded the Joseph Henry Medal of the Smithsonian Institution. Professor Field has published over one hundred articles in the field of astrophysics and was a visiting member in the Institute's School of Natural Sciences in 1982-83.

Elected to the Board at the annual meeting in the spring were two new Trustees, John F. Akers, President of IBM, and Michel L. Vaillaud, President of Schlumberger, Ltd.

That same meeting marked the retirement of Howard C. Petersen from active trusteeship on the Board and his election as Trustee Emeritus. Mr. Petersen joined the Board in 1969 and was its Chairman for seven years, from 1974 to 1981. His counsel, leadership and presence were highly valued and the Institute prospered under his sure guidance.

Among the many pleasures of the Board are the review of those well-deserved honors which come from time to time to the Faculty and Emeriti, and at its April meeting, the Board of Trustees in a resolution extended its particular congratulations to Professor Emeritus George F. Kennan "on the occasion of his receiving the Gold Medal for History from the American Academy/Institute for Arts and Letters" and expressed to him "its admiration and appreciation for the honor and distinction he brings to the Institute through his work as both scholar and statesman."

J. Richardson Dilworth
Chairman

Report of the Director

This year has seen the intensification, within the Institute, of the role and the effects of computer technology. We are now several years into the use of a VAX in the School of Natural Sciences; such a concentration there was to be expected. But the technological revolution has begun to spread throughout the three other Schools and this, together with the increase in the use of word-processors by visiting members and staff alike, has effected a remarkable alteration in the traditional non-instrumental aspect of the Institute itself.

It has also necessitated some Institute-wide planning. To that end, a Committee on Computers and Communications was established, made up of a representative from each School. Its purpose is to help in the establishment of computer policy for the Institute on such issues as internal networks, external linkages and cooperation or instrumental choices. The voice of each School will be heard in this process and the Committee will help also to coordinate their differing needs and ambitions. Increasingly, visiting scholars and scientists come to the Institute with tapes and disks of their own. Our libraries have established connections with national systems for bibliographical and other research purposes, including access to important data bases. The enhanced powers of the new machines, the richer supply of source materials and the wider range of their reach from classical archaeology to pure mathematics has created an extraordinarily greater opportunity for the Institute family, but also new burdens and responsibilities. In effect, given the fact that computer technology and communication systems are themselves undergoing rapidly changing developments, we are faced with a laboratory-like phenomenon for the first time in our history.

Stimulated in part by such developments, but also in recognition of the fact that some industrial research is increasingly profound and fundamental and that some appropriate and carefully controlled associations between the Institute and selected corporations might be mutually beneficial, we have sought and obtained research support in the corporate sector. Schlumberger has established a five-year program in the School of Natural Sciences, whereby the company has agreed to fund a visiting member. That visiting member, selected by the School in the same independent and competitive manner as all other visiting members are selected, will be supported by Schlumberger during the two academic terms of a year here. Outside the boundaries of the academic year, he or she will participate in the company's research program and will be compensated accordingly. The following year the same member could remain the Schlumberger fellow or another might be chosen.

We believe that this relationship between research and business provides both an opportunity and a challenge. The opportunity arises from the intent, on either side, to support basic research and to seek a widened perception of its significance through this exchange of experience, and there is every reason to think that intent will be realized. The challenge lies in carefully formulating and monitoring the connection between the academic scientist and industry, so as to maintain that open quality and wide-ranging intellectual intercourse that is essential to fundamental research in a free society. These

are some issues with which we are deeply engaged at present and towards whose better clarification we welcome the challenge posed by our corporate relationships.

Honors and Distinctions

The most meaningful measure of the contribution of the Institute to international research and scholarship is the work done by its Faculty, professors emeriti and members. Much of this is in itself immeasurable: creative thought has no yardstick and the fruit of time spent here may not mature until years later, in other climates and circumstances. Recognizing that, we nevertheless rejoice in the honors and distinctions which have accrued to our Faculty, members and visitors with long-term appointments during this past year.

STEPHEN L. ADLER was the Robert G. Sprague Lecturer at North Adams State College, North Adams, Massachusetts.

JOHN N. BAHCALL was the Director's Distinguished Lecturer at the Lawrenceville Livermore Laboratory in Livermore, California.

ARNE BEURLING was made an honorary member of the Swedish Mathematical Society.

ENRICO BOMBIERI was appointed a foreign member of the Institut de France, Académie des Sciences.

ARMAND BOREL was honored by a Conference on Algebraic Groups at the Institute for Advanced Study celebrating his sixtieth birthday.

GLEN W. BOWERSOCK was appointed Senior Fellow at Dumbarton Oaks (Center for Byzantine Studies) and an Associate Trustee of the American School of Oriental Research.

ROGER DASHEN was elected to the National Academy of Sciences.

FREEMAN J. DYSON received honorary degrees from Rensselaer Polytechnic Institute and Susquehanna University.

JOHN H. ELLIOTT gave the Director's Lecture at the Institute for Advanced Study and the

J. H. Parry Memorial Lecture at Harvard University. He received an honorary degree from the Universidad Autónoma de Madrid and was made Commander of the Order of Alfonso X El Sabio by the Spanish Ambassador to the United States.

CLIFFORD GEERTZ was the Distinguished Lecturer for the American Anthropological Association and Huxley Memorial Lecturer and Medalist of the Royal Anthropological Institute of Great Britain and Ireland. He received honorary degrees from Brandeis University and Swarthmore College.

HERMAN H. GOLDSTINE was elected Executive Officer of the American Philosophic Society.

ALBERT O. HIRSCHMAN attended a three-day "Conference on Democracy and Development" held in his honor at the University of Notre-Dame.

GEORGE F. KENNAN received honorary degrees from Oberlin College and Brown University, the Gold Medal for History from the American Academy/Institute for Arts and Letters, the Regent's Medal of Excellence from the University of the State of New York, and the Charles E. Merriam Award from the American Political Science Association.

ROBERT LANGLANDS received the 1984 Common Wealth Award.

BERNARD LEWIS gave the Leo Camp Memorial Lecture at Albright College and the Reuben Hecht Lecture at Haifa University. He was appointed Andrew D. White Professor-at-Large by Cornell University. He was elected an honorary member of the Société Asiatique and the Atatürk Academy of History, Language and Culture.

HOMER THOMPSON received an honorary degree from the University of Paris X.

ANDRÉ WEIL was appointed Visiting Lecturer for 1984 by the New Zealand Mathematical Society.

HARRY WOOLF was made a Trustee of The Rockefeller Foundation.

SHING-TUNG YAU was elected a member of the American Academy of Arts and Science.

Harish-Chandra, 1923-1983

Our community was deeply saddened by the death, on October 16, 1983, of Harish-Chandra, IBM von Neumann Professor in the School of Mathematics. A conference on Harmonic Analysis and the Representation Theory of Reductive Groups which was originally planned to celebrate the extraordinary mathematical achievements of Harish-Chandra and to mark the passage of his sixtieth year became a memorial conference in his honor and took place from April 23 to 27 at the Institute. In the words of his colleague and countryman, V. S. Varadarajan, "the originality and depth of his work will compel later generations to confer on him that luminous distinction reserved only for the most exalted figures of our science. . . . In the austere simplicity and uncompromising nature of his approach to life, in his preference for solitary and profound reflection, and in his awesome capacity to discern and persevere after distant goals, he resembled the legendary figures from his country's ancient past."

For all of us here, Harish-Chandra's decency, humanity and gentleness made his friendship all the more precious in a world increasingly inclined to be otherwise. He will be keenly missed.

Members' Program

Visiting members to the four Schools are chosen on the basis of open competition and selected by the Faculty of each School. The total number of members this year was 177. Of these, 66 or 38% were under the age of 35 and 14 or 8% were women. Members in 1983-84 came from 109 institutions located in twenty-three 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 individuals of note who have been part of our community this year, special mention should be made of the Director's visitors: Martin Meyerson, former President of the University of Pennsylvania, who undertook a comparative study of urban centers, relating their establishment and evolution to the national cultures in which they are embedded; Paul Berg, a Nobel laureate in genetics from Stanford University's School of Medicine and Maxine F. Singer, Chief of the Laboratory of Biochemistry, Division of Cancer Biology and Diagnosis, National Institutes of Health, worked together on a joint book on the molecular genetics of eukaryotes; Gajo Petrović, a philosopher from the University of Zagreb in Yugoslavia, and previously a visiting member in the School of Historical Studies, wrote two substantial chapters of his forthcoming book on Heidegger.

It has for some time concerned us that members who come are often accompanied by spouses who have themselves professional interests, and that the limited space available in the housing project does not always lend itself to their needs. This year we were able to make available some office space in a separate building at the end of Olden Lane, and I am pleased to report that these offices were in active use for work which included studies of international economics, the history of the Jews in Italy, water and environmental engineering, medical computing, musicology, and poetry.

At the same time, an extensive remodeling of several areas in Fuld Hall resulted in the creation of twenty-four new office spaces for members and staff and an enlargement of the Mathematics and Natural Sciences Library. Much of this was necessitated by the need to provide for new faculty, while preserving the privileges of emeriti.

Plans for The Institute's open land

After considerable discussion with Trustees, Faculty and with various local groups who were concerned with our plans for developing some of the Institute's open land along Quakerbridge Road, a decision was made in the spring to suspend those particular plans. We deeply appreciated the interest of the com-

munity and hope that the relationship of mutual trust and respect that was formed will continue into the future, as we seek to serve both the physical and intellectual environment we collectively enjoy, and to enlarge the base of support for advanced learning and the free and independent scholarship which is our chief activity and which requires as vigilant and substantive protection as the woods and open spaces we cherish.

Other Events

One of the most rewarding aspects of Institute life and its Princeton setting is the accessibility it affords to informal and useful gatherings. Such a one was arranged in September by William Luers, former United States Ambassador to Venezuela and last year's Director's Visitor, to discuss Southern Hemisphere problems. It was attended by George Ball, Henry Bienen, Carola Eisenberg, Ken Oye, Paul Sigmund, and Richard Ullman. Ambassador Luers was at that time lead consultant to the National Bi-Partisan Commission on Central America chaired by Henry Kissinger and has since been appointed United States Ambassador to Czechoslovakia.

Of a more formal nature were a number of other gatherings which used our premises in part or in whole. In August, the Third International Congress on the Economic and Social History of Turkey took place, organized by Bernard Lewis, Professor of Near Eastern Studies at Princeton University and long-term member of the Schools of Historical Studies and Social Science at the Institute.

On December 6 and 7, 1983, the Institute, together with Princeton University and The Carnegie Foundation for the Advancement of Teaching hosted a Colloquium on Graduate Education in America. Over 100 college and university presidents, provosts, deans, and editors of educational journals, or their representatives, gathered at The Carnegie Foundation headquarters and at the Institute for Advanced Study to discuss "Scholarship and its Survival" in relation to such aspects as demography, balance (between teaching and research, graduate and undergraduate education, professional schools and arts and science), and intellectual integrity. These were appropriate and compelling topics for these three institutions to confront, and a distinguished company participated in active and responsive dialogue.

On April 27, 1984, Professor Abraham Pais from The Rockefeller University gave the second Joseph H. Hazen Lecture to honor the memory of Albert Einstein. Professor Pais spoke on "Niels Bohr: Centenary Reflections." He is the author of the recently published *Subtle is the Lord: The Science and the Life of Albert Einstein* and was a Professor in the School of Natural Sciences at the Institute from 1950 to 1963.

In the late spring, a Conference on the Dynamics of Star Clusters was organized by two of our members in the School of Natural Sciences, Jens Villumsen and Piet Hut. The proceedings are to be published.

A number of other events and gatherings took place as part of the Institute's *pro bono* service to the larger community.

Funding

To meet its own budget, the Institute leans heavily on the generosity of Foundations, both government and private, on gifts from corporations, Trustees, friends and alumni. The large donors are listed at the end of the Annual Report, but I wish to take this opportunity to thank all those who have helped to support us, with whom we share a common commitment to the pursuit of knowledge and the value of free and independent research.

Harry Woolf
Director

Reports of the Schools

The School of Historical Studies

Faculty

Glen W. Bowersock

Marshall Clagett

John H. Elliott

James F. Gilliam

Christian Habicht

Irving Lavin

Kenneth M. Setton

Morton White

Professors Emeriti

Harold F. Cherniss

Felix Gilbert

George F. Kennan

Benjamin D. Meritt

Homer A. Thompson

Members with Long-term Appointments

Herman H. Goldstine

Bernard Lewis

Otto E. Neugebauer

The School of Historical Studies

The School of Historical Studies is concerned with all learning for which the use of the historical method is a principal instrument. Over the years it has mirrored the varied interests of its individual Faculty and visiting members, but certain traditions have been more or less continuous. These have stressed Greek and Roman civilization, medieval history, the history of art, modern European history, the history of modern philosophy, American intellectual history, and the history of mathematics and the sciences.

The particular emphases of the School are a product of its own history. Two years after the opening of the School of Mathematics in 1933, a School of Economics and Politics and a School of Humanistic Studies were established. In Humanistic Studies, the first professor was Benjamin Dean Meritt, a specialist in Greek history and epigraphy, who was closely associated with excavations in the Athenian Agora. He in turn brought a number of distinguished ancient historians to the Institute as visiting members, and he collaborated with two of them in publishing *The Athenian Tribute Lists* (1939-1953).

The second appointment to the Faculty of the School of Humanistic Studies was that of the renowned German art historian, Erwin Panofsky. The titles of some of the books written by Panofsky during his years at the Institute suggest his fields of interest: *Studies in Iconology: Humanistic Themes in the Art of the Renaissance* (1939); *Albrecht Dürer* (1943); *Abbot Suger on the Abbey Church of St.-Denis and its Art Treasures* (1946); *Renaissance and Renascences in Western Art* (1960); and *Saturn and Melancholy: Studies in the History of Natural Philosophy, Religion and Art* (1964).

Two additional appointments strengthened the field of classical studies: Elias Avery Lowe, a Latin paleographer who was embarked on the prodigious task of assembling, transcribing, documenting, photographing, and publishing all the extant Latin literary manuscripts copied before the ninth century, and Ernst Herzfeld, a Near Eastern archaeologist and historian, whose scholarly work, by the time of his death, comprised nearly 200 titles. To this group was added Hetty Goldman, one of the pioneering American women involved in archaeology whose discoveries at Tarsus in Turkey were published in six volumes.

Several other appointments, most notably that of Homer A. Thompson in 1947, and Harold F. Cherniss in 1948, and the acquisition of the Gest Library, a remarkable collection of rare Chinese books and scrolls (now housed in the Princeton University Library), complete the formal early history of the School which, in 1949, merged with the School of Economics and Politics to become the School of Historical Studies.

A few years later, in 1951, medieval studies became represented in the School by the appointment of Ernst Kantorowicz. Professor Kantorowicz's work and interests ranged from the later phases of classical antiquity to the fifteenth and sixteenth centuries; in space they embraced both western Europe and the Byzantine and Islamic East. He is best known for his monumental work, *Frederick II*, and his study of the origins and development of constitutional theory, *The King's Two Bodies*.

Meanwhile, the classical discipline was fortified by the appointment of Andrew Alföldi as professor in 1955, a distinguished historian and numismatist, and the art historical tradition was carried on by Millard Meiss (appointed professor in 1958) who was able to

bring to completion during his years at the Institute a number of works, among them the multi-volume study *French Painting in the Time of Jean de Berry*.

Modern history began in the School of Historical Studies with the work of Edward M. Earle, an original member of the School of Economics and Politics at the Institute. Particularly concerned with military history, Professor Earle edited *Makers of Modern Strategy: Military Thought from Machiavelli to Hitler* (1943), a work which resulted from meetings and seminars at the Institute and which is still in print.

Sir Ernest Llewelyn Woodward, also a modern historian, joined the School in 1951, George F. Kennan in 1956, and Felix Gilbert in 1962, all strengthening the fields of modern and diplomatic history, with Professor Gilbert also sharing a commitment to Renaissance studies.

While these traditions have remained strong at the School of Historical Studies, they have not excluded scholars working in other fields who have come here as visiting members, the total number of which is now more than a thousand. The articles and books resulting from their research at the Institute are witness to the quality and productivity of their scholarly activity here.

Academic Activities, 1983-84

The School was host to forty-four long-term, term and annual members in 1983-84, and eight visitors. During the summer of 1983, it also provided research facilities for four summer visitors. Twenty-seven members came from foreign countries, including Belgium, East Germany, England, France, Greece, Israel, Italy, Japan, New Zealand, Romania, Switzerland, and West Germany.

All members and visitors at the Institute are independent scholars and concentrate on their own subjects. The topics of their individual projects are listed in the next section. But contacts and exchanges with one another, whether organized or informal, are often fruitful and stimulating. Among the formal colloquia—

lectures followed by discussions—were those in art history on a monthly basis in which Princeton University's department took part, and in classical studies roughly six times each term, which scholars from the area attended. Some of the members also gave papers at meetings of the Institute's School of Social Science. All these are listed in the Record of Events.

Faculty

Professor Glen W. Bowersock published six articles and several reviews. He delivered lectures in Bahrain, Berlin, Geneva, and Dublin, and presented papers at colloquia in Germany and Switzerland. He was appointed Senior Fellow at Dumbarton Oaks (Center for Byzantine Studies) and an Associate Trustee of the American Schools of Oriental Research.

Professor Marshall Clagett guided Volume V of his *Archimedes in the Middle Ages* through the last stages of the press and continued work on *A Source Book in Ancient Egyptian Science*.

Professor John H. Elliott's book, *Richelieu and Olivares*, was published by the Cambridge University Press. He gave the Director's Lecture at the Institute for Advanced Study on "Two Seventeenth-Century Statesmen: Richelieu and Olivares," the J. H. Parry Memorial Lecture at Harvard University, as well as lectures at the University of Alcalá de Henares, Simon Fraser University and Smith College. He received an honorary degree from the Universidad Autónoma de Madrid and was presented with a medal as Visitante Ilustre de Madrid by the Mayor of Madrid. He was made Commander of the Order of Alfonso X El Sabio by the Spanish Ambassador to the United States at a ceremony held at the Institute in the spring.

Professor James F. Gilliam continued his preparation of Greek and Latin papyri for publication.

Professor Christian Habicht prepared his Sather Lectures (1982-83) for publication by the University of California Press in 1985 and made a German translation to be published in Munich by C. H. Beck in 1985. He pub-

lished several papers and reviews and lectured at the Universities of Pittsburgh, Geneva, Augsburg, and Hamburg.

Professor Irving Lavin continued his preparation of the Slade Lectures to be delivered at Oxford University in the spring of 1985. He published a number of papers and delivered several lectures including two at the College de France and one at the University of Hamburg where he presented a newly discovered bust portrait by Gianlorenzo Bernini in the Hamburg Kunsthalle.

Professor Kenneth M. Setton corrected the galleys and page proofs of the third and fourth volumes of his *Papacy and the Levant, 1204-1571* and is awaiting the appearance of these two volumes as well as the fifth volume of the *History of the Crusades* of which he is the general editor.

Professor Morton White accepted an invitation from Doshisha University to deliver the Neesima Lectures in Kyoto, Japan, in May 1985. In his lectures, Professor White will present some of the results of his continuing research and writing about the use of philosophy in the defense of the Constitution of the United States. Some of that work was carried on while he was a Visiting Scholar in Philosophy at Harvard University during the spring of 1984.

Professors Emeriti

Professor Harold F. Cherniss pursued his studies of ancient Greek philosophy and especially of Aristotle's criticism of Plato and the Academy.

Professor Felix Gilbert published a number of book reviews and continued his studies on Venice in the sixteenth century, including research in the Venetian archives, and on Burckhardt's concept of cultural history. He rewrote the chapter on Machiavelli for the new edition of *Makers of Modern Strategy* of which he is an associate editor. A new edition of his book, *Machiavelli and Guicciardini*, was published with a revised and enlarged bibliographical essay.

Professor George F. Kennan completed the second volume of his study on the history of the Franco-Russian Alliance to be published under the title, *The Fateful Alliance*. He lectured at Brown University, Lake Forest College, and Grinnell College. During 1984 he received honorary degrees from Oberlin College and Brown University. He also received the Gold Medal for History from the American Academy/Institute for Arts and Letters, the Regent's Medal of Excellence from the University of the State of New York, and the Charles E. Merriam Award from the American Political Science Association.

Professor Homer A. Thompson continued to supervise the program for the publication of the excavations in the Athenian Agora. He lectured in Paris, Fribourg, Richmond and Princeton and received an honorary doctorate from the University of Paris X.

Long-term Members and Visitors

Among the Long-term Members, Dr. Herman H. Goldstine continued to work on the completion of his book, *Mathematical Methods in Computer Science*, and on the annotation of the mathematical works on Jacob I and Johann I Bernoulli for which he is providing an historical and mathematical introduction. He was elected Executive Officer of the American Philosophical Society.

Professor Bernard Lewis published *The Jews of Islam* (Princeton University Press). His book on *The Muslim Discovery of Europe* was translated into French, German and Italian. He delivered the Leo Camp Memorial Lecture at Albright College, the William Foxwell Albright Memorial Lecture at The Johns Hopkins University, the Reuben Hecht Lecture at Haifa University, Israel, as well as lectures at The Carnegie Conference Center in Washington, D.C., Cleveland College of Jewish Studies, and Harvard University. He was elected an honorary member of the Société Asiatique and the Atatürk Academy of History, Language and Culture. He was appointed Andrew D. White Professor-at-Large by Cornell University.

Professor Otto E. Neugebauer published a book written in cooperation with Professor N. Swerdlow, *The Mathematical Astronomy in Copernicus' De Revolutionibus* (Springer), and a collection of essays, *Astronomy and History* (Springer). He continued to work on the Ethiopic version of the "Chronography" of Abu Shaker, a thirteenth-century Arab, and supervised the translation of *The Exact Sciences in Antiquity* into Japanese, Hungarian, Portuguese, and French. He was awarded the medal "Bene merito" of the Vienna Academy.

Dr. Shelomo D. Goitein, a Long-term Visitor, continued his study of the Jewish communities of the Arab world as portrayed in the documents of the Cairo Geniza. He prepared for publication the fifth and last volume of *A Mediterranean Society* and worked on his "India Book" which is also based on Geniza documents.

The School of Historical Studies

**Members with Long-term Appointments,
Members, Visitors and Assistants 1983-84**

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

Members with Long-term Appointments

Herman H. Goldstine, *History of computers and computation; theory of computing machines.*
Born 1913, Chicago, Illinois. University of Chicago, BS 1933, MS 1934, PhD 1936; honorary doctorate University of Lund 1974, Amherst College 1978, Adelphi University 1978.
University of Chicago, research associate and instructor 1936-39; University of Michigan, instructor and associate professor 1939-42; US Army, in charge of development of ENIAC and of EDVAC 1942-46; IBM Corporation, research planning staff 1958, director of mathematical sciences 1958-65, consultant to director of research 1967-69, IBM Fellow 1969- ; Institute for Advanced Study, Electronic Computer Project, associate director 1946-57, School of Mathematics, permanent member 1951-58, School of Natural Sciences, member with long-term appointment 1972- , School of Historical Studies, member with long-term appointment 1977- ; Executive officer of the American Philosophical Association 1984- .

Bernard Lewis, *Islamic history.*
Born 1916, London, England. University of London, BA 1936; University of Paris, Diplôme des Etudes Sémitiques 1937; University of London, PhD 1939; honorary doctorate Hebrew University 1974, Tel Aviv University 1979.
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 at 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 1899, Innsbruck, Austria. University of Göttingen, PhD 1926; University of St. Andrews, LLD 1938; honorary doctorate Brown University, Princeton University.
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

Alan E. Astin, *The censorship of the Roman Republic.*
Born 1930, Surbiton, England. University of Oxford, BA 1954, MA 1957.
The Queen's University of Belfast, assistant lecturer 1954-57, lecturer 1957-67, professor 1967- ; Institute for Advanced Study, member 1964-65, 1975; Yale University, visiting professor 1966.

Robert J. Bartlett, *Military technology, military organization and political power in medieval Europe.*
Born 1950, London, England. University of

Cambridge, BA 1972, MA 1976; University of Oxford, DPhil 1978.

University of Edinburgh, lecturer 1980-   .

Irène Beldiceanu-Steinherr, *Fifteenth-century Ottoman tax surveys for eleven villages in the region of Smyrna (Izmir).*

Born 1928, İstanbul, Turkey. University of Munich, DrPhil 1956; University of Paris IV (Sorbonne), Docteur en Histoire 1965; University of Paris III, Docteur d'Etat ès Lettres 1983.

Ecole Pratique des Hautes Etudes, VIe section, Paris, vacataire 1956-60, chef de travaux 1960-67; Centre National de la Recherche Scientifique, Paris, chargé de recherche 1967-79, maître de recherche 1979-   .

Philip J. Benedict, *History of early modern France.*

Born 1949, Washington, D.C. Cornell University, BA 1970; Princeton University, MA 1972, PhD 1975.

Cornell University, visiting assistant professor 1975-76; University of Maryland, assistant professor 1976-78; Brown University, assistant to associate professor 1978-   .

Marino Berengo, *European towns in the Middle Ages.*

Born 1928, Venice, Italy. University of Florence, Laurea in lettere 1953; University of Padua, Libera docenza 1959.

State Archives, Venice, archivist 1958-63; University of Padua, professor 1961-63; University of Milan, professor 1963-74; University of Venice, professor 1974-   ; Institute for Advanced Study, member fall 1979; Commission internationale d'histoire des villes, member 1982-   .

Christof F. Boehringer, *The Greek coinage of Catania in Sicily.*

Born 1934, Stuttgart, West Germany. University of Munich, PhD 1966.

University of Göttingen, assistant 1967, curator of classical art 1972-   .

Eugene A. Carroll, *Rosso Fiorentino: his life and work.*

Born 1930, St. Louis, Missouri. Harris Teachers College, BA 1952; Harvard University, MA 1958, PhD 1964.

Wellesley College, instructor 1961-64; Williams College, visiting assistant professor

1964-65; Vassar College, assistant professor to professor 1965-   .

Emilia Doruțiu-Boilă, *Greek and Latin epigraphy: the governors of the Roman province Moesia Inferiore.*

Born 1930, Cluj, Romania. University of Bucharest, DrPhil 1972.

University of Cluj, researcher 1952-53; University of Bucharest, lecturer 1953-57; Institute of Archaeology, University of Bucharest, researcher 1958-   .

Werner Eck, *Fasti consulares of the Imperial period.*

Born 1939, Nuremberg, West Germany. University of Erlangen-Nuremberg, DrPhil 1968.

University of Saarbrücken, professor and scientific consultant 1975-76, professor ordinarius 1976-79; University of Cologne, professor ordinarius 1979-   .

Hartmut Galsterer, *Administration of Italy and the provinces in Roman times.*

Born 1939, Hannover, West Germany. University of Erlangen, DrPhil 1968; University of Cologne, Habil 1974.

University of Erlangen, University of Cologne, assistent 1967-74; University of Cologne, privatdozent 1974-77; Free University of Berlin, professor ordinarius 1977-   .

Edward Grant, *The medieval cosmos 1200-1650.*

Born 1926, Canton, Ohio. City University of New York, BS 1951; University of Wisconsin, MA 1953, PhD 1957.

University of Maine, instructor 1957-58; Harvard University, instructor 1958-59; Indiana University, assistant to professor 1959-   ; University of Wisconsin, visiting assistant professor spring 1962; Institute for Advanced Study, member 1965-66.

Edoardo Grendi, *Comparative historical analysis of Ligurian communities.*

Born 1932, Genoa, Italy. University of Genoa, Laurea in Lettere 1956; University of Rome, Libera Docenza 1967, 1970.

University of Turin, lecturer 1967-72; University of Genoa, professor 1972-   .

Anne Coffin Hanson, *Optics, perspective, and the illusion of space in painting.*

Born 1921, Kinston, North Carolina.

University of Southern California, BFA 1943; University of North Carolina, MA 1951; Bryn Mawr College, PhD 1962.

Albright Art School, University of Buffalo, instructor 1955-58; Swarthmore College, assistant professor 1963-64; Bryn Mawr College, assistant professor 1964-68; New York University, adjunct associate professor 1969-70; Museum of Modern Art, International Study Center, director 1968-69; Yale University, professor 1970-   .

Miltiades B. Hatzopoulos, *Macedonian institutions in classical and hellenistic times.*
Born 1944, Athens, Greece. University of Paris IV, Sorbonne, Licence en Lettres Classiques 1967; University of Paris, PhD 1971.

Ekdotike Athenon S.A., co-editor of the *History of the Hellenic World* 1972-79; Research Center for Greek and Roman Antiquity, National Hellenic Research Foundation, head of the Macedonian research program 1979-   .

Peter Herrmann, *Corpus of Greek inscriptions of ancient Lydia.*
Born 1927, Reichstadt, Czechoslovakia. University of Hamburg, DrPhil 1955.

University of Hamburg, dozent 1962-68, professor ordinarius 1968-   ; University of Bordeaux, professeur associé 1972-73; Institute for Advanced Study, member 1974.

M. Keith Hopkins, *Chastity and sexuality in ancient Rome.*
Born 1934, London, England. King's College, Cambridge, BA 1958, MA 1961.

London School of Economics, lecturer 1963-67, senior lecturer 1970-72; University of Hong Kong, professor 1967-69; Institute for Advanced Study, member 1969-70, 1974-75; Brunel University, professor 1972-   .

Stephen Innes, *The work culture of seventeenth-century America.*
Born 1946, Boston, Massachusetts. Boston College, BA 1968; Northwestern University, PhD 1977.

University of Virginia, assistant professor 1977-83; associate professor 1983-   .

David Keyt, *Greek philosophy.*
Born 1930, Indianapolis, Indiana. Kenyon College, BA 1951; Cornell University, MA 1953, PhD 1955.

University of Washington, instructor to professor 1957-   ; University of California at Los Angeles, visiting assistant professor 1962-63; Cornell University, visiting associate professor 1968-69.

Rosalind E. Krauss, *Photography's discursive space: the nineteenth-century surveys.*
Born 1940, Washington, D.C. Wellesley College, BA 1962; Harvard University, MA 1964, PhD 1969.

Wellesley College, instructor 1965-67; Massachusetts Institute of Technology, assistant professor 1967-71; Princeton University, lecturer 1972-74; Hunter College, City University of New York, associate professor 1975-77, professor 1977-   ; Graduate Center, City University of New York, professor 1977-   .

Umberto Laffi, *Roman epigraphical laws: the lex rubria de gallia cisalpina.*
Born 1939, Belluno, Italy. University of Pisa, laurea in lettere 1962; Scuola Normale Superiore, Pisa, perfezionamento in storia antica 1964; Ministero Pubblica Istruzione, libera docenza 1969.

University of Pisa, assistente 1962-1969, professore incaricato 1969-1971, professore ordinario 1971-   , direttore Istituto di Storia Antica 1972-82; Institute for Advanced Study, member 1975-76.

Rex Martin, *A system of rights (a philosophical study).*
Born 1935, Marion, Indiana. Rice University, BA 1957; Columbia University, MA 1960, PhD 1967.

University of Kansas, professor 1973-   .

Maureen F. Mazzaoui, *The role of domestic wools in the textile industry of Renaissance Italy.*
Born 1938, New York, New York. Hunter College, City University of New York, BA 1958; Bryn Mawr College, MA 1960, PhD 1966.

St. Mary of the Woods College, instructor 1964-65; McGill University, lecturer 1966-67; University of Wisconsin at Madison, visiting assistant professor 1969-70; Indiana University, assistant professor 1973-77, associate professor 1977-   .

Fergus G. B. Millar, *Hellenistic Syria.*
Born 1935, Edinburgh, United Kingdom.

University of Oxford, BA 1958, MA 1962, DPhil 1962.

University of Oxford, All Souls College, fellow 1958-64; Queen's College, tutor 1964-76; Institute for Advanced Study, member 1968; University College, London, professor 1976-84; University of Oxford, professor 1984- .

Stephen Mitchell, *Galatia: an historical study of central Anatolia from the arrival of the Gauls to Justinian.*

Born 1948, Oxford, England. University of Oxford, BA 1970, MA 1975, PhD 1975.

Bristol University, lecturer 1973-74; University of Oxford, Christ Church, research lecturer 1974-76; University College, Swansea, lecturer 1976- .

Minoru Murai, *The influence of American social thought on Japanese education.*

Born 1922, Saga Prefecture, Japan. Hiroshima University, PhD 1960.

Keio University, professor 1960- ; Tokyo University, lecturer 1962-65; Waseda University, lecturer 1982; University of Tübingen, visiting professor 1971; University of Cologne, visiting professor 1983.

Christian F. Otto, *Palace architecture of Balthasar Neumann: history and purpose.*

Born 1940, New York, New York. Swarthmore College, BA 1962; Columbia University, MA 1966, PhD 1971.

Vassar College, visiting lecturer 1968-69; University of Wisconsin at Madison, assistant professor 1969-70; Cornell University, assistant professor 1970-75, associate professor 1975-83, professor 1983- ; *Journal of the Society of Architectural Historians,* editor 1974-81.

François Paschoud, *Edition and French translation of Zosimus, New History, books 5 and 6.*

Born 1938, Berne, Switzerland. University of Lausanne, license ès lettres 1960, doctorat ès lettres 1967.

Thesaurus Linguae Latinae, collaborateur scientifique 1965-67; University of Geneva, professeur extraordinaire 1969-74, professeur ordinaire 1974- ; International Federation of the Societies of Classical Studies, secretary general 1974- ; Institute for Advanced Study, member 1976-77.

Constantina Peppas-Delmousou, *The fifth-century Greek inscriptions found in Brauron (Attica).*

Born 1925, Athens, Greece. University of Rome, PhD 1958.

Greek Archaeological Service, Epimeletria of antiquities 1959-64; National Epigraphical Museum, Ephor of antiquities and Director 1965- .

Pietro Redondi, *The relationships between theoretical physics and technology in eighteenth and nineteenth century France.*

Born 1950, Milan, Italy. University of Milan, laurea 1974; Ecole des Hautes Etudes en Sciences Sociales, doctoral thesis 1978.

Ecole des Hautes Etudes en Sciences Sociales, chargé de conférences 1981-82; University of Milan, assistant professor 1982; Centre National de la Recherche Scientifique (CNRS), researcher 1982- .

Avraham Ronen, *Gozzoli's Pestbilder: four plague pictures by Benozzo Gozzoli.*

Born 1929, Tel Aviv, Israel. Hebrew University, BA 1954; University of Rome, DrLitt 1968.

Bezalel Academy of Art, Jerusalem, teacher-lecturer 1954-63; Tel Aviv University, lecturer to associate professor 1968- .

Martin J. S. Rudwick, *The Devonian controversy in nineteenth-century geology.*

Born 1932, London, England. University of Cambridge, BA 1953, MA 1957, PhD 1958, ScD 1976.

University of Cambridge, university demonstrator 1955-59, university lecturer 1960-74; Free University, Amsterdam, professor 1974-80; Princeton University, visiting professor 1981; Hebrew University, Jerusalem, visiting professor 1982; Institute for Advanced Study, member 1982.

Teofilo F. Ruiz, *Rural and urban society in Northern Castile (thirteenth-fourteenth centuries).*

Born 1943, Havana, Cuba. City College of New York, BA 1969; New York University, MA 1970; Princeton University, PhD 1974.

Brooklyn College, assistant to associate professor 1973- ; Princeton University, visiting assistant professor spring 1975.

Klaus G. Sallmann, *Social and cultural background of Roman history in the second and third centuries, A.D.*
Born 1934, Thakhek, Laos. University of Cologne, DrPhil 1959; University of Mainz, DrHabil 1968.
University of Mainz, assistent 1960-69, dozent 1969-72, professor extraordinarius 1973, professor 1970- .

Henry A. S. Schankula, *Edition of the manuscript diaries of John Locke.*
Born 1943, Niagara Falls, Canada. University of Toronto, BA 1965, MA 1967, PhD 1976.
University of Kentucky, assistant to associate professor 1970- .

Seth L. Schein, *"Friendship" (philia) in Euripidean drama.*
Born 1942, New York, New York. Columbia College, BA 1963, University of California at Berkeley, MA 1964; Columbia University, PhD 1967.
Columbia University, instructor to assistant professor 1968-73, State University of New York at Purchase, assistant to associate professor 1973-81; University of California at Santa Cruz, associate professor to professor 1981- .

Antoine Schnapper, *Les collections en France au XVIIᵉ siècle.*
Born 1933, Paris, France. University of Paris IV, Sorbonne, licence 1958, agrégation 1960, PhD 1965; University of Paris IV, doctorat d'Etat 1973.
University of Paris IV, Sorbonne, assistant professor 1963-68, professor 1978- ; Centre National de la Recherche Scientifique, attaché, chargé recherches 1968-73; University of Dijon, professor 1973-78.

Gerald Strauss, *History of early modern Germany.*
Born 1922, Frankfurt, West Germany. Boston University, BA 1949; Columbia University, MA 1950, PhD 1957.
Phillips Exeter Academy, instructor 1950-57; University of Alabama, assistant professor 1957-59; Indiana University, assistant professor to professor 1959- .

Martin M. Tweedale, *John Duns Scotus' doctrine of distinctions.*
Born 1937, Trenton, New Jersey. Princeton

University, BA 1959; University of California at Los Angeles, PhD 1965.
University of Pittsburgh, assistant professor 1965-69; University of California at Los Angeles, assistant professor 1969-71; University of Auckland, senior lecturer 1971- .

Alan W. Tyson, *The investigation of Mozart's working methods.*
Born 1926, Glasgow, Scotland. University of Oxford, BA 1951, MA 1952; University of London, BS MB 1965.
All Souls College, University of Oxford, senior research fellow 1972- , Lyell reader in bibliography 1973-74; Columbia University, visiting professor 1969; University of California at Berkeley, professor 1977-78.

Ernest Ullmann, *Medieval architecture/iconology: German Renaissance.*
Born 1928, Reichenberg-Franzendorf, East Germany. University of Halle, Dipl.phil. 1956, DrPhil 1960; University of Leipzig, DrPhilHabil 1967, DrScPhil 1970.
University of Halle, aspirant 1956-60; University of Leipzig, oberassistent 1960-63, dozent 1964-71, institutsdirektor 1964-68, professor ordinarius 1971- .

Marc J. C. Waelkens, *Inscriptions and monuments from the Upper Tembris Valley (Phrygia).*
Born 1948, Waregem, Belgium. University of Ghent, BA 1968, MA 1970, PhD 1976.
University of Ghent, research assistant 1971-75, senior research assistant 1976-80, research associate 1980- .

Visitors

Angelos Delivorrias, *Archaeological puzzles: Alcamenes.*
Born 1937, Athens, Greece. University of Thessaloniki; University of Athens; University of Freiburg; University of Tübingen, PhD 1972.
Greek Archaeological Service, National Museum of Athens 1965-69; Benaki Museum, Athens, director 1973- .

Gerald L. Geison, *The American style in physiology, 1870-1940.*
Born 1943, Savanna, Illinois. Beloit College, BA 1965; Yale University, MA 1967, PhD 1970.

Princeton University, assistant professor 1970-76, associate professor 1976- .

S. D. Goitein, *Medieval Islamic and Jewish history.*
Born 1900, Burgkunstadt, Bavaria, West Germany. University of Frankfurt, PhD 1923.
Hebrew University, lecturer to professor 1928-57; University of Pennsylvania, professor 1957-70, affiliated professor 1970-71; Institute for Advanced Study, visitor 1971- .

Robert C. Howell, *Kant's transcendental deduction: a new interpretation.*
Born 1940, Indianapolis, Indiana. Kenyon College, BA 1961; University of Michigan, MA 1963, PhD 1967.
University of Illinois at Urbana, assistant professor 1966-68; Stanford University, assistant professor 1968-75; The Johns Hopkins University, visiting assistant professor fall 1974; State University of New York at Albany, assistant professor 1975-76, associate professor 1976- ; Institute for Advanced Study, member 1982-83.

Christoph M. Kimmich, *West Germany's relation with eastern Europe and the Soviet Union, 1966-73.*
Born 1939, Dresden, Germany. Haverford College, BA 1961; University of Oxford, DPhil 1964.
Earlham College, assistant professor 1964-65; Columbia University, assistant professor 1965-68, associate professor 1968-73; Brooklyn College, City University of New York, associate to full professor 1973- .

Jerrold E. Seigel, *Bohemianism in modern France.*
Born 1936, St. Louis, Missouri. Harvard University, BA 1958; Princeton University, PhD 1963.
Princeton University, instructor to professor 1961- .

Craig H. Smyth, *Michelangelo's design for St. Peter's cathedral.*
Born 1915, New York, New York. Princeton University, BA 1938, MFA 1941, PhD 1956; Harvard University, honorary MA 1975.
National Gallery of Art, Washington, D.C., research associate 1941-42; Frick Collection, New York, lecturer 1946-50; New York University, assistant professor to professor 1950-73, director

of Institute of Fine Arts 1951-73; Harvard University, professor 1972- , director of Villa I Tatti 1973- ; Institute for Advanced Study, visitor spring 1971, member fall 1978.

Fritz Stern, *Einstein and the political passions of his time.*
Born 1926, Breslau, Germany. Columbia University, BA 1946, MA 1948, PhD 1953.
Columbia University, lecturer to professor 1946- , provost 1980-83; Cornell University, acting assistant professor 1951-53; University of Konstanz, permanent visiting professor 1967- ; Foundation Nationale des Sciences Politiques, visiting professor spring 1979.

Assistants

Jay D. Atlas, *Negation, existence, and other topics in philosophic logic.*
Born 1945, Houston, Texas. Amherst College, BA 1966; Princeton University, PhD 1976.
Pomona College, associate professor 1981- ; Institute for Advanced Study, assistant to Professor Morton White 1982-84.

Susan M. Babbitt, *Aristotle's* Politics *in medieval thought.*
Born 1949, Dayton, Ohio. University of California at Berkeley, BA 1970; Cornell University, MA 1972, PhD 1977.
Institute for Advanced Study, assistant to Professor Kenneth M. Setton 1975- .

A. S. Bradford, *Roman Sparta.*
Born 1942, Appleton, Wisconsin. University of Chicago, PhD 1973.
Institute for Advanced Study, assistant to Professor Christian Habicht 1977-82, 1983-84.

Mark L. Darby, *Medieval political thought and ecclesiology.*
Born 1954, Aberdeen, Maryland. Vassar College, BA 1976; Cornell University, MA 1978.
Colorado College, visiting instructor 1983; Institute for Advanced Study, assistant to Professor Marshall Clagett 1980- .

Peter Dear, *Marin Mersenne and Jesuit scholasticism in the scientific revolution.*

Born 1958, Portsmouth, England. University of Cambridge, BA 1979, MA 1983; Princeton University, PhD 1984.

Institute for Advanced Study, assistant to Professor John H. Elliott 1983-84.

Claudia Marchitiello, *The Book of Hours in fourteenth-century Metz.*

Born 1951, Montreal, Canada. McGill University, BA 1972; Princeton University, MFA 1975.

Institute for Advanced Study, assistant to Professor Irving Lavin 1982-   .

Everett L. Wheeler, *The concept of stratagem in ancient historiography, military theory, and international law.*

Born 1950, New Albany, Indiana. Indiana University, BA 1972; Duke University, PhD 1977.

Duke University, visiting lecturer 1977, visiting assistant professor 1979; University of Missouri at Columbia, visiting assistant professor 1979-80; Kommission für Alte Geschichte, Munich, von Humboldt fellow 1981-83; University of Louisville, visiting lecturer 1983; Institute for Advanced Study, assistant to Professor Glen W. Bowersock 1983-84.

The School of Mathematics

Faculty

Enrico Bombieri
Armand Borel
Harish-Chandra*
  (IBM von Neumann Professor)
        Shing-Tung Yau

Robert P. Langlands
John W. Milnor
  (Oswald Veblen Professor)
Atle Selberg

Professors Emeriti

Arne Beurling
Deane Montgomery

André Weil
Hassler Whitney

*Deceased October 16, 1983

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 developing 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, renders 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 Kurt Gödel, Carl Ludwig Siegel, John von Neumann and Hermann Weyl, and adding to their presence such American luminaries as James Alexander, Marston Morse and Oswald Veblen. 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. In response to the interests of the 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.

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 whereby 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, 1983-84

The theme of this year's program was L-functions, functions of a complex variable which

since the time of Riemann, and indeed earlier, have played a central role in number theory. A large part of the program was devoted to the development of the theory of L-functions within the context of automorphic forms and infinite-dimensional representations.

In one seminar, the Friday morning seminar, the work of J. Arthur on the trace formula was expounded and extended in a form which had appeared in the informal literature but had never been justified adequately. The notes of this seminar will be rewritten and eventually appear as a book. In the Friday afternoon seminar some of the algebraic and arithmetic aspects of the trace formula were developed and applications were discussed. Much of the material of this seminar will eventually appear in an expository article of J. Rogawski, in which his work and that of Y. Flicker will be described, and in a paper by R. Kottwitz and D. Shelstad, who came down from Rutgers-Newark to take part in the seminars. The Thursday morning seminar grew out of the Friday afternoon seminar. The bulk of it was taken up by an account by J. Arthur and L. Clozel of their work on base change for GL(n), a basic step but by no means the last in a long-term program to prove a conjecture enunciated by E. Artin in 1927, and one of the major achievements of the year. This work will ultimately be published in appropriate journals.

The Thursday afternoon seminar was conducted by I. Piatetski-Shapiro of Yale and Tel-Aviv, and was largely devoted to an account by him and his collaborators, S. Rallis and D. Soudry, of the current status of their ambitious project on L-functions and the oscillator representation.

There were other seminars as well and, in particular, one on Tuesdays dealing with L-functions from a more traditional point of view, to take advantage of the presence of experts of the caliber of H. Iwaniec and J-P. Serre. A second major achievement of the year was the work of Iwaniec and J. Friedlander on classical divisor problems in the analytic theory of numbers. It is appearing in a series of papers.

In addition to the activities mentioned above, there are the possibly more important ones which cannot be so easily summarized. A brief informal remark sometimes has more impact than a course of lectures. Moreover, the School's success lies as much in the atmosphere, created early and sustained over a long period, of joint responsibility for the fostering of mathematics as an intellectual discipline rooted in the past and pertinent to the present, as in the individual achievements of its Faculty and members. For this mutual effort, it is important to recognize the less visible contributions of the mathematical community here and to appreciate the great variety of ways in which ideas are transmitted.

The School of Mathematics

Members, Visitors and Assistants, 1983-84

In the section which follows, the information was obtained from material provided by the Members, Visitors and Assistants.

Members

Jonathan L. Alperin, *Representation theory of finite groups.*
Born 1937, Boston, Massachusetts. Harvard University, BA 1959; Princeton University, MA 1960, PhD 1961.
Massachusetts Institute of Technology, C.L.E. Moore instructor 1962-63; University of Chicago, assistant professor to professor 1963-   ; Institute for Advanced Study, member spring 1969, spring 1979.

James G. Arthur, *Representation theory and automorphic forms.*
Born 1944, Hamilton, Ontario, Canada. University of Toronto, BS 1966, MS 1967; Yale University, PhD 1970.
Princeton University, instructor 1970-72; Yale University, assistant professor 1972-76; Institute for Advanced Study, member 1976-77; Duke University, professor 1976-79; University of Toronto, professor 1979-   .

Michael Artin, *Algebras of global dimension 2.*
Born 1934, Hamburg, West Germany. Princeton University, BA 1955; Harvard University, PhD 1960.
Harvard University, instructor 1960-63; Massachusetts Institute of Technology, assistant professor to professor 1963-   .

Teruaki Asai, *Representation theory of finite reductive groups.*
Born 1949, Gifu-city, Japan. Kyoto University, BA 1974, MA 1976, PhD 1980.
University of Osaka Prefecture, assistant 1976-1980; Nara University of Education, assistant professor 1980-   .

David D. W. Bao, *Supergravity and relativistic field theories.*
Born 1953, Macau, Portugal. University of Notre Dame, BS 1976; University of California at Berkeley, PhD 1983.
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Stephen Wolfram

The School of Natural Sciences

Over time, the School of Natural Sciences 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 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), was one response to this situation. Unfortunately, it did not prove 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. Quantum electrodynamics has now been subsumed into a more general framework, the electroweak theory, which unifies two of these forces. A separate generalization of electrodynamics, called quantum chromodynamics, is by now believed to be the correct theory of the strong force. The latter involves what is perhaps the most complex (but subtle) set of equations ever contemplated by scientists. Considerable work at the Institute is directed towards extracting the consequences of this theory. It is hoped that someday quantum chromodynamics can be combined with the electroweak theory to produce a so-called grand unified theory and that someday gravity can also be incorporated. A number of Institute members work in this area. The history and discussion of modern particle theory at the Institute are thus attempts 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 grav-itational radiation.

Changing observational methods have also led to the discovery or prediction of new as-tronomical 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 contin-uing study of old familiars such as novae, supernovae and white dwarfs. Of equal in-terest 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 be-lieved 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 deviations from Newtonian pre-dictions within the solar system have been delineated by general relativity theory, but its greatest importance lies in the physics of neu-tron 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 re-mains at the edge of contemporary science as a vigorous research frontier.

Under these rather sweeping rubrics, the work of the School of Natural Sciences con-centrates on particular areas: neutrino astron-omy, galactic evolution, star counts, stellar dynamics, 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 at-tention of the astrophysics group. The group also specializes in predicting what the Space Telescope (to be launched in 1986) 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 ob-servatory 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 var-ious equilibrium properties of matter in bulk, such as stability, thermodynamic properties and the like; and dynamical system theory which examines the special properties of mat-ter far from equilibrium. The Institute has a long tradition in statistical mechanics and has recently been developing a new effort in dy-namics. The latter has several links with com-puter science and it is likely that the School will move in this direction also.

Academic Activities, 1983-84

A. Particle Physics

Particle physics at present is characterized by the existence of a good theoretical frame-work (the so-called "standard model") for de-scribing the low-energy strong, weak and electromagnetic interactions, together with the active pursuit of ideas for unifying these in-teractions with each other and with gravity at higher energies.

Much of the research in particle physics at the Institute this past year has dealt with the physics of the standard model, with the aims of finding better computational methods and of exploring simplified analytic models for strong interaction phenomena. The primary computational tool for strong interaction physics is the Monte Carlo method, in which the relevant quantum field theories are sim-ulated on a computer using a statistical sam-pling technique. Gyan Bhanot, Roger Dashen, François David, Herbert Hamber, and Nathan Seiberg pursued Monte Carlo studies last year. Among the results obtained were a demon-stration of universality in the mixed action SU(2) lattice gauge theory, elucidation of the phase diagram of the 2-dimensional O(3) σ-model, determination of critical indices on a fractal lattice, determination of the chiral con-densate and quark masses in lattice quantum chromodynamics (QCD), and study of meth-ods for minimizing errors when dynamical quark effects are included in lattice QCD cal-culations.

Considerable attention has also been di-

rected recently at simple analytic models for strong interaction phenomena. The idea that baryons can be viewed as topological excitations in chiral models was pursued by John Breit and V. Parameswaran Nair. Breit (with Chiara Nappi) studied the breathing mode of the topological soliton in the Skyrme model, and showed that it can be identified with the Roper resonance; Nair showed that the baryon is not a pure topological soliton, but has a phenomenologically important 3-quark admixture. In the area of chiral symmetry breaking, Stephen Adler (with Anne Davis) gave a simple method for using phenomenological potentials to derive a renormalized gap equation for chiral symmetry breaking in QCD, and solved this equation for a confining potential.

Paramount among the ideas for unifying the interactions has been supersymmetry, in which bosons (integer-spin particles) and fermions (half- integer spin particles) are unified in the same multiplet. A prime issue in supersymmetric theories has been finding suitable symmetry breaking methods; a new method for breaking supersymmetry, involving topological solitons called instantons, was developed by Michael Dine and Seiberg (with Affleck). They showed that instanton-induced nonperturbative effects violate the perturbative non-renormalization theorems—a necessary condition for dynamical supersymmetry breaking. Another prime issue in unified theories is the role of gravitation. The renormalizability of higher derivative, conformal and superconformal gravitation theories, and the issues of the calculability of Newton's constant and the vanishing of the cosmological constant, were the subject of investigations by David, Nair, and Andrew Strominger. A method for putting higher derivative quantum gravity on a simplicial lattice, with numerical computations in mind, was developed by Hamber and Ruth Williams.

As noted above, topological ideas have played an important role in the investigations of both standard model and unified field physics. A detailed program of investigation

of topological properties of Dirac operators in the presence of background fields was pursued by Antti Niemi, who found a new method to analyze the fractionization of fermion number, and a relation between D dimensional Abelian anomalies and their D-2 dimensional non- Abelian counterparts. Nair studied nonperturbative (discrete) anomalies arising from the nontrivial topological structure of the gauge group, and generalized earlier work by Witten to arbitrary gauge groups in arbitrary dimensions. Both of these pieces of work are useful for attempts to unify the interactions in so-called Kaluza-Klein models, in which theories with dimensionality higher than four are discussed, with all dimensions other than the observed four compactifying into a ball of very small radius.

B. Astrophysics

Lively discussions continued at coffee hours and lunches, especially the weekly informal seminar luncheons. Senior visitors this year included James Binney (Oxford University), Michael Fall (Cambridge), Kenneth Freeman (Mt. Stromlo Observatory, Australia), Douglas Heggie (University of Edinburgh), Til Kirsten (Max Planck Institut für Kernphysik, Heidelberg), Jan Oort (University of Leiden), William Press (Harvard-Smithsonian Center for Astrophysics), Vera Rubin (Carnegie Institution of Washington), Scott Tremaine (M.I.T.), Edward Van den Heuvel (University of Amsterdam), Simon White (University of Arizona), and Roland Wielen (Technische Universität Berlin, West Germany), representing broad and varied backgrounds in the academic world.

John Bahcall concentrated on three areas: a derivation of the total amount of matter in the solar vicinity (the Oort limit); the determination of the maximum mass of the unseen disk material [with Piet Hut and Scott Tremaine (MIT)]; and a demonstration that a decisive solar neutrino experiment can be performed with fifteen tons of gallium. To determine the total amount of matter near the Sun, Bahcall used improved and detailed gal-

axy models, together with self-consistent numerical solutions of the Vlasov and Poisson equations. The major conclusion of this work is that about half of the matter in the vicinity of the Sun has not yet been observed and must be in a dissipational form with a vertical (exponential) scale height of less than 0.7 kpc. Bahcall, Hut, and Tremaine showed that the existence of wide stellar binaries with separations as large as 0.1 pc implies that the mass of the unseen disk objects must be less than $2M_\odot$. This result was established by analytic calculations of the disruption rate and by numerical simulations (using Hut's 3-body code). The major new development with the solar neutrino problem was the proof—by numerical simulations—that fifteen tons of gallium is sufficient to do a decisive solar neutrino experiment. This work was done together with the Brookhaven experimentalists: Bruce Cleveland, Raymond Davis, and Keith Rowley. Bahcall and Cleveland performed overall simulations of many experimental runs to determine how much could be learned with specific amounts of gallium. They showed that the most important question—is the solar neutrino problem due to neutrino production (astrophysics) or neutrino propagation (physics)?—could be answered with fifteen tons of gallium.

James Binney (visiting from Oxford), together with Ortwin Gerhard of the Max Planck Institut für Astrophysik in Munich and Piet Hut of the Institute, presented three derivations of Poincaré's oft-cited and rarely proved theorem that the Poincaré map of a surface of section onto itself is area-preserving. They illustrated the results by working out the surface of section associated with motion in a Keplerian potential when referred to a rotating system of coordinates.

Stefano Casertano worked on the dynamics of the disks of normal galaxies and on the evolution of few-body systems. Casertano also continued his study of the properties of collective bending waves in thick collisionless galactic disks, and of their relevance to observed warps. Inclusion of a finite disk thickness does not solve the difficulties related to the existence of a continuous spectrum of eigenvalues. He revised the theory that the warp in the Galaxy is caused by the tidal force of the Magellanic Clouds, in the light of the new observational parameters for the warp itself. Preliminary results indicate that the explanation is more viable than previously believed. Casertano explored, in collaboration with Bahcall, the connection between vertical velocity dispersions and masses of galactic disks. They showed, by an analytic derivation and by studying numerical galaxy models, that vertical velocity dispersions can provide powerful probes of the mass distribution in galaxies. Bahcall and Casertano outlined the characteristics of a realistic observational program.

David Gilden worked primarily on three topics: sampling errors in the Oort limit, magnetic reconnection in rotating plasma disks, and thermal stability in molecular clouds. With Bahcall, he has developed an orbit simulation program that computes the orbits of stars in a fixed realistic galactic potential. With this program they have constructed simulated star count catalogues and have calibrated the sampling error in the self-consistent determination of the Oort limit. With T. Tajima (Fusion Center: University of Texas at Austin), Gilden continued work on magnetic field reconnection in differentially rotating plasma disks. They find that the effective resistivity in their disks increases until a magnetic Reynolds number of order unity is achieved and that substantial magnetic flux remains in the disks after several cycles of reconnection and coalescence. Work was also completed on an investigation of thermal instability in molecular clouds. Both time-dependent and time-independent condensation modes can exist for realistic parameter ranges in molecular gas. These modes can provide a source of small scale clumps in regions that interface with HI envelopes.

Douglas Heggie, from Edinburgh, Scotland, visited the Institute for a period of five weeks. He continued a collaboration with Hut which was started during a similar visit of Heggie a year ago. Their goal is to write a

definitive treatment of analytical methods for the three-body scattering problem, a subject on which Heggie has worked for fifteen years. This paper is expected to reach completion early next year.

Shogo Inagaki, from Kyoto University, Japan, visited the Institute for a period of three weeks. He started a collaboration with Hut, on the finite-size effects of stars on the evolution of globular clusters, a subject which has recently attracted attention because the point-mass approximation is now relatively well understood.

Hut developed, in collaboration with Marc Davis and Richard Muller (University of California, Berkeley), a new theory which explains the recently inferred periodicity in mass extinction events that seems apparent in the fossil record. They propose that an unseen companion star of the sun might be responsible for periodic comet showers causing catastrophes when the comets impact on Earth. This suggestion has the important implication that the evolution of species on Earth might be driven by an astronomical clock, causing periodically repeated extinctions which provide new possibilities for those species which survive and can find new ecological niches. Hut has followed up on the original proposal and has tested the plausibility of the idea in an extensive series of numerical orbit calculations.

Hut has continued a long-term project to determine general gravitational scattering cross sections for the three-body problem, started at IAS two years ago in collaboration with Bahcall. The three-body scattering results were applied to a discussion of the formation and evolution of X-ray binaries in globular clusters, in a fruitful collaboration with Bohdan Paczynski (Princeton University).

In collaboration with Frank Verbunt (Cambridge University), Hut analyzed magnetic braking and tidal energy dissipation in close binaries. In collaboration with Haldan Cohn (University of Indiana), Hut argued that many observed globular clusters have survived core collapse. In collaboration with Simon White (University of Arizona), Hut described the

constraints on neutrinos as candidates for making up the dark matter in the Universe.

In May 1984, Hut organized an international symposium sponsored by the International Astronomical Union, on "Dynamics of Star Clusters," held at IAS. Jens Villumsen was chairman of the local organizing committee.

Nikolaos Kylafis studied the spatial distribution of Population II stars in Sb and later type galaxies, together with Bahcall. They showed that surface brightness measurements must be accurate to about 0.1 mag at 1% of the visual sky brightness in order to determine the spatial distribution of Population II stars in galaxies like NGC 891 (often cited as a look-alike for the galaxy). The best available observations of NGC 891 were fit with two widely different models with equal success.

E. Sterl Phinney continued his study of the properties of ideal MHD winds in flat-space and in Kerr geometry. The poloidal magnetic field structure was found to have striking effects on the flows, and in fact determines whether or not they can become supersonic. The results resolve a long-standing paradox in the "axisymmetric pulsar" literatures and determine the conditions under which an MHD wind can efficiently extract energy from a Kerr black hole.

Tsvi Piran worked on the general relativistic axisymmetric collapse problem. A numerical working code was constructed with Richard Stark (of Hebrew University). The code was tested and compared successfully with perturbation calculations.

Kavan Ratnatunga investigated (with Kenneth Freeman, Australian National Observatory), the observed kinematics of K giants in the outer regions of the galactic halo. The line of sight velocity dispersion of these field giants shows a clear difference between the SGP field SA141 and the intermediate latitude field SA127. The velocity ellipsoid appears to be highly anisotropic, but isothermal in a cylindrical coordinate system for galactocentric distances between 10 and 25 kpc. Ratnatunga (with Bahcall) studied the Basel RGU photo-

metric catalogues for 12 Selected fields. Comparison of the observed (G-R) color distributions with the standard Bahcall and Soneira Galaxy model, gave a good fit for all the fields. This work showed that the spheroid field stars have the same feature in their luminosity near absolute visual magnitudes 2 to 4 as do the globular cluster stars.

Linda Sparke worked on a model for the excitation of galactic warps in a barred or triaxial potential. Binney had shown earlier that particle orbits in a barred galaxy are unstable to vertical oscillations, but it had been thought that the self-gravity of a massive disk might allow the disk to be stable. Sparke showed by computer simulations that a strong enough galactic bar or triaxial halo can excite warps in massive disks. An analysis of the equations of motion reveals that the warp grows because outward- and inward-travelling bending waves are coupled by the bar potential and an amplification cycle can be set up.

Tremaine's primary efforts were devoted to a book which he is writing with Binney (Oxford) on galactic dynamics. The book is designed to serve both as a graduate textbook and as a reference for research workers in the field. A book on this subject is timely because of the recent great strides, both observationally and theoretically, in galactic dynamics. No book at a comparable level has been published in this field since the monograph by S. Chandrasekhar in 1942. Using the VAX, Tremaine is preparing the manuscript in a machine-readable form which can be sent directly to the typesetter, thus eliminating the tedious checking of the final proofs.

In collaboration with M. Weinberg (MIT), Tremaine developed the equations describing dynamical friction in spherical stellar systems. Dynamical friction is analogous to gravitational drag in that it can cause the decay of satellite galaxy orbits, leading to the eventual merger and dissolution of the satellite in its parent galaxy. Existing analytical calculations of dynamical friction are based on a formula derived by Chandrasekhar for an infinite homogeneous medium. Tremaine and Weinberg have used action-angle variables and results from the theory of resonant orbits in

celestial mechanics to derive a formula for the frictional torque on a body rotating or revolving in a spherical system. They find that if the orbital decay rate is sufficiently fast, the torque is very similar to the torque predicted by the Chandrasekhar formula; however, if the orbital decay is slow two new effects arise: a reversible "dynamical feedback" which can stabilize or destabilize the orbit, and resonant capture of stars by the satellite. The most interesting application of these results is to the dynamics of bars in barred disk galaxies; Tremaine and Weinberg show that frictional torques may slow the bar to a much lower pattern speed than has usually been assumed.

Tremaine also collaborated with Douglas Richstone (Michigan) in devising a new method for constructing models of spherical galaxies. Models of spherical galaxies are always underconstrained, since the observational data (usually consisting of a surface brightness profile and one or more measurements of the velocity dispersion) are insufficient to determine the phase space distribution function, which is a function of two variables, the energy and the angular momentum. Tremaine and Richstone attacked the problem using the mathematical technique of linear programming, which is designed to find optimal solutions to underconstrained problems. The optimal solution is one which maximizes or minimizes a "cost function", which in this case can be chosen to be, for example, the mass-to-light ratio of the galaxy. Preliminary results suggest that the linear programming technique is the most versatile and general procedure for constructing spherical galaxy models. Tremaine and Richstone performed extensive tests on simple model galaxies and have begun to apply the code to real data. Ultimately, they plan to develop an export version of the code, which is likely to provide the optimum way to analyze the high-resolution photometry and spectroscopy of spherical galaxies which will be available from the Space Telescope.

Tjeerd van Albada worked on the distribution of dark matter in the spiral galaxy NGC 3198 (with Bahcall and K. Begeman and Renzo

Sancisi of Groningen), using the rotation curve from 21-cm line observations of neutral hydrogen and surface photometry. The rotation curve extends to 11 scale lengths of the disk. It is found that the amount of dark matter inside the outermost point on the rotation curve is at least 4 times larger than the amount of visible matter. The mass-to-light ratio of the whole galaxy must exceed 20 $M/L_{B\odot}$.

Jens Villumsen has studied numerically the evolution of the three-dimensional velocity distribution and the vertical density distribution in galactic disks. The physical mechanism is the scattering of stars off Giant Molecular Clouds (GMCs) which heats up the stellar populations. An initially cold population of disk stars and a population of GMCs are evolved in a fixed disk plus halo potential.

C. Miscellaneous

There were no members active in mathematical physics this year. Paul Hanle, a professional historian from the National Air and Space Museum in Washington, worked here on a history of the origins and development of the Space Telescope project, making use of the archives and memories of Lyman Spitzer, John Bahcall and other pioneers of the project. His history should be ready for publication before long. Freeman Dyson spent much of the year completing an historical study of nuclear policy issues, which was published as a book with the title "Weapons and Hope" in April 1984. When not occupied with the book, he was mostly thinking about problems connected with the origin of life.

The School of Natural Sciences

Permanent Member, Members with Long-term Appointments, Members and Visitors, 1983-84

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 1913, Nutley, New Jersey.
Massachusetts Institute of Technology, BS 1934, MS 1935.
Sperry Rand Corporation, research engineer 1936-39; IBM Corporation, research engineer 1939-41; 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, permanent member 1951-70, School of Natural Sciences, permanent member 1970- ; University of California at Los Angeles, visiting professor 1966-67; Massachusetts Institute of Technology, neurosciences research program, visiting scientist 1969-70.

Members with Long-term appointments

Michael Dine, *Elementary particle theory.*
Born 1953, Cincinnati, Ohio. The Johns Hopkins University, BS 1974; Yale University, PhD 1978.
Stanford Linear Accelerator Center, research associate 1978-80; Institute for Advanced Study, member 1981- .

Herman H. Goldstine, See page 25 for biographical entry.

Piet Hut, *Stellar dynamics and cosmology.*
Born 1952, Utrecht, The Netherlands. University of Utrecht, MS 1977; University of Amsterdam, PhD 1981.

Institute for Theoretical Physics, Utrecht, research assistant 1977-78; Astronomical Institute, Amsterdam, research assistant 1979-81; Institute for Advanced Study, member 1981-82, long-term member 1982- .

Otto E. Neugebauer, See page 25 for biographical entry.

E. Sterl Phinny, *High-energy astrophysics, relativity.*
Born 1960, Berkeley, California. California Institute of Technology, BS 1980; University of Cambridge, PhD 1983.
Institute for Advanced Study, long-term member 1983- .

Tsvi Piran, *General relativity and numerical physics.*
Born 1949, Tel Aviv, Israel. Tel Aviv University, BS 1970, MS 1972; Hebrew University, PhD 1976.
Hebrew University, teaching assistant 1975-76, senior lecturer, 1981- ; University of Oxford, research associate, 1976-77; University of Texas, research associate 1977-79, assistant professor 1979; Institute for Advanced Study, member 1980-81, long-term member 1981- .

Stephen Wolfram, *Theoretical physics and computer science.*
Born 1959, London, England. California Institute of Technology, PhD 1979.
California Institute of Technology, senior research associate 1980-82; Institute for Advanced Study, long-term member 1982- .

Members

Thomas Banks, *Particle physics.*
Born 1949, New York, New York. Reed College, BS 1969, Massachusetts Institute of Technology, PhD 1973.
Tel Aviv University, lecturer 1975-77, senior

lecturer 1977-81, associate professor 1981-   ;
Institute for Advanced Study, member 1976-77,
fall 1978.

Gyan Bhanot, *Particle physics; statistical physics.*
Born 1952, Baroda, India. Indian Institute of
Technology, Bombay, MS 1974; State University
of New York at Stony Brook, MS 1975; Cornell
University, PhD 1980.
Brookhaven National Laboratory, research
associate 1979-81; Institute for Advanced Study,
member 1981-82, spring 1983; Centre Européen
de la Recherche Nucléaire, research associate
1982-83.

John D. Breit, *Particle physics.*
Born 1952, Philadelphia, Pennsylvania. Yale
University, BS 1974; Columbia University, MS
1977, PhD 1982.
Columbia University, research assistant
1977-81; Institute for Advanced Study, member
1982-83.

Stefano Casertano, *Galactic dynamics.*
Born 1958, Naples, Italy. University of Pisa,
Laurea 1979; Scuola Normale Superiore, Pisa,
PhD 1983.

François David, *Particle physics.*
Born 1955, Neuilly-sur-Seine, France.
University of Paris VI, Thèse de 3ᵉᵐᵉ cycle 1978,
Thèse d'Etat 1982.
Centre d'Etudes Nucléaires de Saclay,
research associate 1980; Centre National de la
Recherche Scientifique, attaché de recherche
1980-   .

Shmuel Elitzur, *Gauge theories and particle physics.*
Born 1944, Jerusalem, Israel. Hebrew
University, BS 1968, MS 1971; Tel Aviv
University, PhD 1977.
Institute for Advanced Study, member 1977-
79; Hebrew University, lecturer 1980-82, senior
lecturer 1982-83.

Glynnis Farrar, *Supersymmetry and perturbative
QCD.*
Born 1946, Washington, D.C. University of
California at Berkeley, BS 1967; Princeton
University, PhD 1970.
Institute for Advanced Study, member 1971-
73; California Institute of Technology, senior
research associate 1973-74, assistant professor

1974-79; Rutgers University, associate professor
1979-   .

Kenneth C. Freeman, *Structure and dynamics of
galaxies and globular clusters.*
Born 1940, Perth, Australia. University of
Western Australia, BSc 1962; University of
Cambridge, PhD 1965.
University of Texas at Austin, McDonald
fellow 1966; Trinity College, University of
Cambridge, research fellow 1966-67; Australian
National University, Queen Elizabeth fellow
1967-70, fellow 1970-74, senior fellow 1974-80,
professorial fellow 1980-   .

David L. Gilden, *Astrophysics.*
Born 1954, St. Louis, Missouri. University of
Wisconsin at Madison, BS 1974; University of
Texas at Austin, MS 1979, PhD 1982.
Institute for Advanced Study, member
1982-   .

Subhash Gupta, *Cosmology and grand unified field
theories.*
Born 1955, Jaipur, India. Birla Institute of
Technology and Science, India, MS 1976;
Columbia University, MS 1977, MPhil 1979, PhD
1980.
Stanford Linear Accelerator Center, research
associate 1980-82; Institute for Advanced Study,
1982-   .

Herbert Hamber, *Particle physics; statistical
mechanics.*
Born 1953, Milan, Italy. University of Milan,
Laurea 1977; University of California at Santa
Barbara, PhD 1980.
University of California at Santa Barbara,
research associate 1980; Brookhaven National
Laboratory, research associate 1980-82; Institute
for Advanced Study, member 1982-   .

Paul A. Hanle, *A history of the large-space
telescope.*
Born 1947, Newark, New Jersey. Princeton
University, BA 1969; Yale University, MS 1972,
PhD 1975.
National Air and Space Museum,
Smithsonian Institution, associate curator 1974-
78, curator 1978-80, chairman of Space Science
and Exploration Department 1980-   .

Jamal N. Islam, *General Relativity.*
Born 1939, Chittagong, Pakistan. University of Cambridge, BS 1960, PhD 1963.
Trinity College, England, senior scholar 1960-63; University of Maryland, research associate 1963-65; Institute for Advanced Study, visitor 1968, 1973; Institute for Theoretical Astronomy, Cambridge, England 1968; University of Washington, 1973-82; City University, London, reader 1982-   .

Nikolaos D. Kylafis, *Theoretical astrophysics.*
Born 1949, Nea Avorani, Trihonidos, Greece. University of Patras, Greece, Ptyhio 1971; University of Illinois at Chicago Circle, MS 1973, University of Illinois at Urbana, PhD 1978.
University of Illinois, research associate 1979; California Institute of Technology, research fellow 1979-81; Institute for Advanced Study, member 1981-   .

Paul G. Langaker, *Elementary particle theory.*
Born 1946, Evanston, Illinois. Massachusetts Institute of Technology, BS 1968; University of California at Berkeley, MS 1969, PhD 1972.
Rockefeller University, research associate 1972-74; University of Pennsylvania, research associate 1974-75, assistant professor 1975-81, associate professor 1981-   ; Institute for Advanced Study, visitor spring 1980.

Gerhard Mack, *Continuum limit of renormalizable quantum field theories.*
Born 1940, Tübingen a.N., West Germany. University of Munich, Diplom Physiker 1965; University of Bern, PhD 1967.
International Center for Theoretical Physics, Trieste, research associate 1968; University of Munich, Habilitand 1970-71; University of Bern, associate professor 1972-74; Institute for Advanced Study, member 1974-75; University of Hamburg, professor 1975-   .

V. Parameswaran Nair, *Theoretical particle physics.*
Born 1955, Trivandrum, India. University of Kerala, BS 1976, MS 1978; Syracuse University, PhD 1983.

Antti J. Niemi, *Quantum field theory.*
Born 1956, Helsinki, Finland. Helsinki University of Technology, DI 1979; TKL 1980; Massachusetts Institute of Technology, PhD 1983.

Norman Packard, *Theory of complex dynamical systems.*
Born 1954, Billings, Montana. Reed College, BS 1976; University of California at Santa Cruz, PhD 1982.
Center for Nonlinear Studies, Los Alamos National Laboratories, research consultant 1982; Institut des Hautes Etudes Scientifiques, 1982-83.

William Press, *Cosmology and numerical methods.*
Born 1948, New York, New York. Harvard University, AB 1969; California Institute of Technology, PhD 1972.
California Institute of Technology, assistant professor 1973-74; Princeton University, assistant professor 1974-76; Harvard University, professor 1976-   ; Institute for Advanced Study, member spring 1973, 1982-   .

Kavan Ratnatunga, *Astrophysics of the outer galactic halo.*
Born 1952, Colombo, Sri Lanka. University of Ceylon at Colombo, BS 1976; University of Pittsburgh, MS 1979; Australian National University, PhD 1983.
University of Sri Lanka at Colombo, assistant lecturer 1976-78; University of Pittsburgh, teaching assistant 1978-79.

Nathan Seiberg, *Quantum field theory.*
Born 1956, Tel Aviv, Israel. Tel Aviv University, BS 1977; Weizmann Institute of Science, PhD 1982.
Institute for Advanced Study, member 1982-   .

Robert S. Shaw, Jr., *Cellular automata; nonlinear dynamics; neural nets.*
Born 1946, Boston, Massachusetts. Harvard University, BS 1972; University of California at Santa Cruz, PhD 1980.
University of California at Santa Cruz, assistant professor 1980-   .

Linda S. Sparke, *Bonding waves in galactic disks.*
Born 1955, London, England. University of Cambridge, BS 1977; University of California at Berkeley, MS 1979, PhD 1981.
Institute of Astronomy, University of Cambridge, fellow 1981-82; Institute for Advanced Study, member 1982-   .

Andrew E. Strominger, *Quantum gravity; field theory.*

Born 1955, Cambridge, England. Harvard University, BA 1977; University of California at Berkeley, MS 1979; Massachusetts Institute of Technology, PhD 1981.

Massachusetts Institute of Technology, research assistant, 1979-81; Institute for Advanced Study, member 1981-   .

Scott Tremaine, *Galactic dynamics; spherical galaxies.*

Born 1950, Toronto, Ontario, Canada. McMaster University, BS 1971; Princeton University, MS 1973, PhD 1975.

Institute for Advanced Study, long-term member 1978-81; Massachusetts Institute of Technology, associate professor 1981-   .

Tjeerd van Albada, *Dynamics and evolution of stellar systems.*

Born 1936, Akkrum, The Netherlands. University of Groningen, PhD 1968.

Columbia University, research assistant 1969-70; University of Groningen, scientific officer 1971, associate professor 1972-80, professor 1981-   .

Jens V. Villumsen, *Dynamics and evolution of galaxies.*

Born 1954, Svendborg, Denmark. Aarhus University, Denmark, MA 1980; Yale University, PhD 1982.

Institute for Advanced Study, member, 1982-   .

Edward Witten, *Elementary particle physics and cosmology.*

Born 1951, Baltimore, Maryland. Brandeis University, BS 1971; Princeton University, PhD 1976.

Harvard University, research associate 1976-77, junior fellow 1977-80; Princeton University, professor 1980-   .

Chi-Min Wu, *Particle physics.*

Born 1938, Kiangsu, China. Tsing-Hua University, PhD 1962.

Academia Sinica, Institute of High Energy Physics, research assistant 1962-79, assistant professor 1979-   ; Centre Européen de la Recherche Nucléaire, 1978-79; Institute for Advanced Study, member 1982-   .

Alexander Zaks, *Quantum field theory and elementary particles.*

Born 1949, Krakow, Poland. Tel Aviv University, BS 1975, MS 1978, PhD 1982.

Tel Aviv University, instructor and research assistant 1977-82; Institute for Advanced Study, member 1982-   .

Anthony Zee, *Particle physics.*

Born 1945, China. Princeton University, BS 1966; Harvard University, MS 1968, PhD 1970.

Institute for Advanced Study, member 1970-72, 1977-78; Rockefeller University, assistant professor 1972-73; Princeton University, assistant professor 1973-78; University of Pennsylvania, associate professor 1978-80; University of Washington, professor 1980-   ; Ecole Normale Superiore, visiting professor 1981.

Daniel Zwanziger, *Numerical studies of quantum field theory.*

Born 1935, New York, New York. Columbia College, BS 1955; Columbia University, PhD 1960.

University of California at Berkeley, lecturer 1960-62; University of Rome, ricercatore 1962-63; Centre d'Etudes Nucléaires de Saclay, visiteur étranger 1963-65; New York University, professor 1965-   ; Weizmann Institute, visiting scientist 1969-70; Centre Européen de la Recherche Nucléaire, associate professor 1968; Ecole Normale, Paris, professeur associé 1968.

Visitors

Neta Bahcall, *Astrophysics.*

Born 1942, Tel Aviv, Israel. Hebrew University, BS 1963; Weizmann Institute of Science, MS 1965; Tel Aviv University, PhD 1970.

California Institute of Technology, research fellow 1970-71; Princeton University, research associate 1971-74, research staff member 1974-75, research astronomer 1975-79, senior research astronomer 1979-   ; Institute for Advanced Study, member 1982-83.

Kenneth M. Case, *Quantization of classical completely integrable systems.*

Born 1923, New York, New York. Harvard University, BS 1945, MS 1946, PhD 1948.

Los Alamos Scientific Laboratory, physics staff 1944-45, consultant 1948-   ; University of

Michigan, assistant professor 1950-52, professor 1953-67; Rockefeller University, professor 1967- ; Institute for Advanced Study, member 1948-49, 1949-50, 1956-57, visitor 1969-70, 1975-77, 1978- .

Bruce Draine, *Astrophysics.*
    Born 1947, Calcutta, India. Swarthmore College, BA 1969; Cornell University, MA 1974, PhD 1977.
    Harvard University, Center for Astrophysics, research fellow 1977-79; Institute for Advanced Study, member 1979-82; Princeton University, professor 1982- .

Brian P. Flannery, *Astrophysics.*
    Born 1948, Utica, New York. Princeton University, BS 1970; University of California at Santa Cruz, PhD 1974.
    Institute for Advanced Study, member 1974-75, visitor 1981-82; Harvard University, assistant professor 1975-80; Exxon Research and Engineering Company, 1980- ; Institute for Advanced Study, visitor 1981-82, 1982-83.

George Lake, *Formation of evolution of galaxies.*
    Born 1953, Washington, D.C. Haverford College, BA 1975; Princeton University, MS 1976, PhD 1980.

University of California at Berkeley, research astronomer 1979-81; University of Cambridge, Churchill College fellow 1980-81; AT&T Bell Laboratories, member of technical staff 1981- .

Bohdan Paczyński, *Evolution of low mass binary stars.*
    Born 1940, Wilno, Poland. University of Warsaw, MS 1962, PhD 1964.
    University of Colorado, visiting fellow 1968-69; California Institute of Technology, visiting professor 1973, Sherman Fairchild distinguished scholar 1975-76; Copernicus Astronomical Center, Poland, associate professor 1974- ; Institute for Advanced Study, visitor, fall 1974, spring 1976, spring 1977, spring 1978, spring 1980, spring 1981, spring 1982- ; University of California at Berkeley, visiting professor 1979; Princeton University, professor 1981- .

Herbert J. Rood, *Structure of systems of galaxies.*
    Born 1937, New Brunswick, New Jersey. Massachusetts Institute of Technology, BS 1959; University of Michigan, MS 1961, PhD 1965.
    Wesleyan University, assistant professor 1965-72; Institute for Advanced Study, member 1972-73, long-term visitor 1980- ; Michigan State University, associate professor 1973-76, associate adjunct professor 1980- .

The School of Social Science

Faculty

Clifford Geertz
(Harold F. Linder Professor)

Albert O. Hirschman
(1907 Foundation Professor)

Michael Walzer

Members with Long-term Appointments

Wolf Lepenies   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.

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 drawn from an ever wider pool of candidates.

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 purpose. 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 do so 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 criticial assessment of, the academic accomplishment embraced by its areas of expertise.

Academic Activities, 1983-84

During 1983-84, the School of Social Science had fifteen members and three visitors. This was the second year of Wolf Lepenies' long-term appointment. Dr. Lepenies took an active role in School activities and assisted the Faculty in the selection of members for the 1984-85 year and in the design of a long-term program for the School.

The traditional Thursday Luncheon Seminars, which are all listed in the Record of Events, were very well attended, not only by the members of the School but by colleagues from Historical Studies and by members of the Princeton academic community. Four of the seminars were given by members of the

School of Historical Studies and two by guests from other universities; the other nineteen were given by members and visitors of our School. The range of issues discussed was as wide as usual.

The theme of this year was "Toward a Broader Economics." The core group among our members consisted of economists and economic historians. Seven members fell into this group and several others shared in its interests. An economic seminar, "Fitting Economics to the Economy: East, West, and Elsewhere," met regularly on every second Tuesday throughout the year. A number of economists from the University joined in the discussions of papers and work in progress. Two guests, one from Yale and the other from Stony Brook, travelled to Princeton to lead the discussion. The seminar brought together an international set of economists with a spectrum of views but with a common interest in work that brings economics into contact with the other social sciences. The participants have made plans to continue the association in several ways: by co-authoring papers, co-editing books, and by visits to be made to each other's university.

Another seminar, "Argument in Mathematics, Physics, Biology and Economics" met several times in the fall semester. Led by two members, this seminar attracted members of all four Schools at the Institute.

Planning Activities

The permanent members (Professors Geertz, Hirschman, and Walzer) met regularly, together with Dr. Lepenies, to make membership application decisions for the 1984-85 year. Over the course of the year more than 160 applications were read. The theme for 1984-85 is "The study of life histories as an approach to sociological understanding." Five members of the School will form the center of this study group.

This is to be the first year of a three-year program on "Interpretive Social Science." The second year (1985-86) will deal with "Equality and Hierarchy" and the third with herme-

neutic and epistemological problems in the social sciences.

Funding

During 1983-84 the core program in economics was funded by the Ford Foundation, the HKH Foundation, and the Charles E. Culpeper Foundation, Inc. The School had, among its members, a Ford Foundation Post Doctoral Fellow and six members funded in whole or in part by the National Endowment for the Humanities.

Faculty

Professor Clifford Geertz was the Distinguished Lecturer for the American Anthropological Association and Huxley Memorial Lecturer and Medallist of the Royal Anthropological Institute of Great Britain and Ireland. He received honorary degrees from Brandeis University and Swarthmore College and was a Fellow of the Intellectual Interchange Program of the Japan Society. He also published, among other things, "Slide Show: Evans-Pritchard's African Transparencies," *Raritan*, Fall 1983; "Anti Anti-Relativism," *American Anthropologist* 85:305-334 (1983). His "Culture and Social Change: The Indonesian Case" will appear in the next issue of *Man*. In addition, a collection of his essays on Bali, *Bali, interprétation d'une culture*, was published by Gallimard in Paris, and a translation of his *Interpretation of Cultures* was published by Suhrkamp in Frankfurt. A collection of his essays, *Local Knowledge: Further Essays in Interpretive Anthropology*, was published in New York by Basic Books. He was appointed an Advisory and Contributing Editor to *The Georgia Review* and a member of the Advisory Board, Institut für die Wissenschaften von Menschen in Vienna. He is also serving as a consultant to the Felix Group with respect to a documentary film on Javanese culture supported by the National Endowment for the Humanities.

Professor Albert O. Hirschman completed work on a book based on his visits to grass-

roots development projects in Latin America in early 1983. He published "A Dissenter's Confession: Revisiting *The Strategy of Economic Development*," in *Pioneers in Development*, edited by G. M. Meier and Dudley Seers (Oxford University Press, 1984); "University Activities Abroad and Human Rights Violations: Exit, Voice, or Business as Usual," in *Human Rights Quarterly* (February 1984); and "Against Parsimony: Three Easy Ways of Complicating Some Categories of Economic Discourse," in the *American Economic Review* (May 1984). On March 14, 1984, he gave this paper, in an expanded version, at the American Academy of Arts and Sciences in Cambridge, Massachusetts, after having been presented with the Talcott Parsons Prize for excellence in the social sciences. Collections of his essays were published in France (with a preface by François Furet) and Italy (with a preface by Andrea Ginzburg). *Shifting Involvements* (1982) was published in Italian and Portuguese translations. He attended a conference in Paris on "Societal Organization and the Revitalization of Swedish Business Life," and one on Argentine economic policy and performance from 1945-1983, in Toledo, Spain. In April 1984, his colleagues, former students, and friends organized a three-day "Conference on Democracy and Development in Honor of Albert O. Hirschman" at the Helen Kellogg Institute for International Studies of the University of Notre-Dame. The papers that were presented are to be brought together as a Festschrift.

Professor Michael Walzer delivered the Patten lectures at Indiana University in the fall of 1983, and the Talmon Memorial Lecture (on "Albert Camus and the Algerian War") at Hebrew University in Jerusalem in the spring of 1984. He also lectured at Williams College, Syracuse, Georgetown, and Columbia Universities, and gave a series of three lectures at the City University of New York's Center for Jewish Studies. His recent book, *Spheres of Justice*, appeared in a British edition in December. He continued to write and publish in the general area of political theory and the history of theory. For a third year, he served on the committee of scholars working to rebuild the graduate faculty of the New School for Social Research.

The School of Social Science

**Members with Long-term Appointments,
Members, Visitors and Assistants, 1983-84**

In the section which follows, the information was obtained from material provided by the Members, Visitors and Assistants.

Members with Long-term Appointments

Wolf Lepenies, *Literary and social-scientific intelligentsia in England, France and Germany.*
Born 1941, Deuthen, East Prussia, Germany. University of Münster, DrPhil 1967; Free University of Berlin, Habil 1970.
University of Texas, visiting professor 1975; Vienna Institute for Advanced Studies and Scientific Research, visiting professor 1976; Ecole des Hautes Etudes, directeur d'études associé 1977, 1978; Free University of Berlin, assistant professor 1969, professor 1971- ; Institute for Advanced Study, member 1969-70, 1979-80, long-term member 1982-84.

Bernard Lewis, See page 25 for biographical entry.

Members

George C. Bond, *Economic and religious change in northern Zambia.*
Born 1936, Knoxville, Tennessee. Boston University, BA 1959; London School of Economics, London University, MA 1962, PhD 1968.
University of East Anglia, assistant lecturer 1966-68; Columbia University, assistant professor 1968-74; University of California at Berkeley, visiting assistant professor 1973-74; Teachers College, Columbia University, associate professor 1974-82, professor 1982- .

Joseph H. Carens, *Ethics and organizations.*
Born 1945, Shelby, Ohio. College of the Holy Cross, BA 1966; Yale University, MPhil 1969 and 1972, PhD 1977.

North Carolina State University, visiting instructor 1973-75; Lake Forest College, instructor to assistant professor 1975-81; U.S. Office of Personnel Management, program analyst 1980-81; Princeton University, assistant professor 1981- .

Marcello de Cecco, *A study of monetary regimes.*
Born 1939, Rome, Italy. University of Parma, LLD 1961; University of Cambridge, MA 1964.
University of East Anglia, lecturer 1967-68; University of Siena, professor 1968- ; University of Chicago, research associate 1968; The Royal Institute of International Affairs, professorial fellow 1973-75; St. Antony's College, University of Oxford, visiting professor 1972; European University Institute, professor 1979- ; University of California at Berkeley, visiting professor 1982.

Laurence Dickey, *The "Adam Smith problem": conceptual and historical issues.*
Born 1943, Berkeley, California. University of California at Berkeley, BA 1968, MA 1971, PhD 1981.
University of Pennsylvania, assistant professor 1979-80; Columbia University, assistant professor 1980- .

Gillian Feeley-Harnik, *Social and cultural aspects of economic development in Madagascar.*
Born 1940, Cambridge, New York. Radcliffe College, BA 1961; New York University, MA 1969, PhD 1976.
Williams College, assistant professor 1976-83; The Johns Hopkins University, assistant professor 1983- .

Daniel M. Hausman, *Causation and casual judgments in economics.*
Born 1947, Chicago, Illinois. Harvard University, BA 1969; New York University, MA 1971; University of Cambridge, BA 1973, MA

1977; Columbia University, MPhil 1975, PhD 1978.

Columbia University, preceptor 1975-77; University of Maryland at College Park, assistant professor 1978-82, associate professor 1983- .

Sudir Kakar, *Sexual passions: a cross-cultural study.*

Born 1938, Nainital, India. Gujarat University, BS 1958; University of Mannheim, MA 1964; University of Vienna, DrRerComm 1967.

Harvard University, lecturer 1966-67, research fellow 1967-68; Indian Institute of Management, assistant professor 1968-71; University of Ahmedabad, professor 1971; University of Vienna, visiting professor 1974-75; Indian Institute of Technology, New Delhi, India, professor 1976-77; McGill University, visiting professor 1977-78; Center for Study of Developing Societies, New Delhi, India, senior fellow 1980- ; University of Melbourne, visiting fellow 1981.

Ward W. Keeler, *Southeastern Asian anthropology.*

Born 1949, Bronxville, New York. Cornell University, BA 1970; University of Chicago, MA 1977, PhD 1982.

University of Chicago, Harper instructor 1981-83.

János Kornai, *Resource utilization in different economic systems.*

Born 1928, Budapest, Hungary. Hungarian Academy of Sciences, Budapest, Cand.Scient. 1956; Karl Marx University of Economics, Budapest, PhD 1961.

Institute of Economics, Hungarian Academy of Sciences, Budapest, research officer 1955-58; Institute of Textile Industry, Budapest, head of department 1958-63; Computing Center, Hungarian Academy of Sciences, Budapest, head of department 1963-67; Institute of Economics, Hungarian Academy of Sciences, Budapest, head of department 1967- ; Karl Marx University of Economics, Budapest, professor 1968- .

Axel Leijonhufvud, *Problems of monetary instability; relationship between micro- and macroeconomics.*

Born 1933, Stockholm, Sweden. University of Lund, Sweden, Fil.Kand 1960; University of Pittsburgh, MA 1961; Northwestern University, PhD 1967.

University of California at Los Angeles, assistant professor to professor 1964- ; Stockholm School of Economics, visiting professor 1969; Churchill College, University of Cambridge, overseas fellow fall 1974; Institute for Advanced Study, Jerusalem, visiting professor 1978; University of Louis Pasteur, Strasbourg, visiting professor 1980; University of Konstanz, ständiger gastprofessor 1982- ; Institute for Advanced Study, Vienna, visiting professor 1975; European University Institute, Florence, visiting professor 1982; Nikon University, Tokyo, visiting professor 1980.

Giovanni Levi, *The land market in early modern European countries.*

Born 1939, Milan, Italy. University of Turin, Laurea 1964.

University of Turin, assistant professor to associate professor 1964- .

Donald McCloskey, *The rhetoric of economics: the history of English open fields.*

Born 1942, Ann Arbor, Michigan. Harvard University, BA 1964, PhD 1970.

University of Chicago, assistant professor 1968-73, associate professor 1973-80; University of Iowa, professor 1980- .

Anson C. Rabinbach, *The European science of work 1880-1918 - The human motor: European conceptions of work, energy, fatigue.*

Born 1945, New York, New York. Hofstra University, BA 1967; University of Wisconsin, MA 1971, PhD 1973.

Hampshire College, assistant professor 1973-78; New York Center for Visual History, director 1979-80; Princeton University, lecturer 1980-83; Cooper Union for the Advancement of Science and Art, New York, assistant professor 1983- .

Zeev Sternhell, *The ideological transition from left to right as a major dimension of the rise of Fascist ideology.*

Born 1935, Przemysl, Poland. Hebrew University, BA 1960, MA 1964; University of Paris, PhD 1969.

Hebrew University, chairman Department of Political Science 1975-78, Levi Eshko Institute for Economic, Social and Political Research, director 1975-77, fellow at the Institute for Advanced Studies 1980-81, director of the Centre of European Studies 1982- , director of the Center

for the Study of French Civilization 1982-   ; *The Jerusalem Quarterly*, co-editor 1976-   .

Lenore J. Weitzman, *Family law; social suicide—a study of identity change in modern society.*
Born 1942, Brooklyn, New York. Cornell University, BA 1964; Yale Law School, postdoctoral fellow 1969-71; Columbia University, PhD 1970.
Yale University, lecturer 1970-71; University of California at Davis, assistant professor 1971-77; University of California at Berkeley, Center for Law and Society, director and principal investigator 1973-80, German Marshall Fund fellow 1979-81; University of Oxford, Nuffield College and Centre for Socio-Legal Studies, visiting fellow 1981-82; Stanford University, senior research associate and lecturer 1981-   .

Assistants

Gregory Clark, *Economic performance in mature economies.*
Born 1957, Bellshill, Scotland. University of Cambridge, BA 1979.
Institute for Advanced Study, assistant to Professor Albert O. Hirschman 1983-84.

Mark Levinson, *The decline of classical political economy.*
Born 1955, Denver, Colorado. Colorado State University, BA 1977; New School for Social Research, MA 1981.
Institute for Advanced Study, assistant to Professor Michael Walzer, 1983-84.

Bambang K. Purwo, *Indonesian syntax and pragmatics.*
Born 1951, Yogyakarta, Indonesia. Ikip Sanata Dharma, Yogyakarta, BA 1973; Ikip Malang, Drs 1976; Universitas Indonesia, Jakarta, PhD 1982.

Series NUSA, Linguistic Studies of Indonesian and Other Languages in Indonesia, editorial assistant to editor 1976-   ; SEAS, University of Michigan, visiting lecturer 1978; Indonesian Reference Grammar Project, editor 1979-   ; Catholic University of Atma Jaya Jakarta, lecturer to senior lecturer 1980-   ; Linguistic Society of Indonesia, secretary 1982-85; Institute for Advanced Study, assistant to Professor Clifford Geertz 1983-84.

Visitors

George A. Akerlof, *Integration of sociological theory, psychological theory and economics.*
Born 1940, New Haven, Connecticut. Yale University, BA 1962; Massachusetts Institute of Technology, PhD 1966.
University of California at Berkeley, assistant professor to professor 1966-   ; Indian Statistical Institute, New Delhi, India, visiting professor 1967-68; U.S. Council of Economics Advisors, senior economist 1973-74; Board of Governors of the Federal Reserve System, visiting research economist 1977-78; London School of Economics, Cassel professor 1978-80.

M. Keith Hopkins, See page 27 for biographical entry.

Dominique Schnapper, *Jewish population in various socio-political environments: a comparative analysis.*
Born 1934, Paris, France. Institut d'Etudes Politiques, Paris, Diploma 1957; University of Paris, Sorbonne, License of History 1958, Doctorat 1967; University of Paris V, Doctorat d'Etat 1979.
Ecole des Hautes Etudes en Sciences Sociales, chef de travaux 1963-72, maître assistant 1972-80, directeur d'études 1980-   .

Record of Events, 1983-84

The following events of interest to the Institute community took place between July 1, 1983, and June 30, 1984. Not all meetings, such as the regular Tuesday Astrophysics Luncheon Seminars in the School of Natural Sciences or the more informal seminars in the Schools of Historical Studies and Social Science, are recorded, but what follows indicates the variety and quality of Institute activities.

September 23
School of Natural Sciences

Theoretical Physics Seminar: "The Θ-vacuum lives—a novel explanation of the quantized Hall effect"
Guest Lecturer: A. Pruisken, Schlumberger-Doll Research

September 26
School of Natural Sciences

Particle Physics Seminar: "1 + 1 dimensional gravity"
Thomas Banks, Stanford Linear Accelerator Center; Visiting Member, School of Natural Sciences, IAS

September 30
School of Mathematics

Analytical Aspects of the Trace Formula: "Introduction"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Overview for non-experts"
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Meson-Baryon mass inequalities"
Guest Lecturer: S. Nussinov, Tel Aviv University and University of Maryland

October 3
School of Mathematics

Members' Seminar: "Convergence almost everywhere in ODE and PDE of monotone type"
Morris W. Hirsch, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Constraints on symmetry breaking in vector-like theories"
Guest Lecturer: Edward Witten, Princeton University

October 5
School of Mathematics

Topology-Geometry: "Thurston's 3-dimensional geometries, minimal surfaces and finite group actions on R^3"
William H. Meeks, III, Instituto de Matematica Pura e Applicada, Rio de Janeiro; Visiting Member, School of Mathematics, IAS

October 6
School of Mathematics

Baby Seminar on Automorphic Forms: "Work of Waldspurger, Part I"
Ilya Piatetski-Shapiro, Tel Aviv University; Visiting Member, School of Mathematics, IAS

October 7
School of Mathematics

Analytical Aspects of the Trace Formula: "Proof of the basic identity"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Overview for non-experts" (continued)
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Dynamical supersymmetry breaking"
Guest Lecturer: Ian Affleck, Princeton University

October 9
Concert

Little Orchestra of Princeton

October 10
School of Mathematics

Members' Seminar: "Number of points of curves over finite fields"
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "Does $<\text{Tr } F^2>$ really exist?"
François David, Centre d'Etudes Nucléaires de Saclay; Visiting Member, School of Natural Sciences, IAS

October 11
School of Mathematics

Number Theory: "Relations between spectral and algebraic data of discrete groups"
J. Anton Good, E.T.H., Zürich; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Astrophysics Seminar: "Disk instabilities in cataclysmic binaries"
Guest Lecturer: Józef Smak, Astronomical Center, Warsaw

October 12
School of Historical Studies

Art History Colloquium: "The 'opinione contraria' of Rosso Fiorentino: an investigation into the fortune, fame and fate of a Renaissance artist"

Eugene Carroll, Vassar College; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology-Geometry: "Lower bounds for volumes of hyperbolic 3-manifolds and 3-orbifolds"
Robert Meyerhoff, Michigan State University; Visiting Member, School of Mathematics, IAS

October 14
School of Natural Sciences

Theoretical Physics Seminar: "Zeros of the partition function at complex temperature in lattice models"
Guest Lecturer: Jean-Bernard Zuber, Centre d'Etudes Nucléaires, Saclay

October 14-17
School of Mathematics

Conference on Algebraic Groups in honor of Armand Borel's sixtieth birthday

October 17
School of Mathematics

Members' Seminar: "Three applications of algebraic geometry and the calculus of variations to gauge theory"
Simon K. Donaldson, University of Oxford; Visiting Member, School of Mathematics, IAS

Series of Lectures: "Number of points of curves over finite fields"
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Solution of the entropy crisis of supersymmetric theories"
Guest Lecturer: D. Nemeschansky, Princeton University

October 18
School of Mathematics

Number Theory: "Faltings I"
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "Unemployment through the filter of memory"
George Akerlof, University of California at Berkeley; Visitor, School of Social Science, IAS

October 19
School of Mathematics

Topology-Geometry: "Yang-Mills and 4-manifold topology"
Simon K. Donaldson, University of Oxford; Visiting Member, School of Mathematics, IAS

October 20
School of Mathematics

Baby Seminar on Automorphic Forms: "Work of Waldspurger, Part II"
Ilya Piatetski-Shapiro, Tel Aviv University and Yale University; Visiting Member, School of Mathematics, IAS

L-Functions of Automorphic Forms on Classical Groups, Applications: "Value of L-Functions at special points"

Michael Harris, Brandeis University; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Three easy ways of complicating the categories of economic discourse"

Albert O. Hirschman, Professor, School of Social Science, IAS

October 21
School of Historical Studies

Director's Lecture: "Two seventeenth-century statesmen: Richelieu and Olivares"

John H. Elliott, Professor, School of Historical Studies, IAS

School of Mathematics

Analytical Aspects of the Trace Formula: "Convergence of the σ-expansion"

Jean-Pierre Labesse, University of Dijon, France; Visiting Memer, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Unitary groups in three variables"

Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

October 24
School of Mathematics

Series of Lectures: "Number of points of curves over finite fields" (continued)

Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

Members' Seminar: "Nonsolvable partial differential equations in CR geometry of variations to gauge theory"

Howard Jacobowitz, Rutgers University, Camden; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "Instantons in conformal gravity"

Andrew E. Strominger, Massachusetts Institute of Technology; Visiting Member, School of Natural Sciences, IAS

October 25
School of Mathematics

Number Theory: "Faltings II"

Michael Artin, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Astrophysics Seminar: "Milliarcsecond astronomy"

Guest Lecturer: George D. Gatewood, Allegheny Observatory, University of Pittsburgh

October 26
School of Historical Studies

Colloquium in Classical Studies: "Senatorial self-advertisement and epigraphy in the Augustan age"

Werner Eck, University of Cologne; Visiting Member, School of Historical Studies, IAS

October 27
School of Mathematics

Baby Seminar on Automorphic Forms: "The proof of the meromorphic continuation of Eisenstein series by Colin de Verdière"
William A. Casselman, University of British Columbia; Visiting Member, School of Mathematics, IAS

L-Functions of Automorphic Forms on Classical Groups, Applications: "L-functions for simple classical groups"
Ilya Piatetski-Shapiro, Tel Aviv University and Yale University; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "The German connection: a chapter in the history of French sociology"
Wolf Lepenies, Free University of Berlin; Long-term Visiting Member, School of Social Science, IAS

October 28
School of Mathematics

Analytical Aspects of the Trace Formula: "Convergence of the σ-expansion" (continued)
Jean-Pierre Labesse, University of Dijon; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Unitary groups in three variables" (continued)
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Cosmic strings and galaxy formation"
Guest Lecturer: A. Vilenkin, Tufts University

October 31
School of Mathematics

Series of Lectures: "Number of points of curves over finite fields" (continued)
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

Members' Seminar: "The geometry of the wave equation"
Sigurdur Helgason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Space-time: arena or illusion?"
Guest Lecturer: V. Kaplunovsky, Princeton University

November 1
School of Mathematics

Number Theory: "Cubic forms according to Heath-Brown"
Bryan J. Birch, University of Oxford; Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "Argument in modern economics: how Muth persuades"

Donald McCloskey, University of Iowa; Visiting Member, School of Social Science, IAS

November 2
School of Mathematics

Topology-Geometry: "Yang-Mills and 4-manifold topology" (continued)
Simon K. Donaldson, University of Oxford; Visiting Member, School of Mathematics, IAS

November 3
School of Historical Studies

Art History Colloquium: "Types de collection dans la France du XVII siècle"
Antoine Schnapper, Université de Paris IV (Sorbonne); Visiting Member, School of Historical Studies, IAS

School of Mathematics

Baby Seminar on Automorphic Forms: "More about the relative trace formula"
Hervé Jacquet, Columbia University; Visitor, School of Mathematics, IAS

L-Functions of Automorphic Forms on Classical Groups, Applications: "L-functions for simple classical groups" (continued)
Ilya Piatetski-Shapiro, Tel Aviv University and Yale University; Visiting Member, School of Mathematics, IAS

Special Lecture: "Heights and L-series"
Guest Lecturer: B. Gross, Brown University

School of Social Science

Seminar: "Javanese generations: gender roles and generational ties in Javanese myths"
Ward Keeler, University of Chicago; Visiting Member, School of Social Science, IAS

November 4
School of Mathematics

Analytical Aspects of the Trace Formula: "Convergence of the σ-expansion" (continued)
Jean-Pierre Labesse, University of Dijon; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Unitary groups in three variables" (continued)
Guest Lecturer: D. Shelstad, Rutgers University, Newark

School of Natural Sciences

Theoretical Physics Seminar: "A new look at anomalies"
Guest Lecturer: Nicholas Manton, Institute for Theoretical Physics, University of California at Santa Barbara

November 5
Benefit concert and reception

"An Evening for Peace"
The Emerson String Quartet
Lillian Kalir, Pianist
Remarks on the Arms Control Race by George Kennan
Sponsored by the Coalition for Nuclear Disarmament

November 7
School of Mathematics

Series of Lectures: "Number of points of curves over finite fields" (continued)
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

Members' Seminar: "Representations, varieties and Quillen's dimension theorem"
Jonathan L. Alperin, University of Chicago; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminars: "Real-time finite temperature quantum field theories"
Antti J. Niemi, Massachusetts Institute of Technology; Visiting Member, School of Natural Sciences, IAS

School of Social Science

Seminar on Argument in Mathematics, Physics, Biology, and Economics: "The character of argument in modern economics: how Muth explains"
Donald McCloskey, University of Iowa; Visiting Member, School of Social Science, IAS

November 8
School of Mathematics

Number Theory: "Cubic forms according to Heath-Brown" (continued)
Bryan J. Birch, University of Oxford; Visiting Member, School of Mathematics, IAS

November 9
School of Mathematics

Topology-Geometry: "Higher dimensional simple knots and minimal Seifert surfaces"
E. Bayer-Fluckiger, University of Geneva; Visiting Member, School of Mathematics, IAS

November 10
School of Mathematics

Baby Seminar on Automorphic Forms: "More about Eisenstein cohomology, Part I"
Günter Harder, University of Bonn; Visiting Member, School of Mathematics, IAS

L-Functions of Automorphic Forms on Classical Groups, Applications: "L-functions for simple classical groups" (continued)
Ilya Piatetski-Shapiro, Tel Aviv University and Yale University; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Death and development in Madagascar"
Gillian Feeley-Harnik, Williams College; Visiting Member, School of Social Science, IAS

November 11
School of Mathematics

Analytical Aspects of the Trace Formula: "Properties of the truncation operator"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Unitary groups in three variables" (continued)
Guest Lecturer: D. Shelstad, Rutgers University, Newark

School of Natural Sciences

Theoretical Physics Seminar: "New gaugings of $N = 8$ supergravity"
Guest Lecturer: Chris Hull, Massachusetts Institute of Technology

November 14
School of Mathematics

Series of Lectures: "Number of points of curves over finite fields" (continued)
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

Members' Seminar: "n-homology and Jacquet modules for real reductive groups"
David H. Collingwood, University of Utah; Visiting Member, School of Mathematics, IAS

November 15
School of Mathematics

Number Theory: "The distribution of eigenvalues of the automorphic Laplacian and estimates for Fourier coefficients of cusp forms"
Henryk Iwaniec, Polish Academy of Sciences; Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "Discussion of Ron Heiner's 'Origin of Predictable Behavior' "
Axel Leijonhufvud, University of California at Los Angeles; Visiting Member, School of Social Science, IAS

November 16
School of Historical Studies

Colloquium in Classical Studies: "La *lex rubria de Gallia Cisalpina*: inquadramento storico, datazione, contenuto generale"
Umberto Laffi, University of Pisa; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology-Geometry: "The Schläfli differential equality for polyhedral volume"
John W. Milnor, Professor, School of Mathematics, IAS

School of Natural Sciences

Informal Physics Seminar: "The SU(3) deconfinement transition at finite temperature in the presence of quarks"
Guest Lecturer: Francesco Fucito, California Institute of Technology

November 17
School of Mathematics

L-Functions of Automorphic Forms on Classical Groups, Applications: "Applications of symmetric powers to eigenvalues of Hecke operators"
Jean-Pierre Serre, Collège de France; Visiting Member, School of Mathematics, IAS

Special Lecture: "Cells in affine Weyl groups"
Guest Lecturer: G. Lusztig, Massachusetts Institute of
Technology

School of Social Science

Seminar: "The rhetoric of economics: the literary character of
scientific writing"
Donald N. McCloskey, University of Iowa; Visiting Member,
School of Social Science, IAS

November 18
School of Mathematics

Analytical Aspects of the Trace Formula: "Preparation for the
χ-expansion"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Unitary groups in
three variables" (continued)
Guest Lecturer: D. Shelstad, Rutgers University, Newark

School of Natural Sciences

Theoretical Physics Seminar: "Unitarity and higher derivative
theories"
Guest Lecturer: Bob Pisarski, Institute for Theoretical Physics,
Santa Barbara

November 21
School of Mathematics

Series of Lectures: "Number of points of curves over finite
fields" (continued)
Jean-Pierre Serre, Collège de France; Visiting Member, School
of Mathematics, IAS

Members' Seminar: "Dynamics of unipotent flows on
homogeneous spaces"
Shrikrishna G. Dani, Tata Institute of Fundamental Research;
Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar on Argument in Mathematics, Physics, Biology, and
Economics: "Modern evolution of the experimental report in
Physics: spectroscopic articles in *Physical Review*, 1893-1980"
Guest Lecturer: Charles Bazerman, Baruch College, City
University of New York

School of Natural Sciences

Monday Lunchtime Seminar: "Fractional fermion numbers,
spectral asymmetry and trace identities"
Guest Lecturer: Gordon Semenoff, University of British
Columbia

November 22
School of Mathematics

Number Theory: "The distribution of eigenvalues of the
automorphic Laplacian and estimates for Fourier coefficients
of cusp forms" (continued)
Henryk Iwaniec, Polish Academy of Sciences; Visiting Member,
School of Mathematics, IAS

November 28
School of Mathematics

Members' Seminar: "Cataloguing the Gödel *Nachlass*"
John W. Dawson, Jr., Pennsylvania State University; Visiting
    Member, School of Mathematics, IAS

Series of Lectures: "Number of points of curves over finite
    fields" (concluded)
Jean-Pierre Serre, Collège de France; Visiting Member, School
    of Mathematics, IAS

Concert

Joseph Kalichstein, piano

November 29
School of Mathematics

Number Theory: "Some topics connected with Waring's
    problem"
Christopher Hooley, University College, Cardiff, Wales;
    Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "The monetary theories of Roman
    historians"
Marcello de Cecco, European University Institute, Florence;
    Visiting Member, School of Social Science, IAS

Seminar on Argument in Mathematics, Physics, Biology, and
    Economics: "Mathematical knowledge"
Guest Lecturer: Mark Steiner, Hebrew University and
    Columbia University

November 30
School of Historical Studies

Colloquium in Classical Studies: "The Greek coinage of Catania
    in Sicily"
Christof F. Boehringer, Institute of the University of Göttingen;
    Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology-Geometry: "L^2 cohomology of algebraic varieties"
Guest Lecturer: W-C. Hsiang, Princeton University

December 1
School of Mathematics

Baby Seminar on Automorphic Forms: "More about Eisenstein
    cohomology (part II)"
Günter Harder, University of Bonn; Visiting Member, School of
    Mathematics, IAS

L-Functions of Automorphic Forms on Classical Groups,
    Applications: "Works of Waldspurger"
Ilya Piatetski-Shapiro, Tel Aviv University and Yale University;
    Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "The sexual passions of Gandhi"
Sudhir Kakar, Centre for Study of Developing Societies, Delhi;
    Visiting Member, School of Social Science, IAS

December 2
School of Mathematics

Analytical Aspects of the Trace Formula: "Modified basic identity and weighted orbital integrals"
Jean-Pierre Labesse, University of Dijon; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Structure of trace formulae and their comparison"
Robert P. Langlands, Professor, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "New Results on exclusive scattering in QCD"
Glennys Farrar, Rutgers University, New Brunswick; Visiting Member, School of Natural Sciences, IAS

December 5
School of Mathematics

Members' Seminar: "Canonical liftings"
Bernard M. Dwork, Princeton University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "A proposal for numerical renormalization group calculations in lattice gauge theory"
Gerhard Mack, Deutsches Elektronen-Synchrotron, West Germany; Visiting Member, School of Natural Sciences, IAS

School of Social Science

Seminar on Argument in Mathematics, Physics, Biology, and Economics: "A theory of group rationality; or, why science advances when scientists do not"
Guest Lecturer: Husain Sarkar, Louisiana State University

December 6
School of Mathematics

Number Theory: "On Waring's problem for seven cubes"
Christopher Hooley, University College, Wales; Visiting Member, School of Mathematics, IAS

December 6-7
Colloquium

Graduate Education in America
Sponsors: The Carnegie Foundation for the Advancement of Teaching, The Institute for Advanced Study, Princeton University

December 7
School of Mathematics

Topology-Geometry: "Complete affinely flat manifolds and related topics"
Yoshinobu Kamishima, Hokkaido University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Spacetime from spin: a path integral for a Dirac particle"
Guest Lecturer: Ted Jacobson, University of Texas at Austin

December 8
School of Historical Studies

Art History Colloquium: "Gozzoli's 'Pestbilder' "
Avraham Ronen, Tel Aviv University; Visiting Member, School of Historical Studies, IAS

School of Mathematics
: L-Functions of Automorphic Forms on Classical Groups, Applications: "Works of Waldspurger" (continued)
Ilya Piatetski-Shapiro, Tel Aviv University and Yale University; Visiting Member, School of Mathematics, IAS

School of Social Science
: Seminar: "From shamelessness to guilt: a moral revolution in ancient Rome"
Keith Hopkins, Brunel University; Visitor, School of Social Science; Visiting Member, School of Historical Studies, IAS

December 9
School of Mathematics
: Analytical Aspects of the Trace Formula: "The coarse χ-expansion" (continued)
Laurent Clozel, Centre National de Ia Recherche Scientifique; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "The hyperbolic terms for the SL(3) and SU(3)"
Robert P. Langlands, Professor, School of Mathematics, IAS

School of Natural Sciences
: Theoretical Physics Seminar: "Models with two supersymmetries at a TeV"
Guest Lecturer: Lawrence Hall, Harvard University

December 12
School of Mathematics
: Members' Seminar: "Incomplete Kloosterman sums"
John B. Friedlander, University of Toronto; Visiting Member, School of Mathematics, IAS

School of Natural Sciences
: Theoretical Physics Seminar: "Fluctuations in inflationary universe models"
Guest Lecturer: R. Brandenberger, Institute for Theoretical Physics, Santa Barbara

December 13
School of Mathematics
: Number Theory: "Primes in progression to a very large moduli and Titchmarsh's divisor problem"
Enrico Bombieri, Professor, School of Mathematics, IAS

School of Social Science
: Economics Seminar Series: "The causal structure of income distribution theories"
Daniel M. Hausman, University of Maryland, Visiting Member, School of Social Science, IAS

Concert
: Piano Recital by Yefim Bronfman

December 14
School of Natural Sciences
: Theoretical Physics Seminar: "Flux tube model of deconfining transition in QCD"
Guest Lecturer: A. Patel, California Institute of Technology

December 15
School of Mathematics
: L-Functions of Automorphic Forms on Classical Groups, Applications: "Intertwining operators and L-functions"

Freydoon Shahidi, Purdue University; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Is there a Jewish vote in France?"
Dominique Schnapper, Ecole des Hautes Etudes en Sciences Sociales; Visitor, School of Social Science, IAS

December 16
School of Mathematics

Analytical Aspects of the Trace Formula: "The coarse χ-expansion" (continued)
Laurent Clozel, Centre National de la Recherche Scientifique; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Cancellation of singularities"
Robert P. Langlands, Professor, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Anti-Neutrinos from heaven and earth"
Guest Lecturer: L. Krauss, Harvard University

December 19
School of Mathematics

Members' Seminar: "The Penrose correspondence for unitary representations of SU(p,q) on cohomology spaces"
Hugo Rossi, University of Utah; Visiting Member, School of Mathematics, IAS

Number Theory: "A continuity method for spectral theory on Fuchsian groups"
Dennis A. Hejhal, University of Minnesota; Visiting Member, School of Mathematics, IAS

Number Theory, II: "Primes in progression to very large moduli"
Enrico Bombieri, Professor, School of Mathematics, IAS

December 21
School of Historical Studies

Colloquium in Classical Studies: "Roman law and people in the provinces: some problems of transmission"
Hartmut Galsterer, Free University, Berlin; Visiting Member, School of Historical Studies, IAS

January 5
School of Natural Sciences

Theoretical Physics Seminar: "Baryons as solitons in the Skyrme models"
Guest Lecturer: S. Rajeev, Syracuse University

School of Social Science

Seminar: "Shortages in socialist economies"
János Kornai, Hungarian Academy of Sciences; Visiting Member, School of Social Science, IAS

January 6
School of Natural Sciences

Theoretical Physics Seminar: "QCD of random lattice"
Guest Lecturer: H. C. Ren, Columbia University

January 9
School of Mathematics

Members' Seminar: "On the symbols of hyponormal operators"
Daoxing Xia, University of Iowa and People's Republic of
   China; Visiting Member, School of Mathematics, IAS

January 10
School of Social Science

Economics Seminar Series: "Overheating and underutilization
   in economic systems, Part I"
János Kornai, Hungarian Academy of Sciences; Visiting
   Member, School of Social Science, IAS

January 11
School of Mathematics

Differential Geometry: "Curvature and harmonic functions"
Richard Schoen, University of California at Berkeley; Visiting
   Member, School of Mathematics, IAS

January 12
School of Mathematics

L-Functions and the Weil Representation: "Functoriality and
   Weil representation"
Stephen J. Rallis, Ohio State University; Visiting Member,
   School of Mathematics, IAS

School of Social Science

Seminar: "The social and economic effects of no-fault divorce"
Lenore Weitzman, Stanford University; Visiting Member,
   School of Social Science, IAS

January 13
School of Mathematics

Analytical Aspects of the Trace Formula: "The inner-product
   formula"
Jean-Pierre Labesse, University of Dijon; Visiting Member,
   School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "The stable trace
   formula for SU(3)"
Jonathan D. Rogawski, Yale University; Visiting Member,
   School of Mathematics, IAS

January 16
School of Historical Studies

Art History Colloquium: "The location of the spectator in
   futurist art"
Anne Coffin Hanson, Yale University; Visiting Member, School
   of Historical Studies, IAS

School of Mathematics

Marston Morse Memorial Lecture: "Normal forms and group
   actions in symplectic geometry"
Guest Lecturer: R. B. Melrose, Massachusetts Institute of
   Technology

January 17
School of Mathematics

Diophantine Approximation: "Some results on effective
   approximations to algebraic numbers"
Enrico Bombieri, Professor, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "Economic action and social structure: a theory of embeddedness"
Guest Lecturer: Mark Granovetter, State University of New York at Stony Brook

January 18
School of Historical Studies

Colloquium in Classical Studies: "*In Formam Provinciae Redacta*: some reflections on the making of a Roman province"
Stephen Mitchell, University College, Swansea; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Differential Geometry: "Growth results for the solutions of the minimal surface equation"
Leon Simon, Australian National University; Visitor, School of Mathematics, IAS

Mathematical Physics: "The Morse inequalities following Witten and Bott"
Guest Lecturer: R. B. Melrose, Massachusetts Institute of Technology

January 19
School of Mathematics

Topology: "The geometry of Teichmüller space"
Steven P. Kerckhoff, Stanford University; Visiting Member, School of Mathematics, IAS

L-Functions and the Weil Representation: "L-functions associated to Weil representation"
Stephen J. Rallis, Ohio State University; Visiting Member, School of Mathematics, IAS

More Aspects of the Trace Formula: "Division algebras"
Robert P. Langlands, Professor, School of Mathematics, IAS

School of Social Science

Seminar: "State structures and the possibilities for Keynesian responses to the great depression in Sweden, Britain and the United States"
Guest Lecturer: Theda Skocpol, University of Chicago

January 20
School of Mathematics

Analytical Aspects of the Trace Formula: "Some formal properties of terms in the trace formula"
Jean-Pierre Labesse, University of Dijon; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "The stable trace formula for SU(3)" (continued)
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "Dynamical quantum effects in Kaluza-Klein theory"
Guest Lecturer: Jeff Rubin, University of Texas

January 24

School of Mathematics

Diophantine Approximation: "Estimates for exponential sums"
John H. Loxton, University of New South Wales; Visiting
 Member, School of Mathematics, IAS

A Course on Analysis and Geometry
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "Overheating and underutilization
 in economic systems, Part II"
János Kornai, Hungarian Academy of Sciences; Visiting
 Member, School of Social Science, IAS

January 25

School of Mathematics

Differential Geometry: "A probabilistic construction of the heat
 kernel: application to the index theorem of Atiyah-Singer"
Jean-Michel Bismut, Université de Paris-Sud; Visiting Member,
 School of Mathematics, IAS

January 26

School of Mathematics

Topology: "Stability and instability in cellular automata"
Norman Packard, Institut des Hautes Etude Scientifiques;
 Visiting Member, School of Natural Sciences, IAS

L-Functions and the Weil Representation: "Rankin-Selberg
 convolutions for GL(n)"
Freydoon Shahidi, Purdue University; Visiting Member, School
 of Mathematics, IAS

Mathematical Physics: "Existence of maximal space-like
 hypersurfaces in asympototically flat space-time"
Guest Lecturer: R. Bartnik, Courant Institute of Mathematical
 Sciences, New York University

School of Social Science

Seminar: "The factory system"
Axel Leijonhufvud, University of California at Los Angeles;
 Visiting Member, School of Social Sciences, IAS

January 27

School of Mathematics

Analytical Aspects of the Trace Formula: "Limits of the χ-
 expansion and the Paley-Wiener theorem"
Laurent Clozel, Centre National de la Recherche Scientifique;
 Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Orbital integrals
 on SU(3)"
Jonathan D. Rogawski, Yale University; Visiting Member,
 School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Renormalization of effective
 Lagrangians"
Guest Lecturer: Joseph Polchinski, Harvard University

January 30
School of Mathematics

Representation Theory: "Vogan's unitarity theorem: introduction and the Jantzen filtration" (Part 1 of a series)
David H. Collingwood, University of Utah; Visiting Member, School of Mathematics, IAS

Members' Seminar: "P.D.E. aspects of the study of minimal surfaces"
Leon Simon, Australian National University; Visitor, School of Mathematics, IAS

January 31
School of Mathematics

A Course on Analysis and Geometry
Richard Schoen, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

February 1
School of Historical Studies

Colloquium in Classical Studies: "Eunapios, Zosimos and the golden mouth of the Church"
Guest Lecturer: François Paschoud, University of Geneva

School of Mathematics

Differential Geometry: "The index of classical elliptic operators: a probabilistic approach"
Jean-Michel Bismut, Université de Paris-Sud; Visiting Member, School of Mathematics, IAS

Mathematical Physics: "Eta-invariant and a class of Dirac operators"
Antti J. Niemi, Massachusetts Institute of Technology; Visiting Member, School of Natural Sciences, IAS

February 2
School of Historical Studies

Art History Colloquium: "Ascendance downward: the primitive base of Giacometti's art"
Rosalind Krauss, Hunter College; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology: "The immersion conjecture"
Guest Lecturer: R. Cohen, Princeton University

L-Functions and the Weil Representation: "Classification of automorphic form on GL(n)"
Freydoon Shahidi, Purdue University; Visiting Member, School of Mathematics, IAS

More Aspects of the Trace Formula: "Division algebras, II"
Marie-France Vignéras, Ecole Normale Supérieure; Visitor, School of Mathematics, IAS

School of Social Science

Seminar: "Ideology and religion in northern Zambia"
George Bond, Columbia University; Visiting Member, School of Social Sciences, IAS

February 3
School of Mathematics

Analytical Aspects of the Trace Formula: "Limits of the χ-expansion and the Paley-Wiener theorem (II)"
Laurent Clozel, Centre National de la Recherche Scientifique; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Orbital integrals on SU(3)" (continued)
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Fermions and the Kaluza-Klein monopole"
Guest Lecturer: Phillip Nelson, Harvard University

February 6
School of Mathematics

Representation Theory: "Vogan's unitarity theorem: variation of a signature under analytic continuation" (part 2 of a series)
David H. Collingwood, University of Utah; Visiting Member, School of Mathematics, IAS

Members' Seminar: "Polynomial hulls and singularity sets"
John Wermer, Brown University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "Light gluinos"
Glennys Farrar, Rutgers University, New Brunswick; Visiting Member, School of Natural Sciences, IAS

February 7
School of Mathematics

Diophantine Approximation: "Approximation of real numbers by algebraic numbers of fixed degree, I"
Enrico Bombieri, Professor, School of Mathematics, IAS

February 8
School of Mathematics

Mathematical Physics: "Classical supergravity and exposition for mathematicians"
David D. W. Bao, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

Differential Geometry: "Isometric embeddings of surfaces in R^3"
Chang-Shou Lin, Courant Institute of Mathematical Sciences, New York University and People's Republic of China; Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "What is transactions cost economics?"
Guest Lecturer: Oliver Williamson, Yale University

February 9
School of Mathematics

Topology: "Entropy of knots"
Guest Lecturer: J. Franks, Northwestern University

L-Functions and the Weil Representation: "On duality conjecture"
Guest Lecturer: R. Howe, Yale University

More Aspects of the Trace Formula: "Division algebras, III"
Robert P. Langlands, Professor, School of Mathematics, IAS

A Course on Analysis and Geometry
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Social Science

Seminar: "The 'Adam Smith problem': conceptual and historical issues"
Laurence Dickey, Columbia University; Visiting Member, School of Social Science, IAS

February 10
School of Mathematics

Analytical Aspects of the Trace Formula: "Some introductory combinatorics"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Endoscopic groups and transfer factors in the twisted case"
Robert E. Kottwitz, University of Washington; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Towards a realistic Kaluza-Klein cosmology"
Guest Lecturer: D. Sahdev, University of Pennsylvania

February 13
School of Mathematics

Representation Theory: "An alternate proof of unitarity for derived functor modules"
Guest Lecturer: N. Wallach, Rutgers University, New Brunswick

Members' Seminar: "Weierstrass points in characteristic p"
Amnon Neeman, Harvard University; Visiting Member, School of Mathematics, IAS

February 14
School of Mathematics

A Course on Analysis and Geometry, I
Richard Schoen, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

Diophantine Approximation: "Approximation of real numbers by algebraic numbers of fixed degree, II"
Enrico Bombieri, Professor, School of Mathematics, IAS

Number Theory: "Some results of Brun-Titchmarsh type"
Guest Lecturer: E. Fouvry, University of Bordeaux, I

Concert

The Marlboro Octet

February 15
School of Historical Studies

Colloquium in Classical Studies: "The road system of the central Macedonian plain: an epigraphic inquiry"
Miltiades B. Hatzopoulos, National Hellenic Research Foundation; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Differential Geometry: "Twistor spaces and minimal surfaces"
Simon M. Salamon, Scuola Normale Superiore, Pisa; Visiting Member, School of Mathematics, IAS

Mathematical Physics: "Eigenvalue estimates for QCD surfaces"
Edward Witten, Princeton University; Visiting Member, School of Natural Sciences, IAS

February 16
School of Mathematics

Topology: "New extended power constructions in homotopy theory"
Stewart B. Priddy, Northwestern University; Visitor, School of Mathematics, IAS

L-Functions and the Weil Representation: "Theta series and cycles on Picard modular surfaces"
Guest Lecturer: J. Cogdell, Rutgers University, New Brunswick

More Aspects of the Trace Formula: "The base change problem"
James G. Arthur, University of Toronto; Visiting Member, School of Mathematics, IAS

A Course on Analysis and Geometry, II
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Social Science

Seminar: "Ethics and organizations"
Joseph Carens, Princeton University; Visiting Member, School of Social Science, IAS

February 17
School of Mathematics

Analytical Aspects of the Trace Formula: "Combinatorics of the fine χ-expansion"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Endoscopic groups and transfer factors in the twisted case" (continued)
Guest Lecturer: D. Shelstad, Rutgers University, Newark

February 20
School of Mathematics

Representation Theory: "Vogan's unitarity theorem: derived functor duality" (part 3 of a series)
Henrik Schlichtkrull, University of Copenhagen; Visiting Member, School of Mathematics, IAS

Members' Seminar: "Kronecker's limit formula"
Harold M. Stark, University of California at San Diego; Visiting
   Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "Lattice actions stable under
   renormalization and the improved SU(3) action"
Guest Lecturer: Cosmos Zachos, Argonne National Laboratory

February 21
School of Mathematics

A Course on Analysis and Geometry, I
Richard Schoen, University of California at Berkeley; Visiting
   Member, School of Mathematics, IAS

Diophantine Approximation: "Approximation of real numbers
   by algebraic numbers of fixed degree, III"
Enrico Bombieri, Professor, School of Mathematics, IAS

Number Theory: "Fourier coefficients of Maass wave forms"
Harold M. Stark, University of California at San Diego; Visiting
   Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Selling LST"
Guest Lecturer: Paul A. Hanle, National Air and Space
   Museum, Smithsonian Institute

School of Social Science

Economics Seminar Series: "Culture and social change: the
   Indonesian case"
Clifford Geertz, Professor, School of Social Science, IAS

February 22
School of Mathematics

Differential Geometry: "Chains in CR geometry"
Howard Jacobowitz, Rutgers University, Camden; Visiting
   Member, School of Mathematics, IAS

Mathematical Physics: "Regge calculus"
Ruth Williams, Girton College; Visitor, School of Natural
   Sciences, IAS

February 23
School of Mathematics

L-Functions and the Weil Representation: "The Lefschetz fixed-
   point theorem and the cohomology of arithmetic groups"
Birgit E. M. Speh, Cornell University and West Germany;
   Visiting Member, School of Mathematics, IAS

More Aspects of the Trace Formula: "The base change
   problem" (continued)
James G. Arthur, University of Toronto; Visiting Member,
   School of Mathematics, IAS

A Course on Analysis and Geometry, II
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Social Science

Seminar: "The 'antimaterialist' revision of Marxism as an aspect of the rise of fascist ideology"
Zeev Sternhell, Hebrew University; Visiting Member, School of Social Science, IAS

February 24
School of Mathematics

Analytical Aspects of the Trace Formula: "Loose strands"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Endoscopic groups and transfer factors in the twisted case" (continued)
Guest Lecturer: D. Shelstad, Rutgers University, Newark

Special Lecture: "Extremal Kähler metrics"
Guest Lecturer: E. Calabi, University of Pennsylvania

School of Natural Sciences

Theoretical Physics Seminar: "Prospects for new gauge bosons and neutral heavy leptons in the multi TeV range"
Guest Lecturer: Jon Rosner, University of Chicago

February 27
School of Mathematics

Members' Seminar: "Prime geodesic theorem"
Henryk Iwaniec, Polish Academy of Sciences; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Dynamical supersymmetry breaking"
Nathan Seiberg, Weizmann Institute, Israel; Visiting Member, School of Natural Sciences, IAS

February 28
School of Mathematics

A Course on Analysis and Geometry, I
Richard Schoen, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

Diophantine Approximation: "Oesterlé's simplified proof of Goldfeld's theorem"
John H. Coates, Université de Paris-Sud; Visiting Member, School of Mathematics, IAS

February 29
School of Historical Studies

Colloquium in Classical Studies: "Censors, *mores*, and expulsions from the Senate"
Alan E. Astin, The Queen's University; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Automorphic Forms: "Theta functions and curves of genus two"
Harold M. Stark, University of California at San Diego; Visiting Member, School of Mathematics, IAS

Mathematical Physics: "An upper bound for the maximum negative ionization of atoms"
Guest Lecturer: E. Lieb, Princeton University

March 1
School of Historical Studies

Art History Colloquium: "An investigation of Mozart's working methods"
Alan W. Tyson, All Soul's College; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology: "Spherical isotropy representations for cyclic groups"
Guest Lecturer: T. Petrie, Rutgers University, New Brunswick

L-Functions and the Weil Representation: "A random walk through GL(n)"
Audrey A. Terras, University of California at San Diego; Visiting Member, School of Mathematics, IAS

Differential Geometry: "L^2 index theorems on asymptotically flat manifolds"
Guest Lecturer: M. Stern, Princeton University

More Aspects of the Trace Formula: "The base change problem" (continued)
James G. Arthur, University of Toronto; Visiting Member, School of Historical Studies, IAS

A Course on Analysis and Geometry, II
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Social Science

Seminar: "Modes of financial development: American banking dynamics and world financial crises"
Marcello de Cecco, European University Institute, Florence; Visiting Member, School of Social Science, IAS

March 2
School of Mathematics

Analytical Aspects of the Trace Formula: "More loose strands"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Artin L-functions and normalization of intertwining operators"
Freydoon Shahidi, Purdue University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Where does global color go when it goes away"
Guest Lecturer: S. Coleman, Harvard University

March 5
School of Mathematics

Representation Theory: "Vogan's unitarity theorem: the main result" (part 4 of a series)
Birgit E. M. Speh, Cornell University and West Germany; Visiting Member, School of Mathematics, IAS

Members' Seminar: "Elliptic curves and Z_p-extensions"
Karl C. Rubin, Princeton University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "The contribution of supersymmetric particles to the $\Delta 1 = \frac{1}{2}$ rule"
Paul G. Langacker, University of Pennsylvania; Visiting Member, School of Natural Sciences, IAS

March 6
School of Mathematics

A Course on Analysis and Geometry, I
Richard Schoen, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "Why did the British choose to be poor"
Gregory Clark, National Bureau of Economic Research; Assistant, School of Social Science, IAS

March 7
School of Mathematics

Automorphic Forms: "Theta functions and curves of genus 2, part II"
Harold M. Stark, University of California at San Diego; Visiting Member, School of Mathematics, IAS

Differential Geometry: "L^2-cohomology and intersection homology of algebraic varieties"
Guest Lecturer: Leslie Saper, Princeton University

Mathematical Physics: "Nahm's equations and magnetic monopoles"
Simon K. Donaldson, University of Oxford; Visiting Member, School of Mathematics, IAS

March 8
School of Mathematics

L-Functions and the Weil Representation: "Whittaker models of metaplectic forms"
S. J. Patterson, Georg-August-Universität; Visiting Member, School of Mathematics, IAS

More Aspects of the Trace Formula: "The base change problem" (continued)
James G. Arthur, University of Toronto; Visiting Member, School of Mathematics, IAS

A Course on Analysis and Geometry, II
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Natural Sciences

Natural Sciences Lecture: "Double stars, comets, and the extinctions of species"
Piet Hut, Astronomical Institute, University of Amsterdam; Long-term Member, School of Natural Sciences, IAS

School of Social Science

Seminar: "The European science of work: the economy of the body at the end of the nineteenth century"
Anson Rabinbach, Cooper Union for the Advancement of Science and Art; Visiting Member, School of Social Science, IAS

March 9
School of Mathematics

Analytical Aspects of the Trace Formula: "The home stretch"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Ordinary and twisted trace formulas for SU(3)"
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

Special Lecture: "Ambi-twistors and bi-dual-geometries"
Guest Lecturer: P. Yasskin, Texas A & M University

March 12
School of Mathematics

Hermann Weyl Lectures: "Renormalization group methods in dynamical systems, I"
Guest Lecturer: O. E. Lanford, III, Institut des Hautes Etudes Scientifiques

March 13
School of Mathematics

A Course on Analysis and Geometry, I: "A sharp estimate for the first eigenvalue of a compact manifold"
Jia-Qing Zhong, Academia Sinica, People's Republic of China; Visiting Member, School of Mathematics, IAS

School of Social Science

Economics Seminar Series: "The history of political economy: the forgotten years, 1790-1808"
Mark Levinson, New School for Social Research; Assistant, School of Social Science, IAS

March 14
School of Historical Studies

Colloquium in Classical Studies: "Reserved for eternal punishment: the elder Pliny's view of free Germania"
Klaus G. Sallmann, University of Mainz; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Automorphic Forms: "On the strong multiplicity one theorem for GL(n)"
Guest Lecturer: C. J. Moreno, University of Illinois

Hermann Weyl Lectures: "Renormalization group methods in dynamical systems, II"
Guest Lecturer: Oscar E. Lanford III, Institut des Hautes Etudes Scientifiques, Paris

Differential Geometry: "Geometry of the local Kirillov-Lie algebras"
Guest Lecturer: A. Lichnerowicz, Collège de France

March 15
School of Mathematics

Topology: "Non-connective delooping of algebraic K theory"
Guest Lecturer: C. A. Weibel, Rutgers University, New Brunswick

L-Functions and the Weil Representation: "The symplectic theta function and modular forms over number fields"

Harold M. Stark, University of California at San Diego; Visiting Member, School of Mathematics, IAS

More Aspects of the Trace Formula: "The base change problem" (continued)
Laurent Clozel, Centre National de la Recherche Scientifique; Visiting Member, School of Mathematics, IAS

A Course on Analysis and Geometry, II
Shing-Tung Yau, Professor, School of Mathematics, IAS

School of Social Science

Seminar: "Work, law, and development in Puritan New England"
Stephen Innes, University of Virginia; Visiting Member, School of Historical Studies, IAS

March 16
School of Mathematics

Analytical Aspects of the Trace Formula: "Final combinatorics"
Robert P. Langlands, Professor, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Identities for spherical functions on SU(3)"
Robert E. Kottwitz, University of Washington; Visiting Member, School of Mathematics, IAS
Jonathan D. Rogawski, Yale University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Conformal invariance, unitarity and two-dimensional critical exponents"
Guest Lecturer: Daniel Friedan, University of Chicago

March 19
School of Mathematics

Hermann Weyl Lectures: "Renormalization group methods in dynamical systems, III"
Guest Lecturer: Oscar E. Lanford III, Institut des Hautes Etudes Scientifiques, Paris

Special Lecture: "On the DeGeorge-Wallach property for the continuous spectrum"
Guest Lecturer: P. Delorme, Marseille-Luminy

Special Lecture: "Kazhdan's theorem on arithmetic varieties"
Guest Lecturer: J. Milne, University of Michigan

School of Natural Sciences

Monday Lunchtime Seminars: "Status of lattice QCD"
Herbert Hamber, Brookhaven National Laboratory; Visiting Member, School of Natural Sciences, IAS

March 20
School of Mathematics

A Course on Analysis and Geometry, I
Richard Schoen, University of California, Berkeley; Visiting Member, School of Mathematics, IAS

Diophantine Approximation: "Disproof of the Mertens conjectures"
Andrew Odlyzko, Bell Laboratories; Visitor, School of Mathematics, IAS

March 21
School of Mathematics

Automorphic Forms: "Fourier expansions of automorphic forms for GL(n,$\mathbf{Z}$)"
Audrey A. Terras, University of California at San Diego; Visiting Member, School of Mathematics, IAS

Differential Geometry: "The geometry conformal structure and existence of triply-periodic minimal surfaces"
William H. Meeks, III, Instituto de Matematica Pura e Applicada, Rio de Janeiro; Visiting Member, School of Mathematics, IAS

Hermann Weyl Lectures: "Renormalization group methods in dynamical systems, IV"
Guest Lecturer: Oscar E. Lanford III, Institut des Hautes Etudes Scientifiques

March 22
School of Mathematics

Topology: "A survey of some embedding theorems"
Guest Lecturer: N. Habegger, Yale University

More Aspects of the Trace Formula: "The base change problem" (continued)
James G. Arthur, University of Toronto; Visiting Member, School of Mathematics, IAS

A Course on Analysis and Geometry, II
Shing-Tung Yau, Professor, School of Mathematics, IAS

Mathematical Physics: "Isospectral problems for periodic partial difference equations"
David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Two Calvinisms"
Philip Benedict, Brown University; Visiting Member, School of Historical Studies, IAS

March 23
School of Mathematics and
School of Natural Sciences

Special Lecture: "The index theorem and anomalies"
Guest Lecturer: Michael F. Atiyah, University of Oxford

Honorary Ceremony

Conferment of the Insignia of the Commander of the Order of Alfonso X el Sabio on Professor John H. Elliott, Professor, School of Historical Studies, IAS

March 26
School of Mathematics

Special Lecture: "Kazhdan's theorem on arithmetic varieties"
(continued)
James S. Milne, University of Michigan; Visitor, School of
Mathematics, IAS

Members' Seminar: "Ergodic theory for each stratum of the
Teichmüller geodesic flow"
William A. Veech, Rice University; Visiting Member, School of
Mathematics, IAS

School of Social Science

Economics Seminar Series: "Boundary problems between
economics and other social sciences"
Round Table Discussion

March 27
School of Mathematics

A Course on Analysis and Geometry, I
Shing-Tung Yau, Professor, School of Mathematics, IAS

March 28
School of Historical Studies

Colloquium in Classical Studies: "Culture, art, and
urbanization in Roman central Anatolia"
Marc J. C. Waelkens, State University of Ghent, Belgium;
Visiting Member, School of Historical Studies, IAS

School of Mathematics

Automorphic Forms: "Fourier expansions of automorphic forms
for $GL(n,\mathbf{Z})$, II"
Audrey A. Terras, University of California at San Diego;
Visiting Member, School of Mathematics, IAS

Differential Geometry: "Every unstable 2-rank vector bundle on
$\mathbf{P}^4$ splits"
Hans Grauert, Georg-August-Universität, Göttingen; Visitor,
School of Mathematics, IAS

Representation Theory: "Analytic continuation of the signature
and examples" (part 5 of a series)
Birgit E. M. Speh, Cornell University and West Germany;
Visiting Member, School of Mathematics, IAS

March 29
School of Mathematics

More Aspects of the Trace Formula: "The base change
problem" (continued)
James G. Arthur, University of Toronto; Visiting Member,
School of Mathematics, IAS

L-Functions and the Weil Representation: "Rankin products
and Iwasawa theory"
John H. Coates, Université de Paris-Sud; Visiting Member,
School of Mathematics, IAS

Mathematical Physics: "A mathematical theory of gravitational
collapse"

Demetrios Christodoulou, Max Planck Institute for Astrophysics, München; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Solitons in gravity and supergravity"
Guest Lecturer: G. W. Gibbons, University of Cambridge

School of Social Science

Seminar: "Blasphemy and insult in Renaissance Italy"
Guest Lecturer: Peter Burke, Emmanuel College and University of Cambridge

March 30
School of Mathematics

Analytical Aspects of the Trace Formula: "The problem of trace class"
James G. Arthur, University of Toronto; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "Base change lemmas"
Robert E. Kottwitz, University of Washington; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Inflation and supergravity—a new approach"
Guest Lecturer: B. Ovrut, Rockefeller University

April 2
School of Mathematics

Members' Seminar: "Applications of Lie group contractions to Fourier multipliers"
Fulvio Ricci, Politecnico di Torino; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Monday Lunchtime Seminar: "Topological solitons in a hot and dense Fermi gas"
Antti J. Niemi, Massachusetts Institute of Technology; Visiting Member, School of Natural Sciences, IAS

April 3
School of Mathematics

Differential Geometry: "Compact Kähler-Einstein manifolds of semipositive bisectional curvature"
Guest Lecturer: N. Mok, Princeton University

April 4
School of Historical Studies

Colloquium in Classical Studies: "The enigma of Hellenistic Syria"
Fergus G. B. Millar, University College, London; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Mathematical Physics: "Construction, from supersymmetry, of a new class of hyperkämler manifolds"
Guest Lecturer: M. Rocek, State University of New York at Stony Brook

April 5
School of Historical Studies

Art History Colloquium: "Issues of purpose and meaning: the Schönborn palaces of Balthasar Neumann"
Christian Otto, Cornell University; Visiting Member, School of Historical Studies, IAS

School of Mathematics

L-Functions and the Weil Representation: "On the transfer of automorphic forms from SO(4,1) to SO(3,2) and from SO(3,2) to GL(4)"
David Soudry, Tel Aviv University; Visiting Member, School of Mathematics, IAS

More Aspects of the Trace Formula: "Base change: local results for GL(n)"
Laurent Clozel, Centre National de la Recherche Scientifique; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Self-reflection in social inquiry and philosophy"
Daniel M. Hausman, University of Maryland; Visiting Member, School of Social Science, IAS

April 6
School of Mathematics

Analytical Aspects of the Trace Formula: "The fine σ-expansion, Part I"
James G. Arthur, University of Toronto; Visiting Member, School of Mathematics, IAS

Analytical Aspects of the Trace Formula, II: "The fine σ-expansion, Part II"
James G. Arthur, University of Toronto; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Superstring field theory"
Guest Lecturer: John Schwarz, California Institute of Technology

April 9
School of Natural Sciences

Theoretical Physics Seminar: "Numerical algorithms for large N lattice gauge theories"
Guest Lecturer: L. Yaffe, Princeton University

April 11
School of Mathematics

Automorphic Forms: "A global approach to the Rankin-Selberg convolution for GL(3,$\mathbf{Z}$)"
Guest Lecturer: S. Friedberg, Harvard University

April 12
School of Mathematics

Topology: "More Denjoy minimal sets for area preserving homeomorphisms"
Guest Lecturer: J. Mather, Princeton University

School of Social Science

Seminar: "The market for land: England, United States, India and a village in Piedmont"

Giovanni Levi, University of Torino; Visiting Member, School of Social Science, IAS

April 13
School of Historical Studies

Special Lecture: "Cult and competition at Olympia"
Guest Lecturer: Alfred Mallwitz, German Archaeological Institute, Athens

April 16
School of Natural Sciences

Theoretical Physics Seminar: "The role of various two-dimensional QFT's in determining the monopole induced proton decay reaction"
Guest Lecturer: Neil S. Craigie, International Center for Theoretical Physics, Trieste

April 19
School of Mathematics

Topology: "Simple curves are nowhere dense on surfaces"
Guest Lecturer: C. Series, University of Warwick

School of Social Science

Seminar: "The organization of work: authority and efficiency"
Gregory Clark, Massachusetts Institute of Technology; Assistant, School of Social Science, IAS

April 20
School of Natural Sciences

Theoretical Physics Seminar: "Large distance behavior of semiclassical models of confinement"
Guest Lecturer: Tai-Tsun Wu, Harvard University

April 23-27
School of Mathematics

Harish-Chandra Memorial Conference: "Harmonic Analysis and the Representation Theory of Reductive Groups"

April 26
School of Social Science

Seminar: "Does even experimental science have local cultures? Reflections on national styles in physiology"
Gerald L. Geison, Princeton University; Visitor, School of Historical Studies, IAS

April 27
School of Natural Sciences

Theoretical Physics Seminar: "Report on new events from UA1 and UA2"
Glennys Farrar, Rutgers University, New Brunswick; Visiting Member, School of Natural Sciences, IAS

Lecture

Joseph H. Hazen Lecture Series: "Niels Bohr: centenary reflections"
Guest Lecturer: Abraham Pais, The Rockefeller University

April 30
School of Natural Sciences

Monday Lunchtime Seminar: "Recent work on lattice fermions"
Daniel Zwanziger, New York University; Visiting Member, School of Natural Sciences, IAS

May 3
School of Social Science

Economics Seminar Series: "From Pagan to Christian: social and civic transformations in fourth century Asia Minor"
Stephen Mitchell, University College, Swansea, Wales; Visiting Member, School of Historical Studies, IAS

May 7
School of Natural Sciences

Monday Lunchtime Seminar: "Chiral symmetry breaking in Coulomb gauge QCD"
Stephen L. Adler, Professor, School of Natural Sciences, IAS

May 11
School of Natural Sciences

Theoretical Physics Seminar: "Monte Carlo renormalization group study of gauge theory"
Guest Lecturer: Rajan Gupta, Northeastern University

May 11-12
Colloquium

Roman and Byzantine Palaces
Sponsored by Irving Lavin, Professor, School of Historical Studies, IAS

May 14
School of Natural Sciences

Monday Lunchtime Seminar: "$(\phi^6)_3$ at large N"
François David, Centre d'Etudes Nucléaires; Visiting Member, School of Natural Sciences, IAS

May 17
School of Natural Sciences

Theoretical Physics Seminar: "Symmetry breaking due to spacetime curvature and dynamics"
Guest Lecturer: B. L. Hu, University of Maryland

May 17-18
AMIAS Meeting

Tenth Anniversary meeting of the Association of Members of the Institute for Advanced Study

May 18
School of Natural Sciences

Theoretical Physics Seminar: "Monte Carlo renormalization group for SU(2)"
Guest Lecturer: Paul B. Mackenzie, Fermi National Accelerator Laboratory

May 23
School of Natural Sciences

Theoretical Physics Seminar: "Adiabatic theorem, quantum Hall effect, and gauge fields"
Guest Lecturer: F. Wilczek, University of California at Santa Barbara

May 24
School of Natural Sciences

Natural Science Lecture: "Double stars, comets and the extinctions of species"
Piet Hut, Astronomical Institute, University of Amsterdam; Long-term Member, School of Natural Sciences, IAS

May 25
School of Natural Sciences

Theoretical Physics Seminar: "The low energy effective
Lagrangian of QCD"
Guest Lecturer: Spenta Wadia, Tata Institute of Fundamental
Research, India

May 29 - June 1
School of Natural Sciences

International Astronomical Union Symposium: "Dynamics of
Star Clusters"
Organizer: Piet Hut, Astronomical Institute, University of
Amsterdam; Long-term Member, School of Natural Sciences,
IAS

June 11
School of Natural Sciences

Monday Lunchtime Seminar: "Higher derivative gravity on a
simplicial lattice"
Ruth Williams, Girton College, University of Cambridge;
Visitor, School of Natural Sciences, IAS

In addition, the following lectures at the Institute were arranged by the Princeton Society of the
Archaeological Institute of America.

October 12

Lecture: "Recent Discoveries at Morgantina"
Guest Lecturer: Malcolm Bell, University of Virginia

November 9

Lecture: "The Rome of Augustus"
Guest Lecturer: Barbara Kellum, Smith College

December 14

Lecture: "Figural Bronzes from Spina - an Overview"
Guest Lecturer: Eric Hostetter, Indiana University

February 9

Lecture: "The Homeric Question: Mycenaean Studies and
Grote's 'Independent Evidence' "
Guest Lecturer: Thomas Palaima, Fordham University

March 14

Lecture: "Ajax at the Bourne of Life"
Guest Lecturer: Mark I. Davies, Davidson College

April 11

Lecture: "New Directions in Pergamene Sculpture"
Guest Lecturer: Andrew F. Stewart, University of California at
Berkeley

Report of the Treasurer

The market value of the Institute's endowment totaled $114,887,776 on June 30, 1984.

During the fiscal year, total operating expenditures were $10,809,883. After applying $2,577,409 in operating fund gifts and grants against these expenditures, the Institute was required to provide $8,232,474 from endowment resources. This represents approximately 6.9 percent of the average of the endowment market values at June 30, 1984 and June 30, 1983, as compared to 7.6 percent of the comparable endowment totals for fiscal year 1983.

The performance of the Institute's portfolio is measured annually by Hamilton, Johnston & Co., Inc. Over the ten year period ending June 30, 1984, dividend and interest income and net realized and unrealized gains combined for a total average annual compound rate of return on Institute investments of 16.2 percent. Over the past five years, the average annual compound rate of return was 17 percent. For fiscal 1984, the annual rate of return was .3 percent.

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, 1984, follow this report.

Ralph E. Hansmann
Treasurer

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

Accountants' Opinion

Deloitte
Haskins+Sells

The Board of Trustees,   September 28, 1984
    Institute for Advanced Study –
    Louis Bamberger and
    Mrs. Felix Fuld Foundation
Princeton, New Jersey

Dear Trustees:

We have examined the financial statements of the Institute for Advanced
Study – Louis Bamberger and Mrs. Felix Fuld Foundation as of June 30,
1984 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, 1984 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.

Yours truly,

Deloitte Haskins & Sells

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

Balance Sheet, June 30, 1984

ASSETS

Operating Funds:

Cash and temporary investments	$ 236,651
Accounts and notes receivable	125,174
Government receivable	238,035
Specific purpose funds receivable	81,552
Accrued income on investments	1,149,802
Deferred charges	143,708
Due from plant funds	99,977
Total operating funds	**$ 2,074,899**

Plant Funds:

Cash	$ 19,136
Debt service fund deposits	430,842
Accrued income on investments	1,858
Marketable securities, at cost which approximates market (Note D)	360,053
Unamortized debt expense	83,893
Land, buildings and improvements, equipment and library books (including rare book collection) at cost, less accumulated depreciation of $9,289,992 (Notes C and D)	15,373,655
Total plant funds	**$ 16,269,437**

Endowment and Similar Funds: (Note B)

Cash	$ 116,293
Accounts Receivable	15,663
Marketable securities, at cost (Note D)	110,967,504
Mortgages and notes receivable	1,530,920
Total endowment and similar funds	**$112,630,380**

LIABILITIES AND FUND BALANCES

Operating Funds:

Accounts payable, accrued expenses, etc.	$ 377,176
Deferred restricted revenue (Note G)	473,960
Fund balance (Exhibit B)—unrestricted	1,223,763
Total operating funds	**$ 2,074,899**

Plant Funds:

Interest payable (Note D)	$ 320,842
Long-Term Debt (Note D)	8,902,987
Due to Operating Funds	99,977
Plant funds balance (Exhibit B)	6,945,631
Total plant funds	**$ 16,269,437**

Endowment and Similar Funds:

Fund balances (Exhibit B):

Endowment funds	$ 34,552,495
Quasi-endowment funds	78,077,885
Total endowment and similar funds	**$112,630,380**

See summary of significant accounting policies and notes to financial statements.

Institute for Advanced Study
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, 1984

	Operating Funds			Plant Funds	Endowment and Similar Funds	Total All Funds
	Unrestricted	Restricted	Total			
Support and Revenue:						
Endowment income (net of management fees)	$6,149,506	$1,989,088	$8,138,594			$ 8,138,594
Contributions	391,926	1,659,667	2,051,593			2,051,593
Government contracts	165,155	360,661	525,816			525,816
Total support and revenue........	6,706,587	4,009,416	10,716,003			10,716,003
Expenses:						
School of Mathematics	1,243,771	881,234	2,125,005	$ 107,609		2,232,614
School of Natural Sciences	1,166,049	731,055	1,897,104	190,158		2,087,262
School of Historical Studies	1,500,126	378,847	1,878,973	199,516		2,078,489
School of Social Science	204,890	841,622	1,046,512	65,198		1,111,710
Libraries	904,028	1,162	905,190	75,826		981,016
Director's Special Purpose Fund......	4,400	43,278	47,678	1,267		48,945
Administration and General	1,833,677	16,564	1,850,241	177,326		2,027,567
Auxiliary Activity — tenants' housing expenses net of $109,713 of revenue	107,609	84,573	192,182	50,098		242,280
Total expenses....................	6,964,550	2,978,335	9,942,885	866,998		10,809,883
Excess (deficiency) of support and revenue over expenses before capital additions	(257,963)	1,031,081	773,118	(866,998)		(93,880)
Capital Additions:						
Gifts.............................				170,577	$ 430,502	601,079
Realized net gains (losses) on investments				(157,565)	6,693,758	6,536,193
Investment income.................				89,815	152,323	242,138
Total capital additions				102,827	7,276,583	7,379,410
Excess (deficiency) of support and revenue over expenses after capital additions	(257,963)	1,031,081	773,118	(764,171)	7,276,583	7,285,530
Fund Balances at Beginning of Year	397,727	-0-	397,727	7,930,692	105,185,825	113,514,244
Transfers:						
Proceeds from disposal of plant facilities........................	259,000		259,000	(259,000)		
Plant acquisitions and principal debt service payments	(38,110)		(38,110)	38,110		
Portion of quasi-endowment funds appropriated	863,109		863,109		(863,109)	
Transfers to endowment and similar funds...........................		(1,031,081)	(1,031,081)		1,031,081	
Fund Balances at End of Year	$1,223,763	$ -0-	$1,223,763	$6,945,631	$112,630,380	$120,799,774

See summary of significant accounting policies and notes to financial statements.

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

Exhibit C

Statement of Changes in Financial Position
for the Year Ended June 30, 1984

	Operating Funds	Plant Funds	Endowment & Similar Funds	Total All Funds
Resources Provided:				
Excess (deficiency) of support and revenue over expenses before capital additions	$ 773,118	$ (866,998)		$ (93,880)
Capital additions:				
Gifts..............................		170,577	$ 430,502	601,079
Realized net gains (losses) on investments		(157,565)	6,693,758	6,536,193
Investment income.....................		89,815	152,323	242,138
Excess (deficiency) of support and revenue over expenses after capital additions.............................	773,118	(764,171)	7,276,583	7,285,530
Items not using (providing) resources:				
Provision for depreciation		866,998		866,998
Decrease in unamortized debt service expense............................		3,107		3,107
Loss (Gain) on disposition of investments - net.		157,565	(6,693,758)	(6,536,193)
Proceeds from sale of investments..........		259,000	255,673,729	255,932,729
Decrease in marketable securities...........		1,692,117		1,692,117
Decrease in accrued income...............		44,123		44,123
Decrease in deferred charges..............	46,750			46,750
Increase in payables......................		96,893		96,893
Increase in deferred restricted revenue......	244,887			244,887
Total resources provided	1,064,755	2,355,632	256,256,554	259,676,941
Resources Used:				
Purchases of investments..................			256,120,526	256,120,526
Purchases of plant facilities and equipment		1,951,547		1,951,547
Increase in receivables....................	185,654		15,663	201,317
Decrease in payables	275,068		172,044	447,112
Increase in debt service fund deposits		1,916		1,916
Reduction of long-term debt		180,769		180,769
Increase in accrued income	664,647			664,647
Total resources used	1,125,369	2,134,232	256,308,233	259,567,834
Transfers:				
Proceeds from disposal of plant facilities	259,000	(259,000)		
Plant acquisitions and principal debt service payments	(38,110)	38,110		
Portion of quasi-endowment funds appropriated	863,109		(863,109)	
Transfers to endowment and similar funds	(1,031,081)		1,031,081	
Total transfers	52,918	(220,890)	167,972	
Increase (decrease) in cash...........	$ (7,696)	$ 510	$ 116,293	$ 109,107

See summary of significant accounting policies and notes to financial statements.

Summary of Significant Accounting Policies
June 30, 1984

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."

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.

Accrual Basis

The financial statements of the Institute have been prepared on the accrual basis. The significant accounting policies followed are described below to enhance the usefulness of the financial statements to the reader.

Plant Assets and Depreciation

Uses of operating funds for plant acquisitions and principal debt service payments are accounted for as transfers to plant funds. Proceeds from the sale of plant assets, if unrestricted, are transferred to operating fund balances, or, if restricted, to deferred amounts restricted for plant acquisitions. Depreciation is provided over the estimated useful lives of the respective assets on a straight-line basis

(buildings and capital improvements 20-40 years, equipment 3-6 years).

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 to function 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 non-cash 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 or transferred to endowment and similar funds.

Other Significant Accounting Policies

Other significant accounting policies are set forth in the financial statements and notes thereto.

Notes to Financial Statements
June 30, 1984

A.

The accompanying financial statements are presented in accordance with certain recommendations contained in "Audits of Certain Nonprofit Organizations" by the American Institute of Certified Public Accountants.

B.

Investments purchased by the Institute are recorded at cost; investments received by gift are carried at fair market value at the date of donation. Realized gains and losses are computed based on the average cost of the investment.

Assets of endowment and similar funds are pooled with each individual fund subscribing to or disposing of units on the basis of the market value per unit, determined on a quarterly basis.

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

| | Pooled Assets | | Net | Market |
	Market Value	Carrying Value	Increase (Decrease)	Value Per Unit
July 1, 1983	$124,421,781	$105,185,825	$19,235,956	$4,899
June 30, 1984	114,887,776	112,630,380	2,257,396	4,495
Unrealized appreciation (depreciation) for the year ended June 30, 1984			(16,978,560)	
Realized net gain for the year ended June 30, 1984			6,693,758	
Net change for the year ended June 30, 1984			$(10,284,802)	

Earnings per unit, for the year ended June 30, 1984, exclusive of realized gains and losses, amounted to $321, after deducting management fees.

The pooled investments at June 30, 1984 are comprised of the following:

	Carrying Value	Market Value
Cash	$ 116,293	$ 116,293
Cash equivalents	12,028,948	12,028,948
Equity securities	55,769,089	60,540,548
Debt securities	43,169,467	40,655,404
Mortgages and notes receivable	1,530,920	1,530,920
Investment accounts receivable	15,663	15,663
	$112,630,380	$114,887,776

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	$ 1,834,557
Buildings and improvements	19,009,741
Equipment	3,619,841
Library books	199,508
Total	24,663,647
Less accumulated depreciation	9,289,992
Net book value	$15,373,655

D.

A summary of bonds payable follows:

2.75%, 1956—Apartment Bonds	$ 530,000
7.804%, 1980—NJEFA Series A Revenue Bonds	8,475,000
Total	9,005,000
Less unamortized bond discount	102,013
Total long-term debt	$ 8,902,987

On July 24, 1980, the Institute for Advanced Study received proceeds of the New Jersey Educational Facilities Authority (NJEFA) offer of $8,775,000 Revenue Bonds, 1980 Series A, the Institute for Advanced Study Issue. Of the net proceeds $4,100,000 was used to reimburse the Institute for the construction of its West Building, Dining Hall, and Social Science Library, and $1,976,559 was used to reimburse certain capital improvements. The balance is being used for major repairs and remodeling to the apartment housing facility for visiting members and other construction and major remodeling projects of Institute facilities.

The bonds are dated July 1, 1980, bear interest at the net average annual rate of 7.804%, are subject to redemption at various prices, and require principal payments and sinking fund installments through July 1, 2011. Bond principal in the amount of $110,000 matured on July 1, 1984 and bond principal in the amount of $115,000 (1985), $120,000 (1986), $130,000 (1987), and $135,000 (1988) will mature on July 1 of the designated years. The obligation to pay the Authority on a periodic basis, in the amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute and is collateralized by United States Treasury Notes, 13.00% due November 15, 1990, with an aggregate face amount of $8,700,000.

The Institute for Advanced Study Apartment Bonds of 1956 are collateralized by (1) a first mortgage on the members' housing project with a cost of $2,193,299, (2) a first lien and pledge of gross revenues from the project and (3) United States Treasury Notes, 12.625% due November 15, 1987, with an aggregate face amount of $125,000.

The bonds, which mature serially on December 1 of each year, bear interest at the rate of 2.75% and are payable $34,000 in 1984, increasing each December 1 with final payment due December 1, 1996 and are subject to redemption at various prices.

The interest expense for the year ended June 30, 1984 was $677,256.

E.

Separate voluntary defined contribution retirement plans are in effect for faculty members and eligible staff personnel, both of which provide for annuities which are funded with the Teachers Insurance and Annuity Association and/or the College Retirement Equities Fund. Payments for the year ended June 30, 1984 amounted to $412,554.

In addition to the formal 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 $60,013 for the year ended June 30, 1984 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 Will, as reported by the administrator of the Estate, aggregated $1,067,000 as of June 30, 1984 and is not included in the accompanying financial statements.
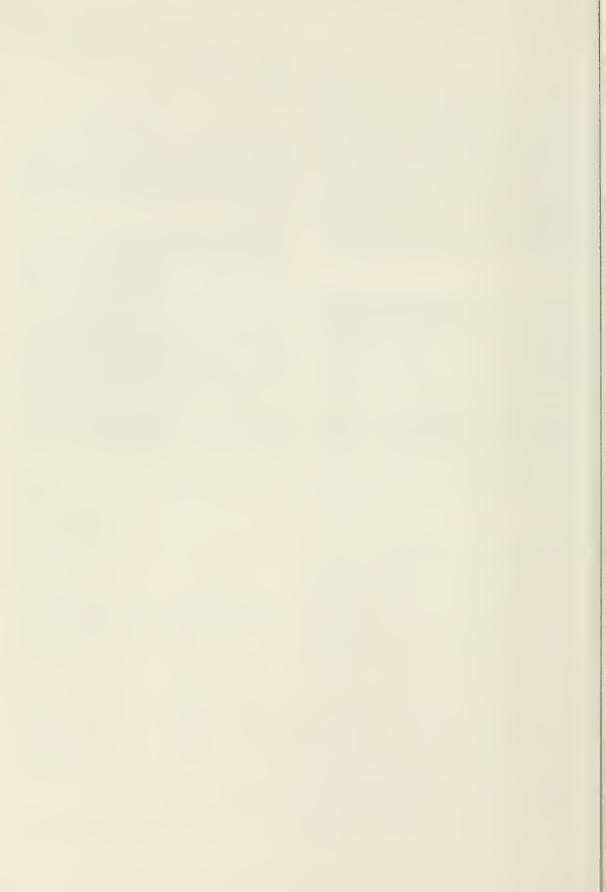
G.

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

	Specific Purpose Funds	Government Contracts	Total
Balance at beginning of year	$ 229,073	$ -0-	$ 229,073
Additions:			
Contributions, grants, etc.	1,821,891	443,324	2,265,215
Net endowment income	1,989,088		1,989,088
Total additions	3,810,979	443,324	4,254,303
Deductions:			
Funds expended during year	2,617,674	360,661	2,978,335
Transfer to endowment and similar funds	1,031,081		1,031,081
Total deductions	3,648,755	360,661	4,009,416
Balance at end of year	$ 391,297	$ 82,663	$ 473,960

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. The costs incurred by the Institute in operating both the Dining Hall ($245,659 net of $244,723 in revenues) and Members' Housing ($489,699 net of $654,219 in revenues) 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 $3,366,931 received between July 1, 1983, and June 30, 1984. Space limitations prohibit listing all 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

Anonymous donors
Professor and Mrs. Enrico Bombieri
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