



The Institute for Advanced Study

Annual Report 1982/83

The Institute for Advanced Study

Annual Report for the Fiscal Year
July 1, 1982–June 30, 1983

The Institute for Advanced Study
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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

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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 con-

duct 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

There is increasing doubt in some circles as to the justification for an institution which is by design exclusive. This attitude, while immediately understandable in a democratic society, misses the fundamental point: any society, no matter what its form of governance, must create and nurture—if it is to survive, let alone prosper—a few foci of excellence; otherwise there is an inevitable decline in standards. There must be a few beacons to which people look to light their way.

The Founders, Louis Bamberger and his sister, Mrs. Felix Fuld, in their letter of June 1930 to the Trustees said, *inter alia*:

"It is our hope that the staff of the institution will consist exclusively of men and women of the highest standing in their respective fields of learning, attracted to this institution through its appeal as an opportunity for the serious pursuit of advanced study and because of the detachment it is hoped to secure from outside distractions.

"Insofar as students are concerned, it is our hope that the Trustees of the institution will advance the ideals upon which it is founded in such a manner that quality of work rather than number of students shall be the distinguishing characteristic of the enrollment."

The Institute has from its founding consistently adhered to those injunctions. The first Director, Abraham Flexner, said at the organizational meeting:

"We do not need a large faculty. We should endeavor to attract into the Institute a small number of scholars and scientists who will be free from financial worries and concern, who will live and work amidst conditions favorable to intellectual activity."

So it has been from the outset. Some fifty years after our inception the Institute consists of four Schools: Historical Studies, Mathe-

matics, Natural Sciences and Social Science. The permanent members (excluding emeriti) number 24, while we have 10 long-term members and 146 members who come for one or two terms.

This small aggregation more than makes up in accomplishments in their chosen fields of work what they lack in numbers, as can be seen in part from the reports that follow.

The permanent and long-term members have made and will make significant and lasting scholarly contributions as evidenced by their publications. The members not only do likewise but also they return to leading academic institutions throughout the world refreshed and reinvigorated by their time at the Institute.

Thus the Institute functions on a highly selective basis for the benefit of learning wherever it may be situated. It is the quiet and detachment from the press of ordinary academic life that is provided in a small, collegial atmosphere that gives the Institute its special quality.

The Trustees are determined that it should remain small, although precise numbers will vary slightly from time to time as opportunity, within its competencies, and funds permit.

The Institute has been fortunate to date in the management of its resources but, like all institutions of learning with which I am acquainted, it is undercapitalized. This deficiency must be addressed and the Administration and Trustees will be giving this high priority in the years ahead.

During this past year, two of our Board members resigned, Sidney D. Drell and James R. Houghton. At the meeting of October 22, 1983, the Board passed the following resolution for Sidney D. Drell:

"Deputy Director of the Stanford Linear Accelerator Center, Lewis M. Terman Professor and Executive Head of Theoretical Physics at Stanford University, Chairman of the High Energy Physics Advisory Panel of the Department of Energy and consultant to numerous national and international committees, Sid has served on the Institute's Board of Trustees since 1974 and brought his ability as a high energy physicist and wise counselor to bear upon Institute matters. He chaired the Visiting Committee to the School of Natural Sciences in 1980-81 and has given us his advice and support during nearly a decade, for which the Institute is deeply grateful as it is for all that he is doing in the larger world to cast light on the dark threat of nuclear war and the urgent cause of arms control."

At a subsequent meeting of the Board, the following resolution was passed for James R. Houghton:

"James R. Houghton was elected to the Board of Trustees in 1971 and has served on its Finance Committee since that date. In 1980, he served a one-year term on the Nominating Committee. In the tradition of his father, Amory Houghton Sr., and his grandfather, Alanson Bigelow Houghton, who were also Trustees of the Institute, Jamie brought to Institute affairs a highly trained business sense, a long-range per-

spective, and a deep appreciation for the purposes and achievements of this intellectual enterprise. He was instrumental in helping the Institute meet an NEH Challenge Grant; his support and enthusiasm for the Fiftieth Anniversary Fund contributed substantially to its success; through him, the generosity of the Corning Glass Works Foundation will make possible the establishment of a Corning Fellowship in the near future.

It is with regret that his resignation is accepted, with gratitude that we remember his share in the Houghton family's distinguished connection with the Institute, and with confidence that we look forward to the restoration of this felicitous relationship at the soonest possible date."

At the October 1982 meeting of the Board, Patricia H. Labalme was elected Secretary of the Corporation. At the April 1983 meeting of the Corporation, all corporate officers were reelected for an additional term and James D. Wolfensohn was elected President of the Corporation and Vice-Chairman of the Board. Chosen to succeed Sidney D. Drell, who was retiring from the Board and was elected trustee emeritus, was George B. Field, Professor of Physics from Harvard University.

J. Richardson Dilworth
Chairman

Report of the Director

This year, the full accounts of the activities of the Schools elsewhere in this volume enable me to come to a focus on selected items of significant interest. Of particular importance for the evolving development of the Institute is the advice and counsel generated by the visiting committees.

In the report of the Review Committee set up by the Board of Trustees in 1975-76 under the chairmanship of Martin Segal, a process of reevaluation and renewal was recommended through the use of visiting committees to the several schools, "to advise the Faculty and the Board on the work of the school, its range of coverage, and its impact on the world of scholarship, and to make whatever suggestions seem appropriate." In 1981-82, a Visiting Committee was set up for the School of Natural Sciences on which I reported in the Annual Report for that year. This past year, a Visiting Committee to the School of Historical Studies was established under the Chairmanship of Professor Zeph Stewart of the Department of Greek and Latin at Harvard University. The Committee consisted of Professor Bernard Bailyn, Harvard University; Sir Isaiah Berlin, University of Oxford, England; Professor Northrop Frye, University of Toronto; Professor Henry Guerlac, Cornell University; and Professor Henry Millon of the National Gallery of Art, Washington, D.C. This Committee met with the Professors of the School, with members present and past as well as with professors emeriti and with the Director. Exchanges were frank and informative. I am pleased to include below a number of the main points of the Visiting Committee's subsequent report.

Visiting Committee

The Committee began by expressing its conviction that the distinguished record of the School continues. "We found no major problems that impeded present functioning or that

threatened the future. We were well aware, however, that two factors make this a time of important transition for the School: the imminent retirement of four of the eight active Professors and the imminent additional appointments both of a permanent Professor and of a Visiting Professor (with funds given by the Andrew W. Mellon Foundation)."

The recommendations of the Committee included the following:

Disciplines and Fields

"Particularly at a time when several new appointments are in prospect the question arises of the areas of study to be represented in the School. Theoretical work in philosophy, linguistics, literature and the arts, for example, have been suggested. After considering various possible innovations we were fully persuaded by the overriding importance of maintaining some degree of coherence and collegiality. We therefore recommend that the School remain historical in its orientation. We suggest, however, that the new Visiting Professorship might be used occasionally for ventures into different areas and interests.

"We consider it a great advantage for the School (and the Institute) that it is not obliged, as in a teaching university, to maintain a fairly rigid 'coverage' of certain areas. This flexibility should not be sacrificed, for it makes it possible always to look for the best scholars without regard to any fixed pattern or continuity. On the other hand, we think it desirable to maintain considerable breadth and variety. . . .

"We recommend that in making permanent appointments attention be paid to the outstanding quality of scholars rather than to the continuation of specific fields; in the selection of Visiting Members, however, we suggest that weight should be given to traditions of distinction, to the presence of emeriti, and to the library facilities of the School. . . ."

Professors and their roles

"The criterion for selection of a Professor should be scholarly eminence. But temperament too should be considered, since not every illustrious scholar is suited to life in a research institute. Some thought should be given to keeping a variety of interests, but we feel that search for world-class historical scholars, what the Japanese designate [as] 'national monuments,' is the foremost consideration.

"Sometimes the School will want to consider an appointment in an area outside the primary interests of any of its incumbent Professors. We recommend that in such cases the Faculty choose a small *ad hoc* advisory group to meet with it for a day to discuss where the cutting edge of scholarship in that discipline is to be found.

"There was considerable discussion of the function of the School and the role of Professors, whether they should have some teaching relationship with, and responsibility for, the Visiting Members or should be completely independent and free to work without interference or external responsibilities. We support the second concept. . . . The only obligations of Professors should be to carry on their scholarly work and to take part in selecting Visiting Members and new Professors. . . .

"We recognize the great value for most scholars of communication with colleagues of all ages. Some of the most eminent and productive scholars are enthusiastic teachers and talkers. We therefore encourage the provision of whatever ways may be found to promote informal exchanges. . . .

"It is the privilege and responsibility of the Faculty to recommend to the Trustees the appointment of new Professors. We have suggested the occasional use of *ad hoc* advisory groups when appointments in new fields are contemplated. We recommend only one change in the present procedure for recommending new appointments: that a Professor not take part in the choice of his successor. This is the normal practice in academic life and seems to us a good and natural one."

Visiting Members and their roles

"Raising of the maximum stipends for Visiting Members is perhaps the highest immediate priority for the School. Desirable candidates, both American and foreign, have failed to apply to the School or have been unable to come because of inadequate financing to cover loss of salary at the home institution. We recommend that resources be applied as soon and as generously as possible to this need. . . .

"Visiting Members should be free to organize whatever informal or loosely formal exchanges they wish among themselves and with Professors. We recommend, however, that the same model of freedom from responsibility should apply to them during their term as we recommend for the Professors. . . ."

Facilities

"Up to now retiring Professors have expected to keep exactly the same office space they occupied before retirement. We feel that this expectation is out of keeping with the practice of most institutions and should be modified to permit greater flexibility (even if in practice it can usually be satisfied). We therefore recommend that future professorial appointments include a written understanding that although every effort will be made not to displace a Professor, there is no guarantee that precisely the same office space will be kept upon retirement."

These recommendations are under discussion by all concerned, the School, the Director and the Board of Trustees, and as we engage in the difficult process of appointing professors, these supportive but challenging guidelines are part of our ongoing deliberations. We look forward to the continuing scholarly endeavors and the happy participation in Institute life of those soon to enter the ranks of the emeriti within the School of Historical Studies and equally to the exciting possibilities inherent in the series of new appointments to come.

Indeed, similar experiences will soon unfold for the two Schools not yet visited by external committees. The Visiting Committee for Social Science will be formed next and the School of Mathematics is scheduled to play host to its Visiting Committee in the year after Social Science.

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. Continuing recognition of the achievements of Institute Faculty and members and visitors with long-term appointments is demonstrated by the following list of this year's honors and distinctions.

GLEN W. BOWERSOCK was elected a Fellow of the American Numismatic Society and a Member of its Council.

JOHN H. ELLIOTT gave the Trevelyan Lectures at Cambridge University.

CLIFFORD GEERTZ was the Harry F. Camp Memorial Lecturer at Stanford University.

SHELOMO GOITEIN was awarded a Laureate Fellowship Prize by the John D. and Catherine T. MacArthur Foundation.

HERMAN H. GOLDSTINE was elected a member of the American Academy of Arts and Sciences.

CHRISTIAN HABICHT gave the Sather Lectures at the University of California at Berkeley; he was elected a member of the American Philosophical Society.

ALBERT O. HIRSCHMAN gave the first Director's Lecture at the Institute for Advanced Study, and the first Henry George Lecture at Williams College. He was awarded the Talcott Parsons Prize for excellence in the Social Sciences by the American Academy of Arts and Sciences.

GEORGE KENNAN received the Peace Prize of the German Book Trade in Frankfurt, the Union Medal of the Union Theological Seminary in New York, the Pacem in Terris Peace

and Freedom Award of the Catholic Diocese of Davenport, Iowa, and honorary degrees from Lake Forest College and Clark University.

ROBERT LANGLANDS received the Humboldt Foundation Prize.

BERNARD LEWIS was elected a member of the American Academy of Arts and Sciences.

MICHAEL WALZER gave the Gauss Seminar Lectures at Princeton University.

HASSLER WHITNEY was awarded the Wolf Foundation Prize in Mathematics.

HARRY WOLF was elected a member of the American Academy of Arts and Sciences.

He was awarded an honorary Doctorate of Humane Letters by The Johns Hopkins University.

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 146. Of these, seventy-four were under the age of 35 and 15% were women. Members in 1982-83 came from 103 institutions located in nineteen 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 Visitor, Ambassador William H. Luers, a career foreign service officer with the Department of State, former Ambassador to Venezuela and now Ambassador to Czechoslovakia, who has been working on the interconnected issues of United States-Mexican and United States-Soviet relationships. While at the Institute, he served as lead consultant to the National Bi-Partisan Commission on Central America, chaired by Henry Kissinger, and held an informal working conference here to discuss Southern Hemisphere problems. This was attended by George Ball, Henry Bienan, Carola Eisenberg, George Kennan, Ken Oye, Paul Sigmund, and Richard Ullman.

Administration

Certain significant developments have occurred in the past year which fall under the rubric of administrative matters, but whose reach and wider effects warrant their mention here.

Integral to this community's internal life is the cross-fertilization of ideas, the cooperative interaction of a gifted society, the seminars in which a work-in-progress is whetted against the criticism of colleagues. For these purposes and for the effective circulation of material, more efficient means of multiplication and revision had become necessary, just as the technological revolution made those means more available. As it became increasingly apparent that Faculty and Visiting Members were turning to word-processors to facilitate their essential tasks of composition, editing and publication, the Institute sought means to enlarge the availability of such hardware. With a generous grant from the Pew Memorial Trust, the Institute was able to purchase 32 word-processors and 13 printers plus software and ancillary equipment. These were distributed throughout the Schools and administrative offices, and have served the cumulative and connective processes of research here as elsewhere.

We are in the process of establishing a patent policy, with a resolution to that effect already passed by the Board of Trustees, but with discussion and possible modification by the Faculty still to come. When formal general agreement has been established, the principal elements of the policy itself will be published in a forthcoming Annual Report.

A major concern this past year has remained the need to increase endowment in order to maintain the vitality and independence of the Institute and its commitment to the support not only of a distinguished Faculty but of its Visiting Members whose stipends must all too often be restricted to levels inadequate for their needs or inappropriate for their achievements. Toward this end, every effort continues to be made to secure additional endowment and operating moneys.

Foundations and corporations, a list of which appears later in this Annual Report, have generously responded. As in the past, the federal government has participated in such support through its various agencies, also listed in the last section. The Board of Trustees, the Friends of the Institute, the Association of Members of the Institute for Advanced Study (AMIAS), and individual alumni have contributed to strengthen the Institute's ability to realize its fundamental purpose, that is, research at the frontiers of knowledge. To all, our warm gratitude is here expressed.

As part of this same financial endeavor, the Institute has, over the past four years, looked to its land assets as a possible source for funds. A number of plans for the development of property along Quakerbridge Road are under consideration, while, concurrently, a dialogue has been opened with the Friends of Princeton Open Space who have expressed interest in maintaining the quality of the natural environment and are seeking alternate solutions. The Institute has every intention, in pursuing its needs, to bring these into a harmonious balance with those community, conservation, and ecological values which it shares and respects. The woods will remain protected as a bird and wildlife sanctuary, open, as they have always been, to the public.

Other events

In November, the first of a series of Director's Lectures by members of the Faculty took place, to which the extended family of the Institute and its friends were invited. It is hoped that the series will afford speakers an opportunity to present their work within this community with somewhat more formality and greater breadth than the usual exchange with professional colleagues allows, while granting the audience a unique privilege. The genesis of ideas and the craftsmanship with which they are brought to completion may well be part of our daily lives, but the finished product is rarely put before us save as a publication. This first lecture, and those that follow,

are meant to enable us to enter the process somewhat earlier, perhaps at that penultimate instant before the printer fixes the moment of learning upon the page forever. Professor Albert Hirschman of the School of Social Science, introduced this series with a lecture on "Civilizing, Destructive, or Feeble? Rival Interpretations of Market Society."

A revised edition of *Makers of Modern Strategy: Military Thought from Machiavelli to Hitler* is being planned. This collection of essays was first edited in 1943 by Edward Meade Earle, an original Faculty member of the School of Economics and Politics here. Much of the material emanated from meetings and seminars of the Institute, and the book was published by the Princeton University Press. So durable and popular has it proved that a revised edition is currently being prepared, under the editorship of Peter Paret, former visiting member of the School of Historical Studies and now Professor of History at Stanford University.

The memorial tributes to Andrew Alföldi which were held here in October 1981 have been published by the Institute together with a bibliography of Alföldi's publications, under the title, *Andrew Alföldi, 1895-1981*. This is the second pamphlet in a series initiated earlier in this academic year by the publication of *Sculpture on the Edge of Dreams*, a lecture delivered by Professor Dore Ashton of the Cooper Union for the Advancement of Science and Art. The lecture formed part of the ceremonies connected with the unveiling of Tony Smith's "New Piece," a sculpture commemorating the accomplishments of Albert Einstein.

John Hunt, Associate Director and Secretary of the Corporation, resigned to become Chairman of the Board and Chief Executive

Officer of BioTechnica International, Inc., Cambridge, Massachusetts, a firm which specializes in recombinant DNA research. John Hunt came to the Institute in 1977 from the Aspen Institute for Humanistic Studies and contributed his extensive energies and abilities to strengthening the Institute in many ways, and most notably in helping to plan the Einstein Centennial Celebration, the establishment of the Fiftieth Anniversary Fund, and the publication of a series of annual reports as well as *A Community of Scholars*, the volume which summarizes the activities of Faculty and visiting members here for the first fifty years. He was succeeded by Patricia H. Labalme, a Renaissance scholar with considerable administrative experience.

A number of community events marked the life of the Institute during the year. At the beginning of the term there were the now traditional brown-bag lunches at Olden Farm with Mrs. Patricia Woolf as hostess to introduce the families of Visiting Members to some members of the Princeton community and to familiarize them with the opportunities and amenities of their neighborhood. A Barn Sale in the fall collected funds for visiting member stipends. Concerts, an exhibit of photographs of precursors of post-modernism in Milan arranged by Professor Irving Lavin, a members' dance, the annual Easter Egg Hunt at Olden Farm, a May Day garden party at Marquand House, contributed to the round of non-academic activities which promote that unique blend of human as well as intellectual exchange which characterizes our residential community.

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

Homer A. Thompson

George F. Kennan
Benjamin D. Meritt

Members with Long-term Appointments

Herman H. Goldstine

Otto E. Neugebauer

Bernard Lewis

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 developments 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, 1982-83

The School was host to forty-four long-term, term and annual members in 1982-83. During the summer of 1982, it also provided research facilities for eight summer visitors. Twenty-three members came from foreign countries, including Australia, Canada, Denmark, England, the Federal Republic of Germany, France, Israel, Italy, New Zealand, The Netherlands, and Yugoslavia.

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's *Roman Arabia* was published by the Harvard University Press. He delivered lectures at the Universities of Oxford, Chicago, and Wisconsin and was elected a Fellow of the American Numismatic Society and a Member of its Council.

Professor Marshall Clagett completed Volume Five of his *Archimedes in the Middle Ages* and began work on a volume to be entitled "Science and Thought in Ancient Egypt."

Professor John H. Elliott gave the Trevelyan Lectures at the University of Cambridge on the subject of Richelieu and Olivares and also lectured in Australia and New Zealand.

Professor James F. Gilliam continued his preparation of Greek and Latin papyri for publication and participated in the German *Historia Augusta* Colloquium.

Professor Christian Habicht served as Sather Professor in Classics at the University of California at Berkeley. He delivered the Sather Lectures on *Pausanias' "Description of Greece"* and conducted a graduate seminar on historical Greek inscriptions. He organized a panel for the VIIIth International Congress of Greek and Latin Epigraphy held in Athens in October, 1982, and gave lectures at the Universities of California in Los Angeles, Stanford, Pittsburgh, Frankfurt, Saarbrücken, Cologne, Giessen, Trier, and Heidelberg. He was elected a member of the American Philosophical Society.

Professor Irving Lavin devoted the year primarily to preparing the Slade lecture series he is to give at Oxford University in 1985, and to the Jerome lectures he is to give the following year at the University of Michigan and the American Academy in Rome. He delivered the Convocation address at the meeting of the

College Art Association of America in Philadelphia.

Professor Kenneth M. Setton worked on the galley proofs of the third and fourth volumes of his *Papacy and the Levant, 1204-1571*, and is expecting very shortly the appearance of the fifth volume of the *History of the Crusades*.

Professor Morton White continued work on his study of the role of philosophy in the defense of the Constitution; in it he gives special attention to the *Federalist Papers*. At the invitation of the United States-Spanish Joint Committee for Educational and Cultural Affairs, he lectured in Madrid to a group of philosophers and social scientists on the relationship between normative and descriptive language.

Long-term Members and Visitors

Among the Long-term Members, Professor Herman H. Goldstine continued to work on his book on "The Mathematics of Computer Science" and his edition of the works of James I Bernoulli and John I Bernoulli. He was elected to membership in the American Academy of Arts and Sciences. He continued to serve on Visiting Committees at Princeton University and the University of Chicago as well as committees of the American Philosophical Society and the National Academy of Science.

Professor Bernard Lewis published his book on *The Muslim Discovery of Europe*. It has been translated into French, German and Italian. He also published the two volumes of *The Christians and Jews in the Ottoman Empire*, co-edited with Benjamin Braude. He conducted a seminar at the Ecole des Hautes Etudes en Sciences Sociales in Paris and attended a bilateral Soviet-American conference on the Middle East at the Soviet Academy of Sciences. He was elected a member of the American Academy of Arts and Sciences.

Professor Otto E. Neugebauer sent to press a book written in cooperation with Professor N. Swerdlow of the University of Chicago on *The Mathematical Astronomy in Copernicus' De Revolutionibus* and is pursuing his study of Abu Shaker's "Chronology," an Ethiopic translation of an Arabic treatise on chrono-

logical and calendrical systems of the Near East from early Christianity to Islam.

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 saw through the press the fourth volume of his study, *A Mediterranean Society*, which deals with daily life, and a book on the history, communal organization, and spiritual life of the Yemenites. He was awarded a Laureate Fellowship Prize by the John D. and Catherine T. MacArthur Foundation.

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 several articles and reviews and participated in an International Conference on the Role of the Nation in German History, in Berlin. He chaired a session on "Truth in History" at the convention of the American Historical Association and worked in the Venetian archives on Venice in the time of the League of Cambrai and in the Jakob Burckhardt papers in Basel on a study of the development of the concept of cultural history.

Professor George F. Kennan completed the second volume of his history of the Franco-Russian Alliance of 1894. His book, *The Nuclear Delusion*, was published by Pantheon Books. He received the Peace Prize of the German Book Trade in Frankfurt; the Union Medal of the Union Theological Seminary in New York; the Pacem in Terris Peace and Freedom Award of the Catholic Diocese of Davenport, Iowa; and honorary degrees from Lake Forest College and Clark University.

Professor Homer A. Thompson continued to supervise the publication program of the excavation of the Athenian Agora, preparing several volumes and articles for the press. He lectured at universities in the United States, Canada, France, and Switzerland.

The School of Historical Studies

Members with Long-term Appointments, Members, Visitors and Assistants 1982-83

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- .

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

Jan Bialostocki, *Italian and French art theory and art historiography of the XVIIIth Century.*

Born 1921, Saratov, Russia (USSR). University of Warsaw MA 1946, PhD 1950; University of Groningen, DLitt 1969.

National Museum, curator of foreign art 1955- ; University of Warsaw, docent 1955, professor extraordinarius 1962, professor ordinarius 1972; Leiden University, visiting professor 1963; Universidad Nacional Autónoma, Mexico, visiting professor 1967 and 1976; Yale University 1966, New York University, Wrightsman Lecturer 1972; University of Wisconsin, visiting professor (Rojtman Seminar) 1972; Pennsylvania State University, visiting professor 1973; Institute for Advanced Study, member spring term 1973; Collège de France,

visiting professor 1978; Carleton University, Ottawa, visiting professor 1979; National University of Australia, Canberra, visiting professor 1980; Wellesley College, visiting professor 1982.

Jean-Paul Bouillon, *The French etcher, painter and designer Félix Bracquemond (1833-1914)*.

Born 1941, Paris, France. Ecole Normale Supérieure, Paris, Agrégation des Lettres 1965; Sorbonne, Doctorat d'Etat 1979.

Centre National de la Recherche Scientifique, attaché de recherche 1966-69; University of Clermont-Ferrand, assistant 1969-71, maître-assistant 1971-72, chargé d'enseignement 1972-81, professeur 1981-

Alan K. Bowman, *A new version of Wilcken's "Grundzüge und Chrestomathie der Papyruskunde."*

Born 1944, Manchester, England. University of Oxford, BA 1966; University of Toronto, MA 1967, PhD 1969.

Rutgers University, assistant professor 1970-72; Manchester University, lecturer 1972-77; Institute for Advanced Study, member fall term 1976; Christ Church, University of Oxford, tutor in Roman history 1977-

Trevor R. Bryce, *The history and civilization of Lycia to the end of the epichoric period (4th century B.C.)*.

Born 1940, Bathurst, Australia. University of Queensland, Australia, BA 1963, MA 1969, PhD 1976.

University of Queensland, lecturer 1969-1976, senior lecturer 1977-82, reader, 1982-

Amnon Cohen, *Studies in the sijill court-records of Jerusalem in the 16th century*.

Born 1936, Tel Aviv, Israel. The Hebrew University of Jerusalem, BA 1958, MA 1966, PhD 1971.

The Hebrew University of Jerusalem, department of history of the Muslim countries, chairman 1974-77; York University, Toronto, visiting professor 1977-78; The Ben Zvi Institute, Jerusalem, director 1979-82.

Joseph J. Connors, *The architecture of Francesco Borromini*.

Born 1945, New York, New York. Boston College, AB 1966, Cambridge University, BA 1968; Harvard University, PhD 1978.

University of Chicago, instructor, assistant professor 1975-80; Columbia University, associate professor 1980-

Willem Den Boer, *An edition of the Historia Augusta*.

Born 1914, Rotterdam, The Netherlands. University of Leiden, DrLitt 1940.

University of Leiden, professor 1946-79; University of Michigan at Ann Arbor, visiting professor 1971-72.

Valerie I. J. Flint, *Magic and astrology in the early middle ages*.

Born 1936, Derby, England. University of Oxford, BA 1958, BPhil 1960, DPhil 1969.

London University, Bedford College, tutorial fellow 1960-63; University College, Dublin, lecturer 1963-68; University of Liverpool, lecturer 1968-71; University of Auckland, New Zealand, senior lecturer/associate professor 1971-

Peter R. Franke, *Ancient history and numismatics (homonioa-coins, coinage of Thessaly, King Pyrrhus and Elis-Olympia)*.

Born 1926, Lüdenscheid, Federal Republic of Germany. University of Erlangen, DrPhil 1954, DrPhil Habil 1960; University of Munich, DrPhil Habil 1965.

Staatl. Münzsammlung München 1955-58, Kommission für Alte Geschichte und Epigraphik München 1958-61; Deutsches Archäologisches Institut Athens, Istanbul, Munich 1961-66; University of Erlangen, docent 1961-65; University of Munich, docent 1965-67; American Numismatic Society, visiting professor 1975; University of Thessaloniki, visiting professor 1976-78; University of Saarbrücken, professor 1967-

Bruce W. Frier, *The social system of Roman law: studies in Cicero's Pro Caelina*.

Born 1943, Chicago, Illinois. Trinity College, BA 1964; Princeton University, PhD 1970.

Bryn Mawr College, lecturer 1969-70; University of Michigan, assistant professor 1970-75, associate professor 1975-83, professor 1983-

Marc Fumaroli, *History of French language: 16th and 17th centuries*.

Born 1932, Marseille, France. University of Aix-en-Provence, University of Paris (Sorbonne), Agrégé en Lettres 1959.

University of Lille, faculty assistant, chargé d'enseignement 1969; Queens College, City University of New York, visiting professor 1969-70; University of Paris (Sorbonne), professor 1977- .

Jean-Baptiste Giard, *History of Roman coinage.*

Born 1932, Lille, France. Ecole Nationale des Chartes, archiviste-paléographe; Ecole Pratique des Hautes Etudes, IVe section, diplômé.

Cabinet des Médailles de la Bibliothèque Nationale, conservateur 1960- ; Institut Français d'Archéologie, Beirut, pensionnaire 1965-66; Institute for Advanced Study, assistant 1973-74; Ecole des Hautes Etudes en Sciences Sociales, maître de conférence 1979- .

Robert S. Gottfried, *Doctors and medicine in medieval England, 1348-1530.*

Born 1949, Philadelphia, Pennsylvania. Pennsylvania State University, BS/BA 1970; University of Michigan, MA 1971, PhD 1975.

University of Michigan, lecturer 1974-75; Rutgers University, assistant professor 1975-79, associate professor 1979-82, professor of history 1982- , director of medieval studies 1983- .

Barbara A. Hanawalt, *The late medieval English peasant family.*

Born 1941, New Brunswick, New Jersey. Douglass College (Rutgers University), BA 1963; University of Michigan, MA 1964, PhD 1970.

San Fernando Valley State College, instructor 1970-72; University of Oregon, visiting assistant professor 1972-73; Indiana University, assistant professor 1974-78, associate professor 1978- .

Mogens Herman Hansen, *The Athenian 'politicians' 403-322.*

Born 1940, Copenhagen, Denmark. University of Copenhagen, MA 1967, DrPhil 1973.

University of Copenhagen, lecturer.

Robert C. Howell, *Kant's transcendental deduction: a new interpretation.*

Born 1940, Indianapolis, Indiana. Kenyon College, AB 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- .

Christopher P. Jones, *Culture and society in Lucian.*

Born 1940, Chislehurst, Kent, England. University of Oxford, BA 1962, MA 1967; Harvard University, PhD 1965.

University of Toronto, lecturer 1965-66, assistant professor 1966-68, associate professor 1968-75, professor 1975- ; Harvard University, visiting lecturer 1968; Institute for Advanced Study, member 1971-72; Ecole Normale Supérieure de Jeunes Filles, Paris, professeur associé 1979.

Dale Kinney, *Twelfth-century Roman architecture: S. Maria in Trastevere.*

Born 1944, New York, New York. Syracuse University, BA 1965; New York University, MA 1967, PhD 1975.

Bryn Mawr College, lecturer 1972-75, assistant professor 1975-78, associate professor 1978- .

Christopher Andrew Kirwan, *Philosophy of Saint Augustine.*

Born 1932, London, England. University of Oxford, BA 1956, MA 1959.

University of Oxford, lecturer 1959-60, 1961; University of Michigan, visiting associate professor 1968.

Egmont Lee, *Foreigners in Renaissance Rome.*

Born 1941, Usingen, Germany. University of Illinois, BA 1964; University of Wisconsin, MA 1965, PhD 1970.

University of Calgary, assistant professor 1968-74, associate professor 1974-82, professor 1982- ; Calgary Institute for the Humanities, director 1979-81.

Miroslava Mirković, *Aspects of the economic life in the Balkan area in the later Roman Empire.*

Born 1933, Kosovska Mitrovica, Yugoslavia. University of Belgrade, DrPhil 1964.

University of Belgrade, assistant 1957, docent 1968, professor 1979.

Edward W. Muir, Jr., *Vendetta and civil disorders in Renaissance Italy.*

Born 1946, Cambridge, Massachusetts.

University of Utah, BA 1969; Rutgers University, MA 1970, PhD 1975.

Stockton State College, assistant professor 1973-77; Syracuse University, assistant professor 1977-81, associate professor 1981-

Gerhard Neumann, *Greek decree reliefs*.

Born 1931, Liessau, Danzig. University of Tübingen, DrPhil 1960.

Deutsches Archäologisches Institut, Athens, referent 1963-67; University of Tübingen, assistant 1969-72, docent 1972-77, professor 1978-

Stephen Polcari, *The intellectual roots of abstract expressionism*.

Born 1945, Boston, Massachusetts. Columbia College, BA 1967; Columbia University, MA 1971; University of California at Santa Barbara, PhD 1980.

DeCordova Museum, Lincoln, Massachusetts, curator 1976; University of Illinois at Urbana-Champaign, assistant professor 1979-83; State University of New York at Stony Brook, assistant professor 1983-

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.

George Saliba, *The astronomical works of Mu'ayyad al-Din al-'Urdu: edition of the Arabic text*.

Born 1939, Chirine, Lebanon. American University of Beirut, BS 1963, MA 1965; University of California at Berkeley, MA 1970, PhD 1974.

New York University, visiting professor of Arabic 1976-79; Columbia University, assistant professor of Arabic, 1979-

Annie Schnapp-Gourbeillon, *Greek ancient history and anthropology*.

Born 1946, Grenoble, France. University of Paris (Sorbonne), licencié d'Histoire 1967, maîtrise d'histoire 1968; University of Caen, doctorat de 3e cycle 1975.

University of Paris VIII, assistant 1969, maitre-assistant 1978.

Stuart B. Schwartz, *The rebellion of Portugal and the crisis of the Iberian Atlantic world in the seventeenth century*.

Born 1940, Springfield, Massachusetts. Middlebury College, BS 1962; Columbia University, MA 1963, PhD 1968.

University of Minnesota, instructor to professor 1967-, chairman department of history 1976-79; University of California at Berkeley, visiting professor 1969-70; Universidade Federal da Bahia, visiting professor 1974; University of California at Los Angeles, scholar in residence 1975.

Emmanuel Sivan, *Islamic fundamentalism: theology and politics*.

Born 1937, Kfar Hakhosh, Israel. Hebrew University, Jerusalem, BA 1962; University of Paris (Sorbonne), doctorat de 3e cycle 1965.

Hebrew University, Jerusalem, professor of history 1966-; University of Montreal and Carlton University, Ottawa, visiting professor 1976-77; University of Paris X, visiting professor 1980.

Robert Collins Sleigh, Jr., *Commentary on Leibniz's Discourse on Metaphysics and the correspondence with Arnauld*.

Born 1932, Marblehead, Massachusetts. Dartmouth College, BA 1954; Brown University, MA 1957, PhD 1963.

Brown University, teaching assistant 1955-57, visiting professor 1981; Wayne State University, instructor to associate professor 1958-69; Harvard University, visiting lecturer 1965; University of Michigan, visiting professor 1973; University of Massachusetts, professor 1969-

Jack Graham Smith, *The portraits of Agnolo Bronzino*.

Born 1942, Banff, Scotland. St. Andrews University, Scotland, MA 1964; University of Edinburgh, post graduate diploma 1965; Princeton University, MFA 1968, PhD 1971.

University of British Columbia, assistant professor 1969-72; University of Michigan, assistant professor to professor 1972-

Edith Dudley Sylla, *The Oxford calculatory tradition from the fourteenth to the seventeenth century*.

Born 1941, Cleveland, Ohio. Radcliffe College, BA 1963; Harvard University, MA 1964, PhD 1971.

North Carolina State University, instructor 1968-70, assistant professor to full professor 1970-

H. S. Thayer, *An edition of the philosophical correspondence of John Dewey.*

Born 1923, New York, New York. Bard College, BA 1945; Columbia University, MA 1947, PhD 1949.

Columbia University, instructor, assistant professor 1949-61, visiting associate professor 1962-63; New York School of Psychiatry, visiting professor 1959-65; City College, City University of New York, assistant professor to professor 1961- ; Institute for Advanced Study, member 1974-75.

Dorothy J. Thompson, *Hellenistic history: Memphis in the Ptolemaic period.*

Born 1939, Liverpool, Lancashire, England. University of Cambridge, BA 1961, MA 1965, PhD 1966; University of Bristol, CertEd 1962.

Girton College, University of Cambridge, research fellow 1965-68, official fellow and lecturer 1968- ; senior tutor 1981- ; Clare College, University of Cambridge, director of studies and lecturer 1973-

Gerhard Thür, *Ancient Greek inscriptions concerning legal procedure.*

Born 1941, Golling, Austria. University of Vienna, Drlur 1965.

University of Vienna, docent 1973; University of Munich, professor 1978-

Mario Torelli, *Rome and Lavinium: studies in religious and social history.*

Born 1937, Rome, Italy. Laurea in Lettere 1960.

University of Cagliari, professore aggregato 1969-73, professore ordinario 1973-76; University of Perugia, professore ordinario 1976- ; University of Colorado, visiting professor 1974; University of Michigan, visiting professor 1978; University of California, visiting professor 1979.

Egon Verheyen, *The tour of Henri III through Italy, 1574: triumphal entries for the King of Poland and France.*

Born 1936, Duisburg, Germany. University of Würzburg, DrPhil 1962.

Germanisches Nationalmuseum, Nuremberg, 1961-62; Bibliotheca Hertziana, Rome, 1963-65; Bayerische Staatsgemäldesammlungen, Munich, 1965-66; University of Massachusetts, assistant professor 1966-67; University of Michigan, assistant to associate professor 1967-72; The Johns Hopkins University, 1972- ; Institute for Advanced Study, member 1962-63.

Nathan Wachtel, *History and anthropology of Andean societies.*

Born 1935, Metz, France. University of Paris (Sorbonne), licencié d'Histoire 1958, diplôme d'études supérieures 1959, agrégation 1963, doctorat d'Etat 1969.

Lycée d'Etat de Reims, professeur 1963-64; l'Ecole Pratique des Hautes Etudes, chef de travaux 1964, maître-assistant 1974; l'Institut Français d'Etudes Andines de Lima, 1969-1971; l'Ecole des Hautes Etudes en Sciences Sociales, directeur d'études 1976-

Robert K. Webb, *The English unitarians, c. 1750-1980.*

Born 1922, Toledo, Ohio. Oberlin College, AB 1947; Columbia University, MA 1948, PhD 1951.

Wesleyan University, instructor in history and social science 1951-53; Columbia University, assistant professor to professor 1953-70; *American Historical Review*, editor 1968-75; University of Maryland Baltimore County, professor of history 1975-

Stephen D. White, *Disputes and dispute-settlement in medieval France.*

Born 1945, New York, New York. Harvard College, AB 1965, Harvard University, PhD 1972.

Harvard University, junior fellow 1971-74, lecturer and research associate 1974-75; Wesleyan University, assistant professor 1975-80, associate professor 1980- ; Harvard Law School, visiting scholar spring 1983.

Curtis A. Wilson, *History of astronomy: the great inequality of Jupiter and Saturn, from Kepler to Laplace.*

Born 1921, Los Angeles, California. University of California at Los Angeles, BA 1945; Columbia University, PhD 1952.

St. John's College, tutor 1948-66, 1973- ; dean 1958-62, 1973-77; University of California at San Diego, visiting associate professor 1966-68, professor 1968-73.

Matthias Winner, *Iconography of Raphael's Stanza della Segnatura*.

Born 1931, Stettin, Poland. DrPhil 1957.

Schnütgen-Museum, Cologne, assistant 1957; Free University of Berlin, assistant 1958-60; Kunsthistorisches Institut, Florence, assistant 1960-63; Kupferstichkabinett, Berlin, director 1968-77; Bibliotheca Hertziana, Rome, director 1977-

Visitors

Sebastian de Grazia, *Machiavelli as moral philosopher*.

Born 1917, Chicago, Illinois. University of Chicago, BA, PhD.

University of Chicago, professor 1945-50; University of Florence, visiting professor 1950-52; Princeton University, visiting professor 1957; Rutgers University, professor 1962- ; University of Madrid, visiting professor 1963; John Jay College, City University of New York, visiting professor 1967.

S. D. Goitein, *Medieval Islamic and Jewish history*.

Born 1900, Burgkunstadt, Bavaria, West Germany. University of Frankfurt, PhD 1923.

Hebrew University, lecturer-professor 1928-57; University of Pennsylvania, professor 1957-70, affiliated professor 1970-71; Institute for Advanced Study, visitor 1971-

Jeffrey Lionel Gossman, *Nineteenth-century Basle and the critique of modernism*.

Born 1929, Glasgow, Scotland. University of Glasgow, MA 1951; University of Oxford, PhD 1958.

University of Glasgow, assistant lecturer 1957-58; The Johns Hopkins University, assistant professor to full professor 1958-76; Princeton University, professor 1977- ; Institute for Advanced Study, member 1978-79.

Ernst Kitzinger, *History of art*.

Born 1912, Munich, Germany. University of Munich, PhD 1934.

British Museum, 1935-40; Dumbarton Oaks Center for Byzantine Studies, 1941-67; Harvard University 1967- ; Institute for Advanced Study, member 1966-67, 1981-82.

François Rigolot, *French literature of the Renaissance*.

Born 1939, Château du Loire, France. Ecole des Hautes Etudes Commerciales, 1961; University of Wisconsin, PhD 1969.

University of Michigan, assistant professor 1969-74; Princeton University, associate to full professor 1974-

Assistants

Jay Atlas, *History of philosophy*.

Born 1945, Houston, Texas. Amherst College, BS 1966; Princeton University, PhD 1976.

Institute for Advanced Study, assistant to Professor Morton White 1982-83.

Susan M. Babbitt, *Medieval history*.

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-

Mark Darby, *Medieval political theory*.

Born 1954, Aberdeen, Maryland. Vassar College, BA 1976; Cornell University, MA 1978.

Institute for Advanced Study, assistant to Professor Marshall Clagett 1980-

Vicente Lleó-Cañal, *The Alcázar of Sevilla: change and continuity*.

Born 1947, Seville, Spain. University of Seville, MA 1974, PhD 1978.

University of Seville, assistant professor 1977- ; School of Architecture of Seville, special professor 1974-77; Institute for Advanced Study, assistant to Professor John H. Elliott 1982-83.

Claudia Marchitello, *Manuscript illumination in the fourteenth century*.

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

Institute for Advanced Study, assistant to Professor Irving Lavin 1982-83.

Donald F. McCabe, *Christians in the late Roman army*.

Born 1946, New York, New York. Princeton University, BA 1968; University of Oxford, BA 1974; Harvard University, PhD 1980.

Harvard University, teaching fellow 1976-80; Yale University, lecturer 1980-81; Institute for

Advanced Study, assistant to Professor Glen W. Bowersock, 1982-83.

Fordyce W. Mitchel, *Early Hellenistic Athens*.

Born 1922, Memphis, Tennessee. Yale University, AB 1943, MA 1944, PhD 1954.

Yale University, instructor 1945-47; Vanderbilt University, assistant professor 1948-53; Randolph-Macon Woman's College, associate

professor to professor 1954-64; University of Missouri, professor 1965- ; University of Cincinnati, visiting professor and Semple lecturer 1967-68; American School of Classical Studies at Athens, associate fellow 1964-65, 1972-73, visiting professor 1974, 1976, visiting scholar 1975, director of summer school 1976; Institute for Advanced Study, member 1979-80, assistant to Professor Christian Habicht, 1982-83.

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

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, 1982-83

The academic year 1982-83 was a very good one for the School of Mathematics. Activities were not focussed this year on one special program but rather work was oriented in several directions ranging over the fields of number theory, representation theory, topology,

differential geometry, partial differential equations, several complex variables, and mathematical physics.

A number of seminars were organized by both faculty and members, usually consisting of a series of lectures on related topics except the Members' Seminar which traditionally has had the purpose of allowing members to give expositions on their current research. The following is a partial list of the seminars with a total of about 280 lectures:

Classical Relativity, Differential Geometry, Evolution Equations, K-Theory, L^2 Cohomology and Intersection Cohomology for Arithmetic Groups, Mathematical Aspects of Renormalization Group Methods, Members' Seminar, Representation Theory of S_n and $GL(n)$: Recent Approaches, Several Complex Variables, Topology, Unitary Representations of Real Reductive Groups.

In addition to the seminars there have been series of lectures by faculty members as follows:

A. Borel, On L^2 cohomology and intersection cohomology of locally symmetric varieties;

R. Langlands, Unitary representations of $GL(n, \mathbf{R})$, according to Speh;

S. T. Yau, Course in minimal surfaces and related topics.

There were special lectures by the following visitors: J. Arthur, P. Blass, L. Clozel, M. Duflo, R. Durrett, J. Glimm, A. Grünbaum, N. Hitchin, H. Jacquet, P. Li, G. Lusztig, R. Melrose, F. Quinn, L. Simon, E. Viehweg. Additionally, E. Calabi gave a series of lectures on Kähler geometry.

There was a small symposium celebrating Calabi's 60th birthday during which four important lectures were given by S. S. Chern, J. Cheeger, Y-T. Siu, and L. Nirenberg.

The Marston Morse Memorial Lecture was given by Karen Uhlenbeck on Variational methods in gauge field theory, and the Hermann Weyl Lecture Series was given by Michael Freedman in the Topology of four-dimensional manifolds. Gary T. Horowitz, an Albert Einstein Fellow at the School this year, was awarded a first prize by the Gravity Re-

search Foundation of Gloucester, Massachusetts.

The above represents the most visible part of the activities during the academic year 1982-83, but a larger part of the work of the School of Mathematics consisted of informal discussions, active research, and the writing of about 60 papers for publication. Parts of several books were also completed by members during this year. It is clearly impossible to report on them individually. What follows below is the specific research of the Faculty during this period.

Professor Bombieri wrote three papers devoted to the question of diophantine approximations, of which two were in collaboration with present or former members. His overall research has been in the area of transcendental number theory.

Professor Borel was on leave during the spring term. During the fall he gave the series of lectures mentioned above. He organized, in consultation with R. Langlands and A. Knapp, a seminar on unitary representations of reductive groups.

Professor Harish-Chandra has been working actively on harmonic analysis on an affine symmetric space. He attended and addressed the Summer Meeting of the American Mathematical Society held in Toronto, Canada.

Professor Langlands collaborated in organizing a seminar with A. Borel and A. Knapp, and with L. Gross directed the seminar on renormalization group methods. This latter seminar was greatly enhanced by the lectures of D. Amit from the School of Natural Sciences.

Professor Milnor supervised the Topology Seminar and worked on the following topics: foundations of the theory of infinite dimensional Lie groups; dynamical systems over the real numbers (maps of the interval) and over a discrete space (cellular automata); and non-euclidean geometry (the Schläfli differential equality).

Professor Selberg continued his research in analytic number theory and actively supervised the work of several members.

Professor Yau wrote papers in three different directions: in collaboration with B. Wong,

P. Li, and Stephen Yau in the area of eigenvalues of bounded domain and the Schrödinger operator; in collaboration with R. Schoen on manifolds with positive scalar curvature and their applications in general relativity; and in collaboration with N. Mok, J. Jost, and Y-T. Siu on problems in complex geometry. He also organized the following seminars: Members' Seminar, Evolution Equations, Differential Geometry, Classical Relativity (in collaboration with G. Horowitz); and conducted

a Working Seminar in differential geometry and mathematical physics.

Professor Weil continued his work on the history of mathematics, and Professor Whitney continued to study the problems in present-day school mathematics.

The faculty was honored by Professor Langlands receiving the Humboldt Foundation Prize and Professor Whitney being awarded the Wolf Foundation Prize in Mathematics.

The School of Mathematics

Members, Visitors and Assistants, 1982-83

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

Members

Alan C. Adolphson. *Number theory.*

Born 1951, Bellingham, Washington. Western Washington University, BA 1969; Princeton University, PhD 1974.

University of Michigan, assistant professor 1973-74; University of Washington, assistant professor 1974- ; Institute for Advanced Study, member 1978-79.

Maria Welleda Baldoni-Silva. *Representations of real semisimple Lie groups.*

Born 1949, Riva del Garda, Italy. University of Genoa, Laurea 1973; Rutgers University, PhD 1977.

Rutgers University, teaching assistant 1975-77; University of Trent, Italy, professore incaricato 1977-81; University of Paris VII, maître de conférence 1979-80; Institute for Advanced Study, member 1981-82.

Paul R. Blanchard. *Low dimensional dynamical systems.*

Born 1951, Worcester, Massachusetts. Brown University, BA 1973; Yale University, PhD 1978.

Northwestern University, visiting assistant professor 1978; University of Southern California, assistant professor 1978-80; Boston University, assistant professor 1980- .

John S. Bland. *Geometry, several complex variables.*

Born 1952, Ingersoll (Ontario), Canada. Queen's University, Kingston, BS 1974; Carleton University (Ottawa), Canada, MS 1977; University of California at Los Angeles, PhD 1982.

Statistics Canada, Ottawa, research officer 1974-76. University of California at Los Angeles, teaching assistant, 1977- .

Thomas P. Branson. *Group-invariant partial differential equations.*

Born 1953, La Crosse, Wisconsin. University of Chicago, BA 1975, MS 1975; Massachusetts Institute of Technology, PhD 1979.

Purdue University, assistant professor 1979- .

Eugenio Calabi. *Differential geometry.*

Born 1923, Italy. Massachusetts Institute of Technology, BS 1946; University of Illinois, MA 1947; Princeton University, PhD 1950.

Louisiana State University, assistant professor 1951-54; California Institute of Technology, assistant professor 1954-55; University of Minnesota, assistant professor to professor 1955-64; University of Pennsylvania, professor 1964- ; Institute for Advanced Study, member 1958-59, 1979.

Chin-Huei Chang. *Partial differential equations and several complex variables.*

Born 1952, Taiwan, Republic of China. National Taiwan University, BA 1974; Purdue University, PhD 1982.

Purdue University, teaching assistant 1976-82.

Ted C. K. Chinburg. *Number theory.*

Born 1954, Springfield, Missouri. Harvey Mudd College, BS 1975; Harvard University, MS 1979, PhD 1980.

University of Washington, assistant professor 1981-82; University of Pennsylvania, assistant professor 1982- .

Edwin H. Connell. *Commutative algebra and algebraic geometry.*

Born 1931, Anson, Texas. McMurry College, BA 1952; Stanford University, PhD 1958.

Lockheed Missiles, member applied mathematics staff 1956-58, University of Miami; assistant professor 1958-60; Louisiana State University, research associate 1960-61; Institute for Advanced Study, member 1961-63; Brandeis University, research associate 1963-64; Rice University, professor 1964-67; University of California at Berkeley, visiting professor 1967-69; University of Miami, professor 1969- .

J. Brian Conrey. *Analytic number theory.*

Born 1955, Agaña, Guam. University of Santa Clara, BS 1976; University of Michigan, PhD 1980.

University of Illinois, visiting lecturer 1980-82.

Donald M. Davis. *Algebraic topology.*

Born 1945, Fort Knox, Kentucky. Massachusetts Institute of Technology, BS 1967; Stanford University, PhD 1972.

University of California at San Diego, acting assistant professor 1971-72; Northwestern University, assistant professor 1972-74, visiting associate professor 1978-79; Lehigh University, assistant professor 1974-78, associate professor 1978-

Michael Davis. *Topology.*

Born 1949, Norristown, Pennsylvania. Princeton University, BA 1971, PhD 1975.

Massachusetts Institute of Technology, instructor 1974-76; Institute for Advanced Study, member 1976-77; Columbia University, assistant professor 1977-82; Ohio State University, associate professor 1983-

John W. Dawson, Jr. *History of modern logic (Studies of Kurt Gödel).*

Born 1944, Wichita, Kansas. Massachusetts Institute of Technology, BS 1966; University of Michigan, PhD 1972.

Pennsylvania State University, University Park, instructor 1972-75; Pennsylvania State University, York, assistant professor 1975-81, associate professor 1981-

Klas Diederich. *Complex analysis.*

Born 1938, Wuppertal, Germany. University of Göttingen, DrRerNat; University of Münster, Habilitation Mathematik.

University of Göttingen, assistant professor 1968-69; University of Münster, assistant-associate professor 1969-78; University of Wuppertal, professor 1978-; Princeton University, visiting professor 1973-74, 1978-79; University of Paris, Orsay, visiting professor 1977; University of Chicago, visiting professor 1981.

Oguz C. Durumeric. *Differential geometry and its relations to topology.*

Born 1954, Aydin, Turkey. Middle East Technical University, Ankara, Turkey, BS 1976;

State University of New York at Stony Brook, MA 1980, PhD 1982.

James Eells. *Elliptic variational theory.*

Born 1926, Cleveland, Ohio. Bowdoin College, BA 1947; Harvard University, MA 1951, PhD 1954.

Institute for Advanced Study, member 1954-56, 1962-63, 1972, 1977, 1982; Cornell University, professor 1964-69; University of Warwick, Coventry, U.K., professor 1969-

Mark K. Farris. *Partial differential equations.*

Born 1954, Daisetta, Texas. Rice University, BA 1976, PhD 1980.

Princeton University, instructor 1980-82.

Alex J. Feingold. *Kac-Moody Lie algebras.*

Born 1950, Baltimore, Maryland. The Johns Hopkins University, MA 1971; Yale University, PhD 1977.

Drexel University, visiting assistant professor 1977-79; State University of New York at Binghamton, assistant professor 1979-

Allan J. Finkel. *Inverse problems.*

Born 1956, New York, New York. State University of New York at Binghamton, BA 1977; New York University, MS 1977, PhD 1982.

New York University, lecturer 1980-82.

Igor B. Frenkel. *Lie algebras.*

Born 1952, Leningrad, USSR. Leningrad State University, Diploma (MA) 1974; Yale University, PhD 1980.

Yale University, Gibbs instructor 1980-82.

David Gabai. *Low dimensional topology—foliations.*

Born 1954, Philadelphia, Pennsylvania. Massachusetts Institute of Technology, BS 1976; Princeton University, MA 1977, PhD 1980.

Harvard University, assistant professor 1981-82.

Amit Ghosh. *Analytic theory of numbers.*

Born 1956, Ladang Geddes, Malaysia. Imperial College, London, BS 1978; University of Nottingham, England, PhD 1981.

Hubert Goldschmidt. *Differential geometry, partial differential equations.*

Born 1942, New York, New York. Princeton University, BA 1963; Harvard University, MA

1964, PhD 1967; University of Paris, doctorat ès Sc Math 1969.

Stanford University, lecturer 1967, assistant professor 1967-70; Université de Grenoble I, maître de conférences associé 1970-72; Université de Nice, maître de conférences 1972-79, professor 1979- ; Institute for Advanced Study, member 1974-75; Princeton University, visiting professor 1975-77; Rutgers University, lecturer 1977-78; Columbia University 1978-79, visiting scholar 1979-82.

Daniel A. Goldston. *Analytic number theory.*

Born 1954, Oakland, California. University of California at Berkeley, BA 1975, MA 1978, PhD 1981.

University of Minnesota at Duluth, assistant professor 1981-82.

Leonard Gross. *Mathematical physics.*

Born 1931, Brooklyn, New York. University of Chicago, MS 1954, PhD 1957.

Yale University, instructor 1957-59; Institute for Advanced Study, member 1959; Cornell University, assistant professor 1960-64, associate professor 1964-68, professor 1968- .

Ranee K. Gupta. *Algebraic geometry, representation theory combinations.*

Born 1957, Detroit, Michigan. Princeton University, BA 1977; Massachusetts Institute of Technology, PhD 1981.

Brown University, Tamarkin assistant professor of mathematics 1982- .

Akihiko Gyoja. *Representation theory of Coxeter groups and Hecke algebras.*

Born 1952, Osaka, Japan. Osaka University, BS 1975, MA 1977.

Osaka University, assistant 1978- .

Christopher Hooley. *Number theory.*

Born 1928, Edinburgh, United Kingdom. Cambridge University, BS 1952, MA 1956, PhD 1957, ScD 1974.

University of Bristol, lecturer 1958-65; University of Durham, professor 1965-67; University College, Cardiff, professor 1967- .

Gary Horowitz. *General relativity and differential geometry.*

Born 1955, Washington, D.C. Princeton University, BA 1976; University of Chicago, PhD 1979.

University of California at Santa Barbara, postdoctoral fellow 1979-80; Mathematical Institute, University of Oxford, NATO postdoctoral fellow 1980-81; Institute for Advanced Study, member 1981-82.

Rhonda J. Hughes. *Singular perturbations and related problems.*

Born 1947, Chicago, Illinois. University of Illinois at Chicago Circle, BS 1969, MA 1970, PhD 1975.

Tufts University, assistant professor 1975-80; Radcliffe College, fellow of the Bunting Institute 1977-79; Harvard University, visiting scholar 1979-80; Bryn Mawr College, assistant professor 1980- .

Shmuel Kaniel. *Non-linear partial differential equations; statistical mechanics.*

Born 1934, Haifa, Israel. Hebrew University of Jerusalem, MS 1959, PhD 1962.

University of Chicago, instructor 1961-63, assistant professor 1963-64; Stanford University, visiting assistant professor 1964-65; Northwestern University, visiting associate professor 1968-69; University of California at Los Angeles, visiting associate professor 1974-75; University of Victoria, B.C., Canada, visiting scientist 1975-76; Hebrew University of Jerusalem, visiting senior lecturer 1965-66, senior lecturer 1966-69, associate professor 1970-78, professor 1979- .

Martin L. Karel. *Automorphic forms.*

Born 1944, Baltimore, Maryland. The Johns Hopkins University, BA 1966; University of Chicago, MA 1967, PhD 1972.

Institutè for Advanced Study, assistant 1972-73, member 1973-74; University of North Carolina at Chapel Hill, assistant professor 1974-80; Rutgers University at Camden, assistant professor 1980- .

Sheldon H. Katz. *Algebraic geometry.*

Born 1956, Brooklyn, New York. Massachusetts Institute of Technology, BS 1976; Princeton University, PhD 1980.

University of Utah, instructor, 1980-82.

H. Jerome Keisler. *Mathematical logic.*

Born 1936, Seattle, Washington. California Institute of Technology, BS 1959; University of California at Berkeley, PhD 1961.

Institute for Defense Analyses,

mathematician 1961-62, visitor 1982; University of Wisconsin, assistant professor to professor 1962- ; University of California at Los Angeles, visiting professor 1967-68.

Anthony W. Knap. *Representation theory of semisimple Lie groups.*

Born 1941, Morristown, New Jersey. Dartmouth College, BA 1962; Princeton University, MA 1964, PhD 1965. Massachusetts Institute of Technology, C.L.E. Moore Instructor 1965-67; Cornell University, assistant professor to professor 1967- ; Institute for Advanced Study, member 1968-69, 1975-76.

Somaskandan Kumaresan. *Representations of semisimple groups.*

Born 1950, Chidambaram, Tamilnadu, India. Annamalai University, BS 1971, MS 1973; Bombay University, PhD 1982. Tata Institute of Fundamental Research, Bombay.

Peter Landrock. *Representations of finite groups and algebras.*

Born 1948, Horsens, Denmark. Aarhus University, Denmark, Cand. scient. 1972; University of Chicago, PhD 1974. The Royal Society, research stipend 1972-73; Aarhus University, assistant professor 1974-76, associate professor 1976- ; University of Oregon, visiting associate professor 1977.

Ka-Sing Lau. *Wiener's generalized harmonic analysis.*

Born 1948, Canton, China. The Chinese University of Hong Kong, BS 1968; University of Washington, PhD 1972. University of Chicago, instructor 1972-74; University of Pittsburgh, assistant professor 1974-80, associate professor 1980- .

Yuk-J. Leung. *Functions of one complex variable*

Born 1949, Hong Kong. University of Michigan, BS 1974, PhD 1978. University of Hawaii, visiting assistant professor 1978-79; State University of New York at Albany, postdoctoral fellow 1980- .

Elliott H. Lieb. *Mathematical physics.*

Born 1932, Boston, Massachusetts. Massachusetts Institute of Technology, BS 1953;

University of Birmingham, England, PhD 1956.

University of Illinois, research associate 1957-58; Cornell University, research associate 1958-60; IBM Corporation Research Center, staff theoretical physicist 1960-63; Fourah Bay College, Sierra Leone, visiting senior lecturer 1961-62; Yeshiva University, associate professor 1963-66; Northeastern University, professor 1966-68; Massachusetts Institute of Technology, professor 1968-74; Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France, 1972-73; Princeton University, professor 1974- .

Haynes R. Miller. *Homotopy theory.*

Born 1948, Princeton, New Jersey. Harvard University, BA 1970; Princeton University, PhD 1974. Princeton University, instructor 1974-75; Harvard University, assistant professor 1975-79; University of Washington, assistant professor 1979-81; Northwestern University, visiting assistant professor 1976-77, visiting associate professor 1981-82.

Vijayakumar P. Murty. *Number theory.*

Born 1956, Guntur, India. Carleton University, Ottawa, Canada, BS 1977; Harvard University, PhD 1982.

Shinji Niwa. *Automorphic forms; number theory.*

Born 1946, Nagoya, Japan. Nagoya University, BS 1969, MS 1972, PhD 1980. Nagoya City College of Child Education, lecturer 1977-82, assistant professor 1982- .

John C. Polking. *Partial differential equations and several complex variables.*

Born 1934, Carroll, Iowa. Notre Dame University, BS 1956; University of Chicago, MS 1961, PhD 1966. University of Chicago, instructor 1965-66; Brandeis University, instructor 1966-68; Rice University, assistant professor to professor 1968- .

Dinakar Ramakrishnan. *Automorphic forms; number theory.*

Born 1949, Madras, India. University of Madras, India, BS 1970; Polytechnic Institute of Brooklyn, MS 1973; Columbia University, MA 1976, PhD 1980. University of Chicago, L. E. Dickson instructor 1980-82.

Alvany Rocha-Caridi. *Representation theory of Lie algebras.*

Born 1947, Maceio, Brazil. Rutgers University, PhD 1978.

Massachusetts Institute of Technology, instructor 1978-80; Rutgers University, visiting assistant professor 1980-82.

Halsey L. Royden. *Complex analysis.*

Born 1928, Phoenix, Arizona. Stanford University, BS 1948, MS 1949; Harvard University, PhD 1951.

Stanford University, assistant to professor 1951- ; Eidgenössische Technische Hochschule, Zürich, 1958-59, spring 1979; Institute for Advanced Study, member fall 1969, visitor 1974.

Joachim H. Rubinstein. *Geometric topology: minimal surfaces.*

Born 1948, Melbourne, Australia. Monash University, BS 1970; University of California at Berkeley, PhD 1974.

University of Melbourne, research fellow 1975-77, lecturer 1978-80, senior lecturer 1981, professor 1982- .

T. Benny Rushing. *Geometric topology.*

Born 1941, Marshville, North Carolina. Wake Forest University, BS 1964, MA 1965; University of Georgia, PhD 1968.

University of Georgia 1968-69; University of Utah, assistant professor to professor 1969- ; University of Zagreb, Yugoslavia 1975-76, 1983; University of Warwick Mathematics Research Center, England, 1976; Instituto de Matemáticas, Mexico City, 1982.

Chadmark L. Schoen. *Algebraic geometry.*

Born 1954, Los Angeles, California. Haverford College, BA 1975; University of Chicago, PhD 1982.

Paul A. Schweitzer, S.J. *Differential topology, especially foliations.*

Born 1937, Yonkers, New York. College of the Holy Cross, Worcester, Massachusetts, BS 1958; Princeton University, PhD 1962; Weston College, PhL 1966; Weston School of Theology, BD 1970.

University of Notre Dame, assistant professor 1962-63; Fairfield University, assistant professor 1966; Northwestern University, research associate 1966-67; Institute for

Advanced Study, member 1970-71, 1981-82; Pontificia Universidade Católica do Rio de Janeiro, associate professor 1971-72, 1973-76, 1977-80, professor 1980-81, 1983- ; Harvard University, research associate 1972-73; University of Strasbourg, visiting professor 1976.

Diana Shelstad. *Representations of reductive algebraic groups.*

Born 1947, Sydney, Australia. University of Tasmania, BA 1967; Monash University, MS 1969; Yale University, PhD 1974.

Institute for Advanced Study, assistant 1973-75; Columbia University, assistant professor 1975-80; Rutgers University, associate professor 1980- .

Goro Shimura. *Number theory and automorphic forms.*

Born 1930, Hamamatsu, Japan. University of Tokyo, BS 1952, DSc 1958.

Princeton University, professor 1964- ; Institute for Advanced Study, member 1958-59, 1967, 1974-75, 1979.

Warren M. Sinnott. *Algebraic number theory.*

Born 1948, Charlottesville, Virginia. Harvard University, BA 1970; Stanford University, PhD 1974.

Princeton University, lecturer 1974-77, assistant professor 1977-81, Sloan fellow 1978-80; Institut des Hautes Etudes Scientifiques, visitor 1979-80; Rutgers University, visiting associate professor 1981-82; Ohio State University, associate professor 1983- .

Vasudevan Srinivas. *Algebraic geometry and K-theory.*

Born 1958, Delhi, India. Bangalore University, BSc 1977; University of Chicago, PhD 1982.

Robert W. Thomason. *Algebraic K-theory.*

Born 1952, Tulsa, Oklahoma. Princeton University, PhD 1977.

Massachusetts Institute of Technology, Moore instructor 1977-79, lecturer 1980-82; University of Chicago, Dickson assistant professor 1979-80.

Jerrold B. Tunnell. *Automorphic forms and representations*

Born 1950, Dallas, Texas. Harvey Mudd

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College, BS 1972; Harvard University, PhD 1977.

Princeton University, instructor 1977-80, assistant professor 1980- .

Jeffrey D. Vaaler. *Analytic number theory.*

Born 1948, Grand Forks, North Dakota.

Lawrence University, BS 1970; University of Illinois at Urbana, MS 1971, PhD 1974.

University of Nottingham, visiting associate professor 1973-74; California Institute of Technology, Bateman research instructor 1974-76; University of Texas, assistant professor 1976-82, associate professor 1982- .

Erik P. van den Ban. *Harmonic analysis on semisimple Lie groups.*

Born 1956, Eindhoven, Netherlands.

University of Utrecht, Dr 1978, Dr 1982.

State University of Utrecht, assistant 1978-82.

Lou van den Dries. *Applications of Logic.*

Born 1951, Ens, Netherlands. State

University of Utrecht, Dr 1978.

Yale University, Gibbs instructor 1979-81; Stanford University, assistant professor 1981- .

Andrei Verona. *Differential topology.*

Born 1943, Bucharest, Romania. University of Bucharest, MA 1966, PhD 1971.

Institute of Mathematics, Bucharest, researcher 1967-75; INCREST, Department of Mathematics, senior researcher 1977-81; Max Planck Institute for Mathematics, Bonn, visiting professor 1982.

Pit-Mann Wong. *Several complex variables.*

Born 1949, Swatow, Canton, China.

National Taiwan University, BS 1971, University of Notre Dame, PhD 1976.

Tulane University, assistant professor, 1976-77, assistant professor 1978-80; Rice University, assistant professor 1977-78; University of Notre Dame, associate professor 1980-82.

Assistants

King Fai Lai. *Automorphic forms.*

Born 1948, Hong Kong. Yale University, PhD 1974.

Chinese University, Hong Kong, lecturer 1978- ; Institute for Advanced Study, assistant to Professor Robert P. Langlands 1982-83.

Hsin-sheng Tai. *Differential geometry.*

Born 1937. Nanjing, China. National Taiwan University, BS 1960; Northwestern University, PhD 1967.

Brown University, instructor 1967-69; University of Saskatchewan, assistant professor 1969-71; Nankai University, lecturer 1972-74; Academia Sinica, associate professor 1974- ; Institute for Advanced Study, assistant to Professors Deane Montgomery and André Weil 1982-83.

Ilan Vardi. *Automorphic forms—number theory*

Born 1957, Paris, France. McGill University, BS 1978; Massachusetts Institute of Technology, PhD 1982.

Institute for Advanced Study, assistant to Professor Atle Selberg 1982-83.

Silei (Sze-Rei) Wang. *Harmonic analysis and related fields*

Born 1933, Soozhou, People's Republic of China. Chekiang University, graduated 1953.

Hangzhou University, associate professor 1978, professor 1981; Beijing, director of PhD candidates in mathematics 1981; Aligarh Muslim University, India, examiner to assess PhD candidates 1982. Institute for Advanced Study, assistant to Professor Shing-Tung Yau 1982-83.

Visitors

Nils Andreas Baas. *Topology.*

Born 1946, Arendal, Norway. University of Oslo, PhD 1969.

Aarhus University, 1968-69, research assistant 1970-71; University of Virginia, visiting assistant professor 1971-72, Institute for Advanced Study, member 1972-74; University of Trondheim, professor; University of California at Berkeley.

William Browder. *Topology.*

Born 1934, New York, New York. Massachusetts Institute of Technology, BS 1954; Princeton University, PhD 1958.

University of Rochester, instructor 1957-58; Cornell University, assistant to associate professor 1958-63; Institute for Advanced Study, member 1963-64, spring 1975; Princeton University, professor 1964- ; University of Paris, professeur associé 1967-68; Harvard University,

visiting fellow 1974; University of Oxford, fellow 1978-79.

Demetrios Christodoulou. *Mathematical relativity.*

Born 1951, Athens, Greece. Princeton University, MA 1970, PhD 1971.

California Institute of Technology, research fellow 1971-72; University of Athens, professor 1972-73; European Center for Nuclear Research, visiting scientist 1974; International Center for Theoretical Physics, Trieste, visiting scientist 1974-76; Max Planck Institute for Astrophysics, member 1976- ; Courant Institute of Mathematical Sciences, New York University, visiting member 1981- .

Jacob C. E. Dekker. *Recursive equivalence types.*

Born 1921, Hilversum, The Netherlands. Syracuse University, MA 1949, PhD 1950.

Syracuse University, instructor 1950-51; University of Chicago, instructor 1951-52, visiting assistant professor 1955-56; Northwestern University, instructor 1952-54, assistant professor 1954-55; Institute for Advanced Study, member 1956-58, 1967-68; University of Kansas, associate professor 1958-59; Rutgers University, assistant professor to professor 1959- .

Joseph Lehner. *Automorphic forms; analytic number theory.*

Born 1912, New York, New York. New York University, BS 1938; University of Pennsylvania, MA 1939, PhD 1941.

Cornell University, instructor 1941-43; University of Pennsylvania, associate professor 1949-52; Michigan State University, professor 1957-63; University of Maryland, professor 1963-72, professor emeritus 1972- ; University of

Pittsburgh, Mellon professor 1973-79, professor emeritus 1979- ; Institute for Advanced Study, visitor fall 1975.

James V. Peters. *Integral transforms.*

Born 1944, New York, New York. Polytechnic Institute of New York, BS 1965, MS 1967; Stevens Institute of Technology, PhD 1976. Saint Bonaventure University, assistant professor 1976-78; State University of New York at Purchase, assistant professor 1978-80; Long Island University, assistant professor 1980- .

Earl J. Taft. *Hopf algebras.*

Born 1931, New York, New York. Amherst College, BA 1952; Yale University, MA 1953, PhD 1956.

Columbia University, instructor 1956-59; Rutgers University, assistant professor to professor 1959- ; Institute for Advanced Study, member 1969, 1973, 1978.

Mina Teicher. *Algebraic geometry.*

Born 1950, Tel Aviv, Israel. Tel Aviv University, BS 1974, MA 1976, PhD 1981.

Tel Aviv University, assistant 1975-78, instructor 1979-81.

Marvin Tretkoff. *Riemann surfaces and topological methods in combinatorial group theory.*

Born 1943, Brooklyn, New York. New York University, BA 1964, MA 1966, PhD 1971.

University of Oxford, Mathematical Institute, visiting mathematician 1975-76; Princeton University, visiting fellow 1978-79; Stevens Institute of Technology, assistant professor to professor 1969- ; Institute for Advanced Study, visitor 1973, 1976, 1977, 1981.

The School of Natural Sciences

Faculty

Stephen L. Adler
(New Jersey Albert Einstein Professor)
John N. Bahcall

Roger Dashen
Freeman J. Dyson

Visiting Professor

Martin Rees

Permanent Member

Julian H. Bigelow

Members with Long-term Appointments

Michael Dine
Piet Hut

Tsvi Piran

Herman H. Goldstine
Otto E. Neugebauer

The School of Natural Sciences

In the early years of the Institute there was no formal division between mathematics and physics. Einstein himself and other great physicists such as Pauli, Dirac and Bohr who came as members belonged to the School of Mathematics. The School of Mathematics had Hermann Weyl, equally great as mathematician and physicist, to hold the two disciplines together. Unfortunately Weyl had no successor. He was the last in the great line of mathematician-physicist-philosophers which began with Descartes and Newton. After Weyl's death, his dream of unifying mathematics and physics within the School of Mathematics was gradually abandoned.

When J. Robert Oppenheimer became Director of the Institute in 1947, he began immediately to collect a group of young physicists working in the new areas of particle physics that had come into flower in the early postwar years. C. N. Yang and T. D. Lee were appointed professors, and they gave vigorous leadership to the work in particle physics. Yang was a member of the Institute's Faculty when he and Lee did the work for which they received the Nobel Prize in physics. A number of visiting members and professors of the Institute have received Nobel Prizes and other major awards.

The twenty years from 1960 to 1980 were a period of transition for the work in the natural sciences at the Institute. The particle physics group was enlarged first by the addition of astronomers led by Bengt G. Strömgren. After years of de facto independence, the School of Natural Sciences was formally established in 1966. The Faculty of the School which Oppenheimer had assembled began to disperse in the 1960's, with only two professors—Freeman J. Dyson and Tullio Regge—remaining from that period. Between 1967 and 1971, four new professors were appointed—Marshall N.

Rosenbluth in plasma physics, Stephen L. Adler and Roger Dashen in high energy physics, and John N. Bahcall in astrophysics. The present Faculty gives the School both a wider range and a more intimate engagement with experimental work than was the case in earlier years.

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

experimental facilities vital to the whole of science.

Bounded by design and tradition as well as by budgetary realities, the School has come to concentrate on three fundamental areas: the physics of the very small (meaning elementary particle physics, high energy physics and field theory), the physics of the very large (astrophysics and general relativity) and the physics of very complex fine 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 gravitational radiation.

Changing observational methods have also led to the discovery or prediction of new astronomical objects such as neutron stars (which Oppenheimer predicted), black holes, pulsars (later identified as neutron stars), quasi-stellar objects such as quasars as well as the continuing study of old familiars such as novae, supernovae and white dwarfs. Of equal interest has been the study of the interstellar medium, important because of its influence on the transmission of radiation signals, and the cosmic blackbody radiation, which is believed to be the remains of radiation which once filled the universe in an earlier, hotter stage of its expansion. For astrophysicists,

general relativity theory thus assumes great importance as they come to grips with the gravitational effects of very large masses. Small well-known deviations from Newtonian predictions within the solar system have been delineated by general relativity theory, but its greatest importance lies in the physics of neutron stars, black holes and theories of cosmic evolution. These revolutionary developments in astronomy have rekindled the interest in general relativity, so that Einstein's work remains at the edge of contemporary science as a vigorous research frontier.

Under these rather sweeping rubrics, the work of the School of Natural Sciences concentrates on particular areas: neutrino astronomy, galactic evolution, 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 attention 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 observatory in space.

The third major subject, the physics of very complex finite systems, divides into two areas. These are statistical mechanics and the many-body problem, which is concerned with various equilibrium properties of matter in bulk, such as stability, thermodynamic properties and the like; and dynamical system theory which examines the special properties of matter far from equilibrium. The Institute has a long tradition in statistical mechanics and has recently been developing a new effort in dynamics. The latter has several links with computer science and it is likely that the School will move in this direction also.

Academic Activities, 1982-83

A. Particle Physics

This past year was a very active one in particle physics, with significant developments

in lattice gauge theories and their numerical study, in unified models and their supersymmetric extensions, and in general relativity and gravitation.

Daniel Amit, in collaboration with Anne Davis, investigated the mechanism of symmetry breaking and restoration in a class of model field theories (the non-compact, non-linear sigma-models) which are believed to behave similarly to supergravity theories. They showed that symmetry restoration does not lead to mass generation, casting doubt on the conjecture that this is the case in $N=8$ supergravity.

Gyan Bhanot returned from CERN in April. Together with Urs Heller and a CERN collaborator he developed a promising new method for doing Monte Carlo simulation calculations involving fermions. With Nathan Seiberg and several outside collaborators he made a detailed study of lattice theta vacua.

John Breit, Subhash Gupta and Alexander Zaks worked on several projects in collaboration. They extended the method of stochastic quantization of Parisi and Wu to field theories that include fermions and that are supersymmetric. They then turned to a detailed study of the so-called new inflationary universe in which symmetry-breaking arises from a Coleman-Weinberg potential, and showed that bubbles do not smoothly evolve to a minimum with the correct symmetry properties of the physics observed at low energies. Hence the new inflationary scenario does not solve all cosmological problems.

Davis, Michael Dine and Seiberg studied the massless limit of supersymmetric quantum chromodynamics, by using simple arguments to construct the general form of the effective Lagrangian. In agreement with Edward Witten's index argument, they showed that the model with non-zero quark mass has at least N supersymmetric vacua, where N is the number of colors. These vacua move to infinity as the quark mass approaches zero. They studied the possibility of supersymmetry breaking at zero quark mass.

Dine collaborated with Willy Fischler of the University of Pennsylvania on a new model for the Peccei-Quinn axion, in which the ax-

ion is light and very weakly coupled. This resolves some of the cosmological problems connected with earlier axion models. With Fischler, he studied the breaking of the $SU(2) \times U(1)$ weak-electromagnetic gauge symmetry in supersymmetric unified models. They focus on models where supersymmetry is broken at an intermediate scale, showing how decoupling of the heavy sector operates, and giving conditions on the Higgs mass matrix for obtaining the correct pattern of symmetry breaking. He also collaborated with Seiberg and Ian Affleck in an important study of dynamical supersymmetry breaking, as described below.

Herbert Hamber wrote a number of papers dealing with aspects of lattice gauge theories and their numerical analysis by Monte Carlo methods. With Chi-Min Wu, he proposed an improved fermion action on the lattice by adding a next nearest neighbor interaction term to the usual Wilson action. Using this action, they discussed the axial-vector anomaly, showing that for finite lattice spacing the improved fermion action gives a more reasonable value for the anomaly contribution at finite quark mass than the Wilson action. With Heller, Hamber studied glueball mass estimates in lattice chromodynamics, giving estimates of the mass of the lowest glueball state. Working with several outside collaborators, Hamber studied various considerations on the numerical analysis of chromodynamics, including methods for including dynamical fermions, and the strategy for removing the quenched approximation and for minimizing statistical and systematic errors. In another direction, Hamber showed that after formal integration over fermion fields, a lattice gauge theory with fermions at infinite coupling reduces to the Wilson pure gauge theory. At the sixth International Congress on Mathematical Physics, Hamber gave a plenary review of the status of numerical simulations of chromodynamics.

Heller worked on several projects in addition to the collaborations described above. With Seiberg, he carried out a numerical simulation of metastable states near a first-order phase

transition, and gave a detailed discussion of the convexity properties of the effective potential. With Herbert Neuberger, he studied large- N matrix and chiral models in a series of papers, following up earlier work in which they showed that the Eguchi-Kawai model must be modified by a quenching prescription in order to correctly reproduce the large- N limit of gauge theories.

Chiara Nappi worked on supersymmetric models, showing that in the large- N limit, supersymmetric non-asymptotically free field theories are perfectly consistent as low energy effective theories. In collaboration with Witten and Gregory Adkins of Princeton University she studied static properties of nucleons in the Skyrme model, in which the solitons can be interpreted as the baryons of chromodynamics. Numerical solution of the model gives results in reasonable agreement with experimental values, both in the limit of exact chiral symmetry and in the case in which an explicit chiral breaking term is included so that the pion gets a mass.

Neuberger worked in several different areas. In addition to the collaborations described above, he studied with Stephen Adler the differences between confinement in the large- N and the quasi-Abelian approximations, which suggest that large- N confinement is not related to the physics of the string or bag models. Finite temperature and topological aspects of large- N gauge theories were studied in other papers. Finally, Roger Dashen and Neuberger made a very interesting proposal for bounding the Higgs mass in the Weinberg-Salam weak interaction model, by exploiting the fact that the Higgs sector by itself is a trivial interacting field theory in the limit as the ultraviolet cutoff becomes infinite. They suggested a numerical experiment for estimating the energy at which the Higgs particle, or new physics, must be found.

Donald Neville gave an improved method for deriving the approximate formula for the Feynman propagator in curved spacetime, by using a compact matrix technique.

Burt Ovrut continued his work on the supersymmetric grand unified models. In col-

laboration with Stuart Raby of Michigan, he generalized a class of O’Raifeartaigh models with Witten’s inverted gauge hierarchy to $N = 1$ supergravity.

Tsvi Piran continued a collaboration with Adler on numerical studies of nonlinear dielectric models of quark confinement. They determined the static potential in models in which radiative corrections to leading log order, and to leading log log order, are retained in the gauge gluon effective action functional. They also wrote a review article, for *Reviews of Modern Physics*, describing the application of relaxation methods to this and similar problems. In collaboration with Robert Wald of Chicago, Piran derived an order of magnitude estimate for the rate at which thermal fluctuations in a box filled with radiation will produce black holes. In a talk delivered at the Marcel Grossmann Meeting in Shanghai, Piran gave a review of coordinate conditions and their implementation in numerical relativity.

In addition to the collaborations with Bhanot, Heller, Dine and Davis described above, Seiberg carried out an important investigation of dynamical supersymmetry breaking with Dine and with Affleck of Princeton University. They showed that instantons generate a superpotential in supersymmetric chromodynamics with N colors and $N-1$ flavors, demonstrating that there can be a nonperturbative breakdown of the perturbative nonrenormalization theorems.

Lee Smolin worked on a number of topics connected with quantum gravitation. In an essay which won second prize in the Gravity Research Foundation annual competition, he analyzed the thermodynamics of gravitational radiation, showing that a system containing gravitational radiation cannot attain thermal equilibrium in any finite time. In a long collaboration with John Dell of Austin, he analyzed the Hamiltonian quantization of a class of gauge theories with independent metric and connection fields, so that the gauge group is generalized to $SL(N, C)$. These theories have second class constraints, and they had to construct a modified Faddeev-Popov ansatz to get a relativistic functional integral

on configuration space. In work on the foundations of quantum mechanics, Smolin analyzed the distinction between quantum and thermal fluctuations in systems where gravitational effects are important, discussed the many worlds interpretation of quantum mechanics in the context of quantum gravity, and gave a new kind of hidden variable theory from which quantum mechanics can be derived as a large-particle number limit.

Andrew Strominger carried out a number of investigations in quantum gravity. He studied the expansion of quantum gravity in a series, using the inverse number of dimensions ($1/D$) or the inverse number of matter fields ($1/N$) as the expansion parameter. With Gary Horowitz (Institute for Advanced Study, School of Mathematics), he investigated the origin and physical interpretation of Witten’s integral expression for gravitational energy, showing that it naturally arises from a Hamiltonian treatment of “classical supergravity.” With David Boulware (University of Washington) and Horowitz, he established an important Zero-Energy Theorem for higher derivative gravity theories, which states that all exact solutions representing isolated systems have precisely zero energy. This result also holds in the presence of arbitrary matter, and can be understood as resulting from a confinement of energy. It suggests that some of the problems with the perturbation theory of higher derivative gravity may be artifacts of the perturbation expansion, related to the linearization instability of higher derivative theories.

In addition to the collaborative work with Piran and Neuberger described above, Adler gave several conference talks which were subsequently written up, on quark statics and on induced gravitation.

Dashen, in addition to his collaborations with members studying lattice gauge theory, continued an ongoing research program dealing with scattering in random media. He derived a general form for the distribution of intensity in a medium with a random index of refraction. From it, one can see why the K distribution is phenomenologically useful, but

also that it requires corrections. In collaboration with Walter Munk of the Scripps Institution, he presented a simple theory of ocean noise generated by distant dipole sources.

B. Astrophysics

Lively discussions continued at coffee hours and lunches, especially the weekly informal seminar luncheons. Senior visitors this year included Martin Rees (Cambridge University), James Binney (Oxford University), George Field (Harvard University), Jan Oort (University of Leiden), Donald Osterbrock (University of California at Santa Cruz), William Press (Harvard University) and Frank Shu (University of California at Berkeley) representing broad and varied backgrounds in the academic world.

John Bahcall concentrated on the determination of the total amount of matter in the vicinity of the Sun. He solved numerically the combined non-linear Poisson-Boltzman equation for the gravitational potential generated by a realistic Galaxy model. The basic result obtained by comparison with the distribution of tracer stars perpendicular to the galactic plane is that about half of the total amount of matter that is present near the Sun has not yet been detected other than by its gravitational pull. The new aspects of this work include a fully self-consistent solution of the combined non-linear equation, the inclusion of realistically many galactic components (including a massive halo and many different disk components), and the limitation of the analysis to a region of space in which the tracer stars are known to be uncontaminated. Bahcall (with workers at Brookhaven, the Max Planck Institutes of Heidelberg, and the Weizmann Institute) continued to investigate the implementation of a large scale gallium solar neutrino experiment.

During the past year, David Gilden worked primarily on the numerical simulation of fluid and plasma flow. A long-term project with Stuart Shapiro (Cornell University) was completed in which the gravitational radiation from the direct collision between two neutron stars

was calculated. With Toshi Tajima (University of Texas at Austin), Gilden simulated magnetic field reconnection in a differentially rotating disk and found a possible explanation for the quasi-periodic oscillations observed in dwarf novae. With J. Bahcall, Gilden began a project in which the dynamical assumptions involved in the evaluation of the Oort limit will be evaluated by explicitly integrating the orbits of an ensemble of test stars. In addition, Gilden has been writing a series of papers on the interstellar medium that remain from his dissertation research.

Pier Hut continued a long-term project to determine gravitational scattering cross sections for the three-body problem, started here the previous year in collaboration with J. Bahcall. One of the applications of three-body scattering is the formation of cataclysmic binaries in globular clusters, which was investigated together with Frank Verbunt (Cambridge University, United Kingdom). He worked on several other problems including a study of the stability of the vacuum (with Martin Rees), the investigation of the observational effects of core collapse in globular clusters (with Haldan Cohn, Urbana, Illinois), and the investigation of the conservative hypothesis that the dark matter in the universe consists of neutrinos of known type (with Simon White, University of California at Berkeley).

Arieh Königl worked on a number of subjects in theoretical high-energy astrophysics. During the year he investigated the nature of the radio nebula W50 surrounding the galactic jet source SS433. In collaboration with Jean Brodie and Stuart Bowyer (University of California at Berkeley), he interpreted the optical emission knots recently discovered in the inner jet of Centaurus A and also considered the line-excitation mechanism and the origin of the optical continuum emission.

Nikolaos Kylafis worked in three areas. He predicted from the theoretical arguments that interstellar radio-frequency absorption lines in the millimeter and centimeter domain are under certain conditions both linearly and circularly polarized (with Paul Shapiro, Univer-

sity of Texas). He calculated the amount of linear polarization expected in such lines if they are seen in the direction of H II regions, supernova remnants, and hot cores of molecular clouds. Also completed (with Don Lamb, Harvard University) was an analytic model calculation of the ionization structure of matter accreting onto a degenerate dwarf. Kylafis and J. Bahcall devised a method to infer the dust distribution in spiral galaxies (seen edge-on) from their surface photometry. The method was applied successfully to the galaxy NGC 891.

Jan Oort completed an important review article on the latest scale structures in the universe.

Donald Osterbrock continued his fundamental research on active galactic nuclei. He investigated the role of charge transfer reactions involving [O III] ions in Seyfert galaxies (with Ovid Dahari, Lick Observatory and Jan Ekberg, University of Lund), presented a systematic study of the spectra of the Seyfert galaxies (with Dahari, Lick Observatory) and wrote an important review of the observational structure of active galactic nuclei. Osterbrock also completed a book, *James E. Keeler, Pioneer American Astrophysicist—and the Early Development of American Astrophysics*, during his visit to the Institute.

Wayne Roberge carried out theoretical studies of processes in the interstellar medium. He devised a way of studying cosmic ray-induced emission in the electronic band systems of molecules, which may be the dominant source of ionization deep in the clouds (with Sheo Prasad, Jet Propulsion Laboratory). Roberge also continued a study of atomic and molecular processes in magnetohydrodynamic shock waves (with Bruce Draine, Princeton University Observatory) and with Alex Dalgarno (Harvard University) calculated absorption oscillator strengths for the electric dipole transitions of the HD molecule.

Raymond Soneira divided his time between two projects: star counts and galactic structure with J. Bahcall and superclustering and cosmology with Neta Bahcall. In the area of star counts, J. Bahcall and Soneira analyzed

data from many observers in terms of the Bahcall-Soneira Galaxy model and found excellent agreement between observations and the model in both the number of stars and their distribution in color.

In the area of superclustering, N. Bahcall and Soneira completed work on a catalog of superclusters for $z < 0.1$ that are identified by their density enhancement in space, using a complete redshift sample of Abell clusters. An analysis was continued of the large peculiar velocities found for Abell clusters within superclusters, typically 2000 km sec^{-1} , as well as work on another surprising result: the strong variation of clustering strength with the richness of the cluster system. They also studied the geometry of the clustering using percolation theory and related methods.

Linda Sparke spent most of 1982-83 working on models for the warps which are observed in the disks of many spiral galaxies. Isolated galactic disks have long been thought to be incapable of sustaining persistent warps; however, the visible disk contains only a fraction of the galactic mass, the rest being found in an invisible galactic halo. She showed that if the halo matter is distributed in one of two ways, the disk has a discrete mode of vibration, and can maintain a warp until dissipative processes become important. The dark mass must either become rapidly more flattened at large radii, or must be prolate (cigar-shaped), otherwise the disk has no discrete modes of vertical bending, and cannot maintain a long-lived warp (unless the edge is sharply truncated). Computed mode shapes which resemble the observed warps can be found for halo masses consistent with those inferred from galactic rotation curves.

Jens Villumsen investigated the vertical growth and structure of systems like the disk of our galaxy. The physical mechanism for the evolution is the scattering of stars out of the plane due to Giant Molecular Clouds (GMCs) originally proposed by Spitzer and Schwarzschild in 1951. He found that the vertical growth of the disk can be characterized by a random walk in phase space with a diffusion coefficient that is time independent.

During his four-month stay, Frank Shu worked on ambipolar diffusion in self-gravitating isothermal layers. He formulated a solution to the problem of the drift of magnetic field and ions embedded in a self-gravitating layer of neutral isothermal gas, assuming quasi-magnetohydrostatic equilibrium and local ionization equilibrium. He also studied the collective effects in planetary rings arising from the self-gravity of the ring material, including spiral density waves and spiral bending waves.

C. Mathematical Physics

The mathematical physics group this year consisted of only two members, Elliott Lieb and Vincent Rivasseau, but they made up in quality for what they lacked in quantity. Lieb, visiting the Institute on leave from Princeton University, worked on mathematical problems connected with the spectra of many-electron systems. The culmination of his work was a proof that a negative ion cannot exist with a net charge greater than its nuclear charge. The simplest case of this theorem says that a double-negative hydrogen ion cannot exist, thereby settling one of the famous unsolved problems of atomic physics. Lieb also finished an important mathematical work in which he proved the existence of sharp con-

stants for the Hardy-Littlewood-Sobolev and related inequalities.

Rivasseau, visiting the Institute from France, worked on the problem of proving Borel summability for the perturbation-theory series in quantum field theories. This is one of the most important problems in particle physics. If a theory is Borel summable, it means that the consequences of the theory can in principle be calculated to any desired accuracy, so that the theory can be unambiguously tested by experiment. If a theory is not Borel summable, we do not know whether its consequences are accurately calculable or whether it may need additional physical hypotheses to make it experimentally testable. Rivasseau succeeded in proving Borel summability for the so-called "planar model" of four-dimensional field theory. He failed to prove summability, in spite of strenuous efforts, for a physically realistic four-dimensional theory. It remains to be seen whether the Borel summation method can succeed for any theory which has a hope of being a correct description of nature.

Freeman Dyson spent the greater part of this year taking a holiday from physics and writing a book about the problems of weaponry and arms-control. The book will be published in Spring 1984.

The School of Natural Sciences

Permanent Member, Members with Long-term Appointments, Members and Visitors, 1982-83

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- ; Institute for Advanced Study, member 1981-82.

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

Piet Hut. *Astrophysics, stellar dynamics.*

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.

Otto Neugebauer. See page 27 for biographical entry.

Tsvi Piran. *General relativity and relativistic astrophysics.*

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, assistant professor 1979; Institute for Advanced Study, member 1980- .

Raymond M. Soneira. *Astrophysics.*

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

CBS Television Network, consultant 1967-70; Princeton University, research assistant 1972-73, assistant in instruction 1973-74, research assistant 1974-78; Institute for Advanced Study, long-term member 1978-83.

Stephen Wolfram. *Theoretical physics.*

Born 1959, London, England. California Institute of Technology, PhD 1979.

California Institute of Technology, senior research associate 1979-82.

Members

Daniel Amit. *Field theory; critical phenomena.*

Born 1938, Lodz, Poland. University of Jerusalem and Weizmann Institute, MS 1961; Brandeis University, PhD 1966.

Hebrew University, lecturer 1967-69, senior lecturer 1971-73, associate professor 1973-75, professor 1978- ; Brandeis University, assistant professor 1969-71; Centre d'Etudes Nucléaires de Saclay, France, senior visiting scientist 1975-76.

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- .

Gyan Bhanot. *Particle physics.*

Born 1952, Baroda, India. University of Baroda, India, MS 1972; State University of New York, MA 1975; Cornell University, PhD 1980.

Brookhaven National Laboratory, research associate 1979-81. Institute for Advanced Study, member 1981-82.

James J. Binney. *Theoretical astrophysics.*

Born 1950, London, England. University of Cambridge, BA 1971; University of Oxford, DPhil 1975.

University of Oxford, Magdalen College, fellow 1975-79; Princeton University, visiting assistant professor 1979-81; University of Oxford, Merton College, lecturer and fellow 1981- .

John D. Breit. *Theoretical physics.*

Born 1952, Philadelphia, Pennsylvania. Yale University, BS 1974; Columbia University, MA 1977, PhD 1982.

Columbia University, research assistant 1977-81.

Anne Davis. *Theoretical particle physics.*

Born 1951, United Kingdom. London University, BSc 1972; Bristol University, PhD 1975.

Bristol University, research assistant 1975-76; Durham University, research assistant 1976-78; Imperial College, research assistant 1978-80; Centre Européen de la Recherche Nucléaire, research fellow 1980-82.

George Field. *Theoretical astrophysics.*

Born 1929, Providence, Rhode Island. Massachusetts Institute of Technology, BS 1951; Princeton University, PhD 1955.

Harvard University, Society of Fellows, junior fellow, 1955-57; Princeton University, assistant professor 1957-62, associate professor 1962-65; University of California at Berkeley,

professor 1965-72; Harvard University, professor 1972- ; Smithsonian Astrophysics Observatory, director 1973-82, senior physicist 1982- ; Harvard College Observatory, director 1973-82; Center for Astrophysics, director 1973-82.

David L. Gilden. *Astrophysics.*

Born 1954, St. Louis, Missouri. University of Wisconsin at Madison, BA 1974; University of Texas at Austin, MA 1979, PhD 1982.

Subhash Gupta. *Elementary particle physics.*

Born 1955, Jaipur, India. Birla Institute of Technology and Science, India, MSc 1976; Columbia University, MA 1977, PhD 1980.

Stanford Linear Accelerator Center, research associate 1980-82.

Herbert Hamber. *Theoretical physics.*

Born 1953, Milan, Italy. University of Milan, BS 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.

Urs M. Heller. *High energy physics.*

Born 1953, Zurich, Switzerland. Eidgenössische Technische Hochschule, Diploma in Physik 1977; Rutgers University, PhD 1981.

Institute for Advanced Study, member 1981-82.

Arieh Konigl. *Theoretical astrophysics.*

Born 1951, Jerusalem, Israel. University of California at Berkeley, BS 1975; California Institute of Technology, MA 1978, PhD 1980.

California Institute of Technology, teaching assistant 1976-78, research assistant 1978-80; University of California at Berkeley, research associate 1980-82.

Nikolaos D. Kylafis. *Astrophysics.*

Born 1949, Nea Avorani, Trihonidos, Greece. University of Patras, Greece, Pthio 1971; University of Illinois, MS 1973, PhD 1978.

University of Illinois, research associate 1979; California Institute of Technology, 1979-81; Institute for Advanced Study, member 1981- .

Elliott Lieb. See page 42 for biographical entry.

Chiara R. Nappi. *Constructive field theory and particle physics.*

Born 1948, Naples, Italy. University of Naples, Laurea 1972, Diploma Scuola di Perfezionamento, Naples, 1976.

University of Naples, Contrattista 1972-76; University of Oslo, Vitenskapelig assistent 1974; Harvard University, lecturer 1978-79; Institute for Advanced Study, member 1981-82.

Herbert Neuberger. *Particle physics.*

Born 1949, Cluj, Rumania. Tel Aviv University, BS 1974, PhD 1980.

University of California at Berkeley, research associate, 1978-81; Institute for Advanced Study, member 1981-82.

Daniel E. Osterbrock. *Active galactic nuclei and biography of James E. Keeler.*

Born 1924, Cincinnati, Ohio. University of Chicago, PhB 1948, BS 1948, MS 1949, PhD 1952.

Princeton University, instructor 1952-53; California Institute of Technology, instructor and assistant professor 1953-58; University of Wisconsin, assistant professor to professor 1958-73; University of California at Santa Cruz, Lick Observatory, director and professor 1973- ; Institute for Advanced Study, member 1960-61.

Burt A. Ovrut. *Theoretical particle physics.*

Born 1946, New York, New York. McGill University, BS 1967; University of North Carolina, MSc 1973; University of Chicago, PhD 1978.

Brandeis University, research associate 1978-80; Institute for Advanced Study, member 1981-82.

Vincent Rivasseau. *Mathematical physics: quantum field theory and statistical mechanics.*

Born 1955, Talence, France. University of Paris VII, Maîtrise in Mathematics 1975; University of Paris VI, Maîtrise in Physics 1976, Diplôme d'Etudes Approfondies in Physics 1977, Thèse d'Etat en Sciences Physiques 1980.

Centre de Physique Théorique, Ecole Polytechnique, research associate 1979-81; Institute for Advanced Study, member 1981-82.

Wayne Roberge. *Interstellar matter.*

Born 1954, Northampton, Massachusetts. Williams College, BA 1976; Harvard University, PhD 1981.

Institute for Advanced Study, member 1981- .

Nathan Seiberg. *Theoretical particle physics.*

Born 1956, Israel. Tel Aviv University, BS 1977; Weizmann Institute of Science, PhD 1982.

Frank H. Shu. *Origin of the solar system.*

Born 1943, Kunming, People's Republic of China. Massachusetts Institute of Technology, BS 1963; Harvard University, PhD 1968.

State University of New York at Stony Brook, assistant professor 1968-71, associate professor 1971-73; Massachusetts Institute of Technology, senior research associate 1971; University of California at Berkeley, associate professor 1973-76, professor 1976- .

Lee Smolin. *Quantum theory of gravity.*

Born 1955, New York, New York. Hampshire College, BS 1975; Harvard University, MA 1978, PhD 1979.

Institute for Advanced Study, member 1979, 1981-82; University of California at Santa Barbara, research associate, spring 1980, 1980-81.

Linda S. Sparke. *Astrophysics.*

Born 1955, London, England. University of Cambridge, BA 1977; University of California at Berkeley, MA 1979, PhD 1981.

Institute of Astronomy, University of Cambridge, postdoctoral fellow 1981- .

Andrew E. Strominger. *Particle physics, quantum gravity.*

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

Massachusetts Institute of Technology, research assistant, 1979-81; Institute for Advanced Study, member 1981-82.

Jens V. Villumsen. *Astrophysics, galaxy dynamics.*

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

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.

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

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

Tel Aviv University, instructor and research fellow 1977-82.

Visitors

Kenneth Case. *Mathematical physics.*

Born 1923, New York, New York. Harvard University, BA 1945, MA 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, 1978-82.

Walter Dittrich. *Theoretical physics: quantum field theory.*

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

Brown University, teaching assistant 1965-66; Karlsruhe University, teaching assistant 1966-67; Massachusetts Institute of Technology, instructor 1969-71; Institute for Advanced Study, visitor 1972-73, 1978-79; University of Tübingen, research associate 1971-75, professor 1975- .

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- .

Donald Neville. *Quantization and phenomenology of gravity theories with torsion.*

Born 1936, Los Angeles, California. University of Chicago, PhD 1962.

Temple University, professor 1967- .

Jan H. Oort. *Astrophysics.*

Born 1900, Franeker, Netherlands. University of Gronigen, DSc.

University of Gronigen, assistant 1921-22;

Yale Observatory 1922-24; Leiden Observatory, conservator 1924-30, assistant director 1935-45, director 1945- ; University of Leiden, faculty 1926- , professor 1945- ; Institute for Advanced Study, visitor 1981-82.

Bohdan Paczyński. *Astrophysics.*

Born 1940, Wilno, Poland. University of Warsaw, MA 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- .

William Press. *Astrophysics, cosmology, numerical methods.*

Born 1948, New York, New York. Harvard University, BA 1969; California Institute of Technology, PhD 1972.

California Institute of Technology, research fellow 1972-73, assistant professor 1973-74; Princeton University, assistant professor 1974-76; Harvard University, professor 1976- .

Herbert Rood. *Astronomy, astrophysics.*

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- .

Claudio Teitelboim. *Mathematical physics, relativity, quantum gravity.*

Born 1947, Santiago, Chile. University of Chile, Santiago, BS 1969; Princeton University, MA 1971, PhD 1973.

University of Chile, teaching assistant 1966-68, memorista 1968-69, assistant to associate researcher 1969-73; Princeton University, research assistant 1969-70, teaching assistant 1970-71, research associate 1973-74, assistant professor 1974-77; Institute for Advanced Study, member 1977-78, member with long-term appointment 1978-80, visitor 1981-82; University of Texas at Austin, associate 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 critical assessment of, the academic accomplishment embraced by its areas of expertise.

Academic Activities, 1982-83

During 1982-83, the School of Social Science had fifteen members and three visitors. As in previous years, the principal intellectual communication, not only among the members of the School but also between them and a group of members of the School of Historical Studies, took place during the weekly luncheon seminars on Thursdays. These seminars covered a wide spectrum of topics as can be seen in the Record of Events. Eight out of the twenty-six seminars (through April 28) were given by members and a visitor of the School of Historical Studies, and one by a faculty member from Princeton University. The rest were given by social scientists, most of whom were members, with one faculty member of the Institute and one social scientist visitor also participating. The seminars were remarkably well-attended, each topic attract-

ing, of course, a somewhat different audience; discussions were lively and spilled over into subsequent informal conversations and exchanges.

The focus of the year was on social and cognitive psychology. Seven members of the School formed a core group, with several others sharing in its interests. A cognitive psychology seminar of eight to ten members met regularly throughout the year, bringing together people who normally work in several different academic departments. In the spring three separate conferences were held at the Institute, two of these organized chiefly by Paul Churchland from the University of Manitoba. One was on Artificial Intelligence in which the regular group was joined by a number of well-known spokesmen on that subject. Differing views were expressed on the possibility of simulating human thought mechanically, and there was lively, concentrated and deeply serious argument. A second conference dealt with "Neuroscience, Mathematics, and Biophysics: Naturalistic Approaches to Mind-Brain Function." Here a similar format was followed with similar good results. Both of these conferences were funded by the Exxon Education Foundation. The third conference was organized by Naomi Quinn, a member from Duke University, on Folk Models, Theories, and Explanatory Systems, sponsored by the National Science Foundation and Wenner-Gren Foundation and funded in part by the Exxon Education Foundation.

During this academic year, several informal seminars met, one on social theory and history with about twelve regular participants and another on international relations theories, involving some twenty people, many of them from the University. The School itself received grants from the National Endowment for the Humanities, the German Marshall Fund (matched by the Alfred Krupp von Bohlen und Halbach-Stiftung), and the Exxon Education Foundation.

Faculty

Professor Clifford Geertz joined the Council of Scholars of the Library of Congress. He

was the Harry F. Camp Memorial Lecturer at Stanford University and became a member of the Committee on Basic Research in the Behavioral and Social Sciences of the National Research Council, and Advisor and Contributing Editor to *The Georgia Review*. He continued his research and published articles on anthropology and the social sciences generally. A collection of his papers, *Local Knowledge: Further Essays in Interpretive Anthropology*, was published by Basic Books.

Professor Albert O. Hirschman published "Civilizing, Destructive, or Feeble? Rival Interpretations of Market Society" in the *Journal of Economic Literature*, December 1982. This is the English text of the Marc Bloch Lecture he had given in Paris in May 1982. His book *Shifting Involvements* (1982) was published in a French translation. He gave an invited lecture at the World Bank on his contributions to development economics in the fifties which is to be published in a Bank-sponsored volume, *Pioneers in Development*. He also gave the Director's Lecture at the Institute, the first Henry George Lecture at Williams College, as well as other invited lectures at the University of Michigan and Harvard University. In the second semester he was on sabbatical leave from the Institute. From January to May he traveled in seven Latin American countries (The Dominican Republic, Colombia, Peru, Chile, Argentina, Uruguay, Brazil), primarily to visit "grassroots" development projects financed by the Inter-American Foundation. He then wrote a short book on his impressions which is to be published in 1984. In all of the countries he visited he gave one or two public lectures in universities or social science centers. In April 1983 he was awarded the Talcott Parsons Prize for excellence in the social sciences by the American Academy of Arts and Sciences.

Professor Michael Walzer completed work on his book *Spheres of Justice: A Defense of Pluralism and Equality*. It was published in March, 1983, by Basic Books. In February and March, he gave a Gauss Seminar at Princeton University: three lectures under the general title "Exodus and Revolution." During the spring

trimester (April, May and June), he was a visiting professor at Hebrew University in Jerusalem, where he taught a seminar on "War and Morality." He continued to serve on the

committee of scholars working to rebuild the graduate faculty of the New School of Social Research and was elected to a five-year term on the Brandeis University Board of Trustees.

The School of Social Science

Members with Long-term Appointments, Members, Visitors, and Assistants, 1982-83

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. *Changing relationships between science and literature since the end of the eighteenth century.*

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- .

Bernard Lewis. See page 27 for biographical entry.

Members

Paul M. Churchland. *Naturalistic approaches to mind-brain function: neuroscience, mathematics, and biophysics.*

Born 1942, Vancouver, Canada. University of British Columbia, BA 1964; University of Pittsburgh, MA 1965, PhD 1969.

University of Toronto, lecturer 1967-69; University of Manitoba, assistant professor to professor 1969- .

Michael W. Doyle. *Diplomacy and political economy in north-south relations.*

Born 1948, Honolulu, Hawaii. Harvard University, AB 1970, MA 1972, PhD 1977.

University of Warwick, lecturer 1975-76; Princeton University, lecturer 1976-77, assistant professor 1977- .

Claudia Goldin. *Economic change and American women: historical precedents to change in the*

economic role of American women.

Born 1946, New York, New York. Cornell University, BA 1967; University of Chicago, MA 1969, PhD 1972.

University of Wisconsin, assistant professor 1971-73; Harvard University, visiting professor 1975-76; Princeton University, assistant professor 1973-79; National Bureau of Economic Research, research associate 1979- ; University of Pennsylvania, associate professor 1979- .

Judith L. Goldstein. *The cultural construction of religious and sexual identity (Iran).*

Born 1949, New York, New York. University of Chicago, BA 1970; Princeton University, MA 1973, PhD 1978.

Vassar College, assistant professor 1976- ; Ben Gurion University of the Negev, assistant professor 1978-79.

Howard E. Gruber. *Cognitive development and the study of creative work.*

Born 1922, Brooklyn, New York. Brooklyn College, BA 1943; Cornell University, PhD 1950.

Queen's University, Canada, assistant professor 1950-52; University of Colorado, assistant professor 1952-56, associate professor 1956-61; Graduate Faculty of New School for Social Research, professor 1962-65; Rutgers University, professor 1966- ; Cornell University, visiting professor 1961-62; University of Geneva, visiting professor 1974-75; Massachusetts Institute of Technology, visiting professor 1978-79.

Grazyna Kochanska. *Psychological space of Polish workers during the Solidarity revolution: an experimental social psychology approach to a political movement.*

Born 1952, Warsaw, Poland. University of Warsaw, MA 1974, PhD 1978.

University of Warsaw, assistant 1974-79, assistant professor 1979-80; Polish Academy of Sciences, assistant professor 1980- ; University of Massachusetts at Amherst, visiting scholar 1981-82.

George E. Marcus. *The invention of tradition among American dynastic elites during the past century.*

Born 1946, Pittsburgh, Pennsylvania. Yale University, BA 1968; Harvard University, PhD 1976.

Rice University, associate professor 1975- , chairman of department of anthropology 1980- .

Howard Margolis. *Logic, interests, and cognition.*

Born 1932, Boston, Massachusetts. Harvard University, BA 1953; Massachusetts Institute of Technology, PhD 1979.

Science magazine, organizer and principal writer of "News and Comment" 1960-62; staff assistant to the Secretary of Defense 1962-64; *Bulletin of the Atomic Scientists and Washington Post*, political writer 1964-65; Institute for Defense Analyses, professional staff 1966-72; Massachusetts Institute of Technology, research fellow 1972-81; Russell Sage Foundation, visiting scholar 1981-82.

Naomi Quinn. *A cultural analysis of American marriage.*

Born 1939, Boston, Massachusetts. Radcliffe College, BA 1961; Stanford University, MA 1964, PhD 1971.

University of Hawaii, acting assistant professor 1969-71, assistant professor 1971; Duke University, assistant professor 1972-78, associate professor 1978- .

Charles F. Sabel. *Contemporary industrial reorganization in the United States and western Europe.*

Born 1947, New York, New York. Harvard College, AB 1969; Harvard University, PhD 1978.

Massachusetts Institute of Technology, assistant professor 1978-82, associate professor 1982- .

Louis A. Sass. *Parallels in the forms of experience and expression characteristic of schizophrenia and of modernist art and literature.*

Born 1949, New York, New York. Harvard University, BA 1970; University of California at Berkeley, MA 1972, PhD 1979.

Holy Cross College, instructor, assistant professor 1977-83; Harvard Medical School, instructor 1981- ; McLean Hospital, Belmont, Massachusetts, assistant attending psychologist 1981- .

Allan Silver, *Historical sociology of friendship institutions.*

Born 1930, New York, New York. University of Michigan, BA 1954, MA 1956, PhD 1963.

University of Wisconsin, assistant professor 1962-64; Columbia University, assistant professor to professor 1964- .

John Turner. *Social psychology: the role of social categorization in group processes.*

Born 1947, London, England. University of Sussex, BA 1971; University of Bristol, PhD 1975.

University of Bristol, research associate 1974-76, lecturer 1976- .

Visitors

Patricia Smith Churchland. *Philosophy and neuroscience.*

Born 1943, Oliver, British Columbia, Canada. University of British Columbia, BA; University of Pittsburgh, MA; Oxford University, BPhil.

University of Manitoba, 1969- .

George A. Miller. *Cognitive psychology.*

Born 1920, Charleston, West Virginia. University of Alabama, BA 1940; Harvard University, PhD 1946.

Harvard University, assistant professor 1948-51, associate professor, professor 1955-68; Institute for Advanced Study, member fall 1950, 1970-72, visitor 1972-76; Massachusetts Institute of Technology, associate professor 1951-55, visiting professor 1976-79; Rockefeller University, visiting professor 1967-68, professor 1968-79, adjunct professor 1979- ; Princeton University, professor 1979- .

Richard H. Ullman. *Problems of international security.*

Born 1933, Baltimore, Maryland. Harvard University, BA 1955; University of Oxford, BPhil 1957, DPhil 1960.

University of Oxford, St. Antony's College, Fellow 1958-59; Harvard University, instructor 1960-63, assistant professor and faculty member, Graduate School of Public Administration, 1963-65; Princeton University, Center of International Studies, faculty associate 1965-77, 1979- , Woodrow Wilson School of Public and International Affairs, associate dean and director of the graduate program 1968-71, acting dean

1969, associate professor of politics and international affairs 1965-69, professor of politics and international affairs 1965-73, professor of international affairs 1973-77, 1979- ; The Johns Hopkins University, visiting research associate 1971-72; *Foreign Policy*, editor 1978-80.

Assistants

John R. Eidson. *Intellectual and institutional history of local government.*

Born 1954, Kittery, Maine. Duke University, BA 1976; Cornell University, PhD 1983.

Cornell University, instructor 1982; Institute for Advanced Study, assistant to Professor Clifford Geertz 1982-83.

Donald Herzog. *Strategies of justification in political theory.*

Born 1956, Mineola, New York. Cornell University, BA 1978; Harvard University, MA 1980, PhD 1982.

Institute for Advanced Study, assistant to Professor Michael Walzer 1982-83; University of Michigan, assistant professor 1983- .

Record of Events, 1982-83

The following events of interest to the Institute community took place between July 1, 1982 and June 30, 1983. 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 10

School of Natural Sciences

Theoretical Physics Seminar: "Equivalence of adiabatic invariance and the KMS condition for quantum systems"
Guest Lecturer: Walter Thirring, University of Vienna

September 17

School of Mathematics

General Relativity Seminar: "How to quantize the relativistic simple harmonic oscillator"
Guest Lecturer: L. Hughston, University of Oxford

September 20

School of Mathematics

Members' Seminar: "Harmonic maps of Riemann surfaces"
James Eells, University of Warwick, England; Visiting Member, School of Mathematics, IAS

September 21

School of Mathematics

The Representation Theory of S_n and $GL(n)$ —Recent Approaches: "Classical background"
Guest Lecturer: Jacob Towber, DePaul University and Rutgers University

September 22

School of Mathematics

Differential Geometry: "Monopoles, differential equations, and algebraic curves"
Guest Lecturer: N. Hitchin, University of Oxford

September 23

School of Mathematics

Special Lecture: "Characters of reductive groups over finite fields"
Guest Lecturer: G. Lusztig, Massachusetts Institute of Technology

Concert

The Classical Quartet

September 27

School of Mathematics

Members' Seminar: "Linear and non-linear problems and the Jacobian conjecture"

Edwin H. Connell, University of Miami; Visiting Member, School of Mathematics, IAS

September 28

School of Mathematics

Unitary Representations of Real Reductive Groups:

"Introduction and background"

Anthony W. Knapp, Cornell University; Visiting Member, School of Mathematics, IAS

Representation Theory of S_n and $GL(n)$ —Recent Approaches: "Classical background" (continued)

Guest Lecturer: Jacob Towber, DePaul University and Rutgers University

L^2 Cohomology and Intersection Cohomology for Arithmetic Groups: "Introduction"

Armand Borel, Professor, School of Mathematics, IAS

September 29

School of Historical Studies

Colloquium in Classical Studies: "Latin military texts from Vindolanda"

Alan K. Bowman, Christ Church, University of Oxford; Visiting Member, School of Historical Studies, IAS

School of Social Science

Social Theory/History Group: "Clifford Geertz's *Negara*"

George E. Marcus, Rice University; Visiting Member, School of Social Science, IAS

September 30

School of Mathematics

Topology: "Approximating homotopy equivalences by disk bundle projections"

T. Benny Rushing, University of Utah; Visiting Member, School of Mathematics, IAS

K-Theory: "Algebraic K-theory and étale cohomology"

Robert W. Thomason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Statistical mechanics of cellular automata"

Stephen Wolfram, Long-term Member, School of Natural Sciences, IAS

October 4

School of Mathematics

Members' Seminar: "Coxeter groups and aspherical manifolds"

Michael Davis, Columbia University; Visiting Member, School of Mathematics, IAS

October 5

School of Mathematics

Unitary Representations of Real Reductive Groups:

"Introduction and background" (continued)

Anthony W. Knapp, Cornell University; Visiting Member,
School of Mathematics, IAS

Representation Theory of S_n and $GL(n)$ —Recent Approaches:
"Hopf algebra background"

Earl J. Taft, Rutgers University; Visitor, School of Mathematics,
IAS

L^2 Cohomology and Intersection Cohomology for Arithmetic
Groups: "Regularization theorems"

Armand Borel, Professor, School of Mathematics, IAS

Differential Geometry: "Monopoles, differential equations, and
algebraic curves" (continued)

Guest Lecturer: N. Hitchin, University of Oxford

October 6

School of Mathematics

Differential Geometry: "Monopoles, differential equations, and
algebraic curves" (continued)

Guest Lecturer: N. Hitchin, University of Oxford

October 7

School of Historical Studies

Art History Colloquium: "*Muta eloquentia*: La représentation de
l'éloquence dans l'oeuvre de Nicolas Poussin"

Marc Fumaroli, University of Paris, Sorbonne; Visiting
Member, School of Historical Studies, IAS

School of Mathematics

Topology: "The Sullivan conjecture"

Haynes R. Miller, University of Washington and Northwestern
University; Visiting Member, School of Mathematics, IAS

K-Theory: "Algebraic K-theory and étale cohomology"
(continued)

Robert W. Thomason, Massachusetts Institute of Technology;
Visiting Member, School of Mathematics, IAS

Classical Relativity: "Gravitational instantons and the dihedral
group"

Guest Lecturer: N. Hitchin, University of Oxford

October 10

Concert

Little Orchestra of Princeton

October 11

School of Mathematics

Members' Seminar: "Fundamental solutions for the Cauchy
Reimann equations"

John C. Polking, Rice University; Visiting Member, School of
Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "R-invariance and supersymmetry"

Guest Lecturer: Glennys Farrar, Rutgers University

October 13

School of Mathematics

Unitary Representations of Real Reductive Groups:
 "Representations constructed by derived functors"
 Guest Lecturer: N. Wallach, Rutgers University

Representation Theory of S_n and $GL(n)$ —Recent Approaches:
 "Hopf algebra background" (continued)
 Earl J. Taft, Rutgers University; Visitor, School of Mathematics,
 IAS

L^2 Cohomology and Intersection Cohomology for Arithmetic
 Groups: " L^2 cohomology of locally symmetric manifolds"
 Armand Borel, Professor, School of Mathematics, IAS

October 14

School of Mathematics

K-Theory: "Algebraic K-theory and etale cohomology"
 (continued)
 Robert W. Thomason, Massachusetts Institute of Technology;
 Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Looking back on my views about
 economic development, after twenty-five years"
 Albert O. Hirschman, Professor, School of Social Science, IAS

October 15

School of Natural Sciences

Theoretical Physics Seminar: "Invisible axions and cosmology"
 Guest Lecturer: Paul Frampton, University of North Carolina at
 Chapel Hill

October 18

School of Mathematics

Members' Seminar: "A kinetic model for some fluid dynamic
 equations"
 Shmuel Kaniel, Hebrew University of Jerusalem; Visiting
 Member, School of Mathematics, IAS

October 19

School of Mathematics

Unitary Representations of Real Reductive Groups:
 "Representations constructed by derived functors"
 (continued)
 Guest Lecturer: N. Wallach, Rutgers University

Representation Theory of S_n and $GL(n)$ —Recent Approaches:
 "Positive self-adjoint Hopf algebras"
 Earl J. Taft, Rutgers University; Visitor, School of Mathematics,
 IAS

L^2 Cohomology and Intersection Cohomology for Arithmetic
 Groups: "Cohomology with respect to induced
 representations"
 Armand Borel, Professor, School of Mathematics, IAS

Lecture Series: "Course on minimal surfaces and related
 topics"
 S.-T. Yau, Professor, School of Mathematics, IAS

October 20

School of Historical Studies

Colloquium in Classical Studies: "Plutarch's vision as a biographer"

Willem den Boer, University of Leiden; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Differential Geometry: "The infinitesimal Blaschke problem for complex projective spaces"

Hubert Goldschmidt, University of Nice and Columbia University; Visiting Member, School of Mathematics, IAS

School of Social Science

Social Theory/History Group: "R. Rosaldo's *Ilongot Headhunting*"

Edward W. Muir, Jr., Syracuse University; Visiting Member, School of Historical Studies, IAS

October 21

School of Mathematics

Topology: " $H_2(BSU(2)^\delta) \cong K_2(\mathbb{C})^+$, and related matters"

Guest Lecturer: H. Sah, State University of New York at Stony Brook

K-Theory: "Algebraic K-theory and etale cohomology" (continued)

Robert W. Thomason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Is scientific thinking different?"

George A. Miller, Princeton University; Visitor, School of Social Science, IAS

October 25

School of Mathematics

Marston Morse Memorial Lecture: "Variational methods in gauge field theory"

Guest Lecturer: Karen Uhlenbeck, University of Illinois at Chicago Circle

School of Natural Sciences

Lunchtime Seminar: "Dynamical symmetry breaking and vacuum alignment in two-dimensional models"

Anne Davis, Centre Européen de la Recherche Nucléaire; Visiting Member, School of Natural Sciences, IAS

October 26

School of Mathematics

Representation Theory of S_n and $GL(n)$ —Recent Approaches: "Decomposition theorem for positive self-adjoint Hopf algebras"

Earl J. Taft, Rutgers University; Visitor, School of Mathematics, IAS

 L^2 Cohomology and Intersection Cohomology for Arithmetic Groups: " L^2 cohomology of locally symmetric manifolds"

Armand Borel, Professor, School of Mathematics, IAS

Unitary Representations of Real Reductive Groups:
 "Representations constructed by derived functors"
 (continued)

Guest Lecturer: N. Wallach, Rutgers University

School of Social Science

Cognitive Seminar: "On creative work"
 Howard E. Gruber, Rutgers University; Visiting Member,
 School of Social Science, IAS

October 27

School of Mathematics

Special Lecture: "Yang-Mills theory and differentiable
 structures on compact 4-manifolds"
 Guest Lecturer: Karen Uhlenbeck, University of Illinois at
 Chicago Circle

Differential Geometry: "Invariant embedded minimal surfaces"
 Joachim H. Rubinstein, Melbourne University; Visiting
 Member, School of Mathematics, IAS

School of Natural Sciences

Informal Quantum Gravity Discussion Session: "Induced
 gravity"
 Stephen L. Adler, Professor, School of Natural Sciences, IAS

October 28

School of Mathematics

Topology: "Infinite dimensional Lie groups"
 John W. Milnor, Professor, School of Mathematics, IAS

K-Theory: "Algebraic K-theory and etale cohomology"
 (continued)
 Robert W. Thomason, Massachusetts Institute of Technology;
 Visiting Member, School of Mathematics, IAS

Classical Relativity: "Coordinate conditions for numerical
 relativity"
 Tsvi Piran, Racah Institute for Physics, Hebrew University;
 Visiting Member, School of Natural Sciences, IAS

School of Social Science

Luncheon Seminar: "Machiavelli: the women in his life"
 Sebastian de Grazia, Rutgers University; Visitor, School of
 Historical Studies, IAS

October 29

School of Mathematics

Working Seminar: "Course on minimal surfaces and related
 topics"
 S.-T. Yau, Professor, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Dynamical symmetry breaking
 and vacuum alignment in 2-dimensional models"
 Anne Davis, Centre Européen de la Recherche Nucléaire;
 Visiting Member, School of Natural Sciences, IAS

Theoretical Physics Seminar: "Quantum gravity on a lattice"
 Guest Lecturer: Don Weingarten, Brown University

October 30

School of Historical Studies

Colloquium in Classical Studies: "Plutarch's vision as biographer"

Willem den Boer, University of Leiden; Visiting Member, School of Historical Studies, IAS

November 1

School of Mathematics

Members' Seminar: "Foliations without compact leaves"

Paul A. Schweitzer, Pontifical Catholic University, Rio de Janeiro; Visiting Member, School of Mathematics, IAS

November 2

School of Mathematics

Unitary Representations of Real Reductive Groups:
"Representations constructed by derived functors"
(continued)

Guest Lecturer: N. Wallach, Rutgers University

Representation Theory of S_n and $GL(n)$ —Recent Approaches:
"Positive self-adjoint Hopf algebras with one primitive
irreducible element"

Earl J. Taft, Rutgers University; Visitor, School of Mathematics, IAS

 L^2 Cohomology and Intersection Cohomology for Arithmetic
Groups: " L^2 cohomology at infinity"

Armand Borel, Professor, School of Mathematics, IAS

School of Social Science

Social Theory/History Group: "N. Elias's *The Process of
Civilization*"Stuart B. Schwartz, University of Minnesota; Visiting Member,
School of Historical Studies, IAS

November 3

School of Historical Studies

Colloquium in Classical Studies: "Cults in Lavinium—new
evidence on religion and social structure in early Latium"Mario Torelli, University of Perugia; Visiting Member, School
of Historical Studies, IAS

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics"
S.-T. Yau, Professor, School of Mathematics, IASDifferential Geometry: "Curvature of the Weil-Petersson metric
on Teichmüller space"Halsey L. Royden, Stanford University; Visiting Member,
School of Mathematics, IAS

November 4

School of Historical Studies

Art History Colloquium: "Goncourt on art: from realism to
formalism"Jean-Paul Bouillon, Clermont-Ferrand University, France;
Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology: "Incompressible surfaces in link complements"

Guest Lecturer: W. Menasco, Rutgers University

- K-Theory: "Algebraic K-theory and étale cohomology"
(continued)
Robert W. Thomason, Massachusetts Institute of Technology,
Visiting Member, School of Mathematics, IAS
- School of Social Science Luncheon Seminar: "Scientific research under an historical
microscope"
Martin J. S. Rudwick, London, England; Visiting Member,
School of Historical Studies, IAS
- November 5*
- School of Mathematics Working Seminar: "Hamilton's paper on Ricci curvature"
Guest Lecturer: B. Chow, Princeton University
- November 8*
- School of Mathematics Members' Seminar: "Salem numbers and L-functions"
Ted C. K. Chinburg, University of Washington; Visiting
Member, School of Mathematics, IAS
- School of Natural Sciences Luncheon Seminar: "Polymers, random walks and the
renormalization group"
Daniel Amit, Racah Institute for Physics, Israel; Visiting
Member, School of Natural Sciences, IAS
- November 9*
- School of Mathematics Special Lecture: "Lie algebras and isolated singularities"
Guest Lecturer: Stephen Yau, University of Illinois at Chicago
Circle
- Unitary Representations of Real Reductive Groups:
"Representations constructed by derived functors"
(continued)
Guest Lecturer: N. Wallach, Rutgers University
- Representation Theory of S_n and $GL(n)$ —Recent Approaches:
"Positive self-adjoint Hopf algebras with one primitive
irreducible element" (continued)
Earl J. Taft, Rutgers University; Visitor, School of Mathematics,
IAS
- L^2 Cohomology and Intersection Cohomology for Arithmetic
Groups: " L^2 cohomology at infinity" (continued)
Armand Borel, Professor, School of Mathematics, IAS
- School of Social Science Cognitive Seminar: "Consciousness: the transmutation of a
concept"
Patricia Smith Churchland, University of Manitoba; Visitor,
School of Social Science, IAS
- Director's Lecture "Civilizing, Destructive, or Feeble? Rival Interpretations of
Market Society"
Albert O. Hirschman, Professor, School of Social Science, IAS

November 10
School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics"
(continued)
S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Curvature of the Weil-Petersson metric
on Teichmüller space" (continued)
Halsey L. Royden, Stanford University; Visiting Member,
School of Mathematics, IAS

November 11
School of Mathematics

Topology: "Applications of splitting $B(\mathbb{Z}/p)^n$ "
Guest Lecturer: S. Priddy, Northwestern University

K-Theory: "Algebraic K-theory and étale cohomology"
(continued)
Robert W. Thomason, Massachusetts Institute of Technology;
Visiting Member, School of Mathematics, IAS

Classical Relativity: "The Aharonov-Bohm effect and its
gravitational analog"
Guest Lecturer: John Stachel, Einstein Project

Evolution Equations: "Existence proof for the Boltzmann
equation"
Shmuel Kaniel, Hebrew University of Jerusalem; Visiting
Member, School of Mathematics, IAS

Luncheon Seminar: "Emotion and cognition in Darwin's
creative work"
Howard E. Gruber, Rutgers University; Visiting Member,
School of Social Science, IAS

November 12
School of Mathematics

Working Seminar: "Hamilton's paper on Ricci curvature"
(continued)
Guest Lecturer: B. Chow, Princeton University

School of Natural Sciences

Theoretical Physics Seminar: "Stochastic quantization and the
large N limit"
Guest Lecturer: Bunji Sakita, City College of New York

November 15
School of Mathematics

Members' Seminar: "The estimation of exponential sums over
finite fields"
Christopher Hooley, University College, Cardiff, Wales;
Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "New test for spontaneous breakdown of
supersymmetry"
Guest Lecturer: Fred Cooper, Los Alamos

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November 16

School of Mathematics

Unitary Representations of Real Reductive Groups:
"Representations constructed by derived functors"
(continued)

Guest Lecturer: N. Wallach, Rutgers University

Representation Theory of S_n and $GL(n)$ —Recent Approaches:
"The primitive elements in PSH-algebras"

Earl J. Taft, Rutgers University; Visitor, School of Mathematics,
IAS

L^2 Cohomology and Intersection Cohomology for Arithmetic
Groups: "Review of middle intersection cohomology"

Armand Borel, Professor, School of Mathematics, IAS

Working Seminar: "On Leon Simon's paper on minimal S^2 "

Joachim H. Rubinstein, Melbourne University; Visiting
Member, School of Mathematics, IAS

November 17

School of Historical Studies

Colloquium in Classical Studies: "L'invention de la
numismatique aux XVI^e et XVII^e siècles"

Jean-Baptiste Giard, Bibliothèque Nationale; Visiting Member,
School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics"
(continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Local boundary regularity of the
Einstein-Kähler metric on pseudoconvex domains"

John S. Bland, University of California at Los Angeles; Visiting
Member, School of Mathematics, IAS

School of Social Science

Social Theory/History Group: "C. Sabel's *Work and Politics*"

Charles F. Sabel, Massachusetts Institute of Technology;
Visiting Member, School of Social Science, IAS

November 18

School of Mathematics

Topology: "Stability of compact leaves under perturbation of
foliations"

Paul A. Schweitzer, Pontifical Catholic University, Rio de
Janeiro; Visiting Member, School of Mathematics, IAS

Special Lecture: "A proof of the Howe conjecture for $GL(n)$ "

Guest Lecturer: Laurent Clozel, University of Michigan at Ann
Arbor and University of Paris VII

Evolution Equations: "Existence proof for the Boltzmann
equation" (continued)

Shmuel Kaniel, Hebrew University of Jerusalem; Visiting
Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Naturwissenschaften, Geisteswissenschaften, and the unity of science"

Paul M. Churchland, University of Manitoba; Visiting Member, School of Social Science, IAS

November 19

School of Mathematics

Working Seminar: "Hamilton's paper on Ricci curvature" (continued)

Guest Lecturer: B. Chow, Princeton University

Special Lecture: "Spectral theory and the billiard ball map"

Guest Lecturer: R. Melrose, Massachusetts Institute of Technology

Differential Geometry: "Submanifolds of constant mean curvature in spheres"

Guest Lecturer: W.-Y. Hsiang, University of California at Berkeley

School of Natural Sciences

Lunchtime Seminar: "Fermion Monte Carlo calculations: pictures of the ground state of a many-particle system"

Guest Lecturer: Douglas Scalapino, University of California at Santa Barbara

Theoretical Physics Seminar: "Some interesting failures in inflationary universe scenarios"

Guest Lecturer: Paul Steinhardt, University of Pennsylvania

November 22

School of Mathematics

Members' Seminar: "Degeneration of quintic threefolds and their lines"

Sheldon H. Katz, University of Utah; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "Supergravity and the gauge hierarchy problem"

Burt Ovrut, Brandeis University; Visiting Member, School of Natural Sciences, IAS

November 23

School of Mathematics

Working Seminar: "On Leon Simon's paper on minimal S^2 " (continued)

Joachim H. Rubinstein, Melbourne University; Visiting Member, School of Mathematics, IAS

Unitary Representations of Real Reductive Groups: "Functoriality and unitary representations"

Guest Lecturer: D. Vogan, Massachusetts Institute of Technology

Representation Theory of S_n and $GL(n)$ —Recent Approaches: "Inner products of basic monomials in PSH-algebras"

Earl J. Taft, Rutgers University; Visitor, School of Mathematics, IAS

L^2 Cohomology and Intersection Cohomology for Arithmetic Groups: "Locally symmetric manifolds of Q -rank one"
Armand Borel, Professor, School of Mathematics, IAS

Classical Relativity: "The multipole structure of general relativity"
Guest Lecturer: R. Beig, University of Vienna

School of Social Science

Cognitive Seminar: "Cognitive system and social conduct"
Grazyna Kochanska, University of Massachusetts; Visiting Member, School of Social Science, IAS

November 24

School of Historical Studies

Colloquium in Classical Studies: "The birth of writing and poetic function in ancient Greece: some reflections"
Annie Schnapp-Gourbeillon, University of Paris VIII, Lagny; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)
S.-T. Yau, Professor, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "Non-Abelian gauge theory of the ocean"
Guest Lecturer: Frank Henyey, La Jolla Institute

Theoretical Physics Seminar: "Nonlinear effective action models for quark confinement: effective action models as approximations to QCD"
Stephen L. Adler, Professor, School of Natural Sciences, IAS

November 25

School of Mathematics

Differential Geometry: "Local isometric embeddings"
Guest Lecturer: D. Yang, Harvard University

Unitary Representations of Real Reductive Groups: "Geometric construction of representations"
Guest Lecturer: W. Schmid, Harvard University

Members' Seminar: "Theory of Kac-Moody algebras as an intersection of disciplines"
Igor Frenkel, Yale University; Visiting Member, School of Mathematics, IAS

November 26

School of Mathematics

Working Seminar: "On Leon Simon's paper on minimal S^2 " (continued)
Joachim H. Rubinstein, Melbourne University; Visiting Member, School of Mathematics, IAS

Representation Theory of S_n and $GL(n)$ —Recent Approaches: "The irreducible elements and the basic structure of PSH-algebras"
Earl J. Taft, Rutgers University; Visitor, School of Mathematics, IAS

L^2 Cohomology and Intersection Cohomology for Arithmetic Groups: "Locally symmetric manifolds of Q-rank one"
(continued)

Armand Borel, Professor, School of Mathematics, IAS

Number Theory: "Waring's problem for two squares and three cubes"

Christopher Hooley, University College, Cardiff, Wales;
Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Astrophysics Seminar: "Spectropolarimetry of active galaxies and quasars"

Guest Lecturer: Joseph S. Miller, University of California at Santa Cruz

Quantum Gravity Seminar: "On the quantization of gauge theories with independent metrics and connections"

Guest Lecturer: John Dell, University of Texas at Austin

December 1

School of Mathematics

Special Lecture: "Picard groups of Zariski surfaces"

Guest Lecturer: P. Blass, Clark University

Lecture Series: "Course in minimal surfaces and related topics"
(continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Manifolds with almost equal diameter and interjectivity radius"

Oguz C. Durumeric, State University of New York at Stony Brook; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Nonlinear effective action models for quark confinement: small-R and large-R expansions"

Stephen L. Adler, Professor, School of Natural Sciences, IAS

December 2

School of Historical Studies

Art History Colloquium: "Poussin paints an idea"

Matthias Winner, Bibliotheca Hertziana, Rome; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology: "Foliations and the topology of 3-manifolds"

David Gabai, Harvard University; Visiting Member, School of Mathematics, IAS

K-Theory: "Algebraic K-theory and etale cohomology"
(continued)

Robert W. Thomason, Massachusetts Institute of Technology;
Visiting Member, School of Mathematics, IAS

Classical Relativity: "Violation of cosmic censorship in spherically symmetric gravitational collapse"

Guest Lecturer: D. Christodoulou, Courant Institute of Mathematical Sciences, New York University

Evolution Equations: "Existence proof for the Boltzmann equation" (continued)

Shmuel Kaniel, Hebrew University of Jerusalem; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Political cognition"

Howard Margolis, Massachusetts Institute of Technology; Visiting Member, School of Social Science, IAS

December 3

School of Mathematics

Working Seminar: "Hamilton's paper on Ricci curvature" (continued)

Guest Lecturer: B. Chow, Princeton University

School of Natural Sciences

Theoretical Physics Seminar: "Strong-coupling limit of K.A.M. theory"

Guest Lecturer: Eric Siggia, Cornell University

December 6

School of Mathematics

Special Lecture: "Computation for hyperbolic conservation laws"

Guest Lecturer: J. Glimm, Courant Institute of Mathematical Sciences, New York University

Members' Seminar: "L-functions of modular curves at $s = 0$ "
Dinakar Ramakrishnan, University of Chicago; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "Progress in the numerical simulation of QCD"

Herbert Hamber, Brookhaven National Laboratory; Visiting Member, School of Natural Sciences, IAS

December 7

School of Mathematics

Working Seminar: "On Leon Simon's paper on minimal S^2 " (continued)

Joachim H. Rubinstein, Melbourne University; Visiting Member, School of Mathematics, IAS

Unitary Representations of Real Reductive Groups: "Unitary representations for real-rank one groups"

M. Walleda Baldoni-Silva, University of Trent; Visiting Member, School of Mathematics, IAS

Representation Theory of S_n and $GL(n)$ —Recent Approaches: "Irreducible representations of $GL(n, F_q)$ "

Peter Landrock, University of Aarhus; Visiting Member, School of Mathematics, IAS

Differential Geometry: "Asymptotics for some nonlinear evolution equations with applications to geometric problems"

Guest Lecturer: Leon Simon, Australian National University

- Number Theory: "On the numbers that are expressible as the sum of two h -th powers"
Christopher Hooley, University College, Cardiff, Wales;
Visiting Member, School of Mathematics, IAS
- School of Social Science
Cognitive Seminar: "Madness and modernism: a comparison of experience and expression in psychopathology and art"
Louis Sass, Holy Cross College; Visiting Member, School of Social Science, IAS
- Concert
Kathryn Selby, pianist
- December 8*
School of Historical Studies
Colloquium in Classical Studies: "Early Greek bronze sculpture"
Gerhard Neumann, University of Tübingen; Visiting Member, School of Historical Studies, IAS
- School of Mathematics
Lecture Series: "Course in minimal surfaces and related topics" (continued)
S.-T. Yau, Professor, School of Mathematics, IAS
- School of Natural Sciences
Theoretical Physics Seminar: "Nonlinear effective action models for quark confinement: mathematical aspects"
Elliott Lieb, Princeton University; Visiting Member, School of Natural Sciences and School of Mathematics, IAS
- School of Social Science
Social Theory/History Group: "E. Fox's *History in Geographic Perspective*"
John R. Eidson, Cornell University; Assistant, School of Social Science, IAS
- December 9*
School of Mathematics
Topology: "An algorithm to decide if a 3-manifold is Haken"
Guest Lecturer: W. Jaco, Oklahoma State University
- K-Theory: "Algebraic K-theory and étale cohomology" (continued)
Robert W. Thomason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS
- Special Lecture: "The trace formula and lifting problems" (Lectures I and II)
Guest Lecturer: J. Arthur, University of Toronto
- Classical Relativity: "Spacelike infinity"
Guest Lecturer: P. Bergmann, New York University
- Evolution Equations: "The Kolmogorov nonlinear diffusion equation"
Ka-Sing Lau, University of Pittsburgh; Visiting Member, School of Mathematics, IAS

84 Record of Events

- School of Natural Sciences Relativity and Quantum Gravity Seminar: "Spacelike infinity"
Guest Lecturer: Peter Bergmann, New York University
- School of Social Science Luncheon Seminar: "Dynastic alchemy in America: breathing
life into the dead-hand of patrimony"
George E. Marcus, Rice University; Visiting Member, School of
Social Science, IAS
- Concert Wesley E. Beaumont and his reproducing piano
- December 10*
School of Mathematics Working Seminar: "Hamilton's paper on Ricci curvature"
(continued)
Guest Lecturer: N. Mok, Princeton University
- School of Natural Sciences Theoretical Physics Seminar: "Modular technicolor"
Guest Lecturer: Howard Georgi, Harvard University
- School of Social Science International Relations Theory Discussion Group:
" 'Cooperation under the security dilemma' by Robert Jervis"
Michael W. Doyle, Princeton University; Visiting Member,
School of Social Science, IAS
- December 13*
School of Mathematics Members' Seminar: "The Green ring of a finite group"
Peter Landrock, University of Aarhus; Visiting Member, School
of Mathematics, IAS
- December 14*
School of Mathematics Representation Theory of S_n and $GL(n)$ —Recent Approaches:
"Irreducible representations of $GL(n, F_q)$ " (continued)
Peter Landrock, University of Aarhus; Visiting Member, School
of Mathematics, IAS
- Special Lecture: "Some mathematical problems suggested by X-
ray and NMR tomography"
Guest Lecturer: A. Grünbaum, University of California at
Berkeley
- Number Theory: "The Pellian equation and the class number of
indefinite binary quadratic forms"
Christopher Hooley, University College, Cardiff, Wales;
Visiting Member, School of Mathematics, IAS
- December 15*
School of Mathematics Lecture Series: "Course in minimal surface and related topics"
(continued)
S.-T. Yau, Professor, School of Mathematics, IAS
- Differential Geometry: "The Morse complex and its application
to closed geodesics"
Guest Lecturer: Wilhelm Klingenberg, University of Bonn

- School of Natural Sciences Theoretical Physics Seminar: "Nonlinear effective action models for quark confinement: mathematical aspects" (continued)
Elliott Lieb, Princeton University; Visiting Member, School of Natural Sciences and School of Mathematics
- December 16*
- School of Mathematics Topology: "Incompressible surfaces in link complements"
Guest Lecturer: W. Menasco, Rutgers University
- K-Theory: "Algebraic K-theory and etale cohomology" (continued)
Robert W. Thomason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS
- Special Lecture: "Asymptotics for some nonlinear evolution equations with applications to geometric problems" (continued)
Guest Lecturer: Leon Simon, Australian National University
- Evolution Equations: "The Kolmogorov nonlinear diffusion equation" (continued)
Ka-Sing Lau, University of Pittsburgh; Visiting Member, School of Mathematics, IAS
- School of Natural Sciences Theoretical Physics Seminar: "Extended supergravity in 10-dimensions"
Guest Lecturer: Michael Green, California Institute of Technology and Queen Mary College, London
- School of Social Science Luncheon Seminar: "A sociology of trust and friendship"
Allan Silver, Columbia University; Visiting Member, School of Social Science, IAS
- December 17*
- School of Mathematics Working Seminar: "Lempert's paper on 'Kobayashi metric of strictly convex domain' "
Pit-Mann Wong, University of Notre Dame; Visiting Member, School of Mathematics, IAS
- School of Natural Sciences Theoretical Physics Seminar: "Superfield theory of superstrings"
Guest Lecturer: Michael Green, California Institute of Technology and Queen Mary College, London
- January 6*
- School of Historical Studies Art History Colloquium: "Embellishing the temple of liberty: The Rotunda of the United States Capitol"
Egon Verheyen, The Johns Hopkins University; Visiting Member, School of Historical Studies, IAS
- School of Social Science Luncheon Seminar: "Pride and forgetfulness: sociology in Weimar culture and in Nazi Germany"
Wolf Lepenies, Freie Universität, Berlin; Long-term Member, School of Social Science, IAS

January 10

School of Mathematics

Members' Seminar: "Asymptotic behaviour of Eisenstein integrals on a real semisimple Lie group; a complex analytic approach"

Eric van den Ban, Utrecht State University, Netherlands;
Visiting Member, School of Mathematics, IAS

Classical Relativity Seminar: "On a family of gravitational metric-connection theories"

Guest Lecturer: J. Dell, University of Texas at Austin

School of Natural Sciences

Luncheon Seminar: "Global aspects of current algebra"

Guest Lecturer: Edward Witten, Princeton University

January 11

School of Mathematics

Unitary Representations of Real Reductive Groups: "The role of basic cases"

Anthony W. Knap, Cornell University; Visiting Member,
School of Mathematics, IAS

Lecture Series: "Course in minimal surfaces and related topics"
(continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Volumes of arithmetic hyperbolic manifolds"

Ted C. K. Chinburg, University of Washington; Visiting
Member, School of Mathematics, IAS

School of Social Science

Cognitive Seminar: "Understanding the experience of marriage in our culture"

Naomi Quinn, Duke University; Visiting Member, School of
Social Science, IAS

January 13

School of Mathematics

K-Theory: "Deligne cohomology and regulators from higher K-groups"

Guest Lecturer: H. Gillet, Princeton University

School of Social Science

Luncheon Seminar: "Cleansing original sin in the tropics: slavery and baptism"

Stuart Schwartz, University of Minnesota; Visiting Member,
School of Historical Studies, IAS

January 14

School of Social Science

International Relations Theory Discussion Group: " 'No first use' of nuclear weapons"

Richard H. Ullman, Princeton University; Visitor, School of
Social Science, IAS

January 17

School of Mathematics

Members' Seminar: "On p-adic L-functions and the Reimann-Hurwitz genus formula"

Warren M. Sinnott, Rutgers University; Visiting Member,
School of Mathematics, IAS

January 18

School of Mathematics

Unitary Representations of Real Reductive Groups: "The role of
basic cases" (continued)

Anthony W. Knap, Cornell University; Visiting Member,
School of Mathematics, IAS

January 19

School of Mathematics

Differential Geometry: "M. Gromov's paper on 'Curvature,
diameter and Betti numbers' "

Oguz C. Durumeric, State University of New York at Stony
Brook; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Nonlinear effective action models
for quark confinement: mathematical aspects" (continued)

Elliott Lieb, Princeton University; Visiting Member, School of
Natural Sciences and School of Mathematics

January 20

School of Mathematics

Topology: "The spectrum $P_\infty \wedge bo$ "

Donald M. Davis, Lehigh University; Visiting Member, School
of Mathematics, IAS

K-Theory: "Deligne cohomology and regulators from higher K-
groups" (continued)

Guest Lecturer: H. Gillet, Princeton University

Lecture Series: "Course in minimal surfaces and related topics"
(continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Evolution Equations: "Eardley and Moncrief's paper on global-
in-time existence of Yang-Mills fields"

Thomas P. Branson, Purdue University; Visiting Member,
School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Madness and modernism: a comparison of
experience and expression in psychopathology and art"

Louis A. Sass, Holy Cross College; Visiting Member, School of
Social Science, IAS

January 21

School of Mathematics

Working Seminar: "Lempert's paper on 'Kobayashi metric of
strictly convex domain' "

Pit-Mann Wong, University of Notre Dame; Visiting Member,
School of Mathematics, IAS

January 24

School of Mathematics

Members' Seminar: "On the homogeneous complex Monge-
Ampere equation"

Pit-Mann Wong, University of Notre Dame; Visiting Member,
School of Mathematics, IAS

January 25

School of Mathematics

Unitary Representations of Real Reductive Groups:
 "Unitarizable highest weight modules"
 Guest Lecturer: N. Wallach, Rutgers University

School of Social Science

Cognitive Seminar: " 'Twoness' and mental health"
 Howard Margolis, Massachusetts Institute of Technology;
 Visiting Member, School of Social Science, IAS

January 26

School of Historical Studies

Colloquium in Classical Studies: "The way of death in ancient Lycia"
 Trevor R. Bryce, University of Queensland; Visiting Member,
 School of Historical Studies, IAS

School of Mathematics

Differential Geometry: "M. Gromov's paper on 'Curvature, diameter and Betti numbers' " (continued)
 Oguz C. Durumeric, State University of New York, Stony Brook; Visiting Member, School of Mathematics, IAS

Lecture Series: "Course in minimal surfaces and related topics" (continued)
 S.-T. Yau, Professor, School of Mathematics, IAS

Special Lecture: "The Schroedinger equation and the eigenvalue problem"
 Guest Lecturer: Peter Li, Purdue University

School of Natural Sciences

Theoretical Physics Seminar: "Nonlinear effective action models for quark confinement: small-R and large-R expansions" (continued)
 Stephen L. Adler, Professor, School of Natural Sciences, IAS

Informal Quantum Gravity Discussion: "Cosmology at the Planck time"
 Donald Neville, Temple University; Visitor, School of Natural Sciences, IAS

January 27

School of Mathematics

Topology: "The modular Hecke algebra and the Steinberg representation for finite Chevalley groups"
 Guest Lecturer: Nicholas J. Kuhn, Princeton University

K-Theory: "Deligne cohomology and regulators from higher K-groups" (continued)
 Guest Lecturer: H. Gillet, Princeton University

Classical Relativity: "The Kaluza-Klein theory"
 Guest Lecturer: Malcolm Perry, Princeton University

Evolution Equations: "Eardley and Moncrief's paper on global-in-time existence of Yang-Mills fields" (continued)
 Thomas P. Branson, Purdue University; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "The psychological conceptualization of the social group"

John Turner, University of Bristol; Visiting Member, School of Social Science, IAS

January 28

School of Mathematics

Working Seminar: "K. Uhlenbeck's paper on L^p estimates of gauge field theory"

Guest Lecturer: N. Mok, Princeton University

Mathematical Aspects of Renormalization Group Methods:
"Some basic ideas and overview of Collet-Eckmann on the hierarchical model"

Leonard Gross, Cornell University; Visiting Member, School of Mathematics, IAS, and

Robert P. Langlands, Professor, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Phase and renormalization structure of lattice gauge theories"

Guest Lecturer: Cosmas Zachos, Fermilab

Theoretical Physics Seminar: "Complex universality"

Guest Lecturer: Predrag Cvitanović, Niels Bohr Institute

Astrophysics Seminar: "The vertical growth and structure of galactic disks"

Jens V. Villumsen, Yale University; Visiting Member, School of Natural Sciences, IAS

January 31

School of Mathematics

Members' Seminar: "Character formulas for irreducible highest weight modules over the Virasoro algebra"

Alvany Rocha-Caridi, Rutgers University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "Monte Carlo Studies of Hadron masses in $SU(3)$ "

Guest Lecturer: Rajan Gupta, Northeastern University

Concert

Jean-Bernard Pommier, pianist

February 1

School of Mathematics

Special Lecture: "On the residual spectrum of $GL(n)$ "

Guest Lecturer: H. Jacquet, Columbia University

Unitary Representations of Real Reductive Groups:
"Unitarizable highest weight modules" (continued)

Guest Lecturer: N. Wallach, Rutgers University

February 2

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Triangulation of complete Riemannian manifolds"

Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

School of Social Science

International Relations Theory Discussion Group: "Theory of international politics"

Guest Lecturer: Kenneth Waltz, University of California at Berkeley

February 3

School of Historical Studies

Art History Colloquium: "Borromini and Roman urbanism"

Joseph J. Connors, Columbia University; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology: "The homology of the mapping class groups and moduli spaces of Riemann surfaces"

Guest Lecturer: E. Y. Miller, Polytechnic Institute of New York

K-Theory: "Deligne cohomology and regulators from higher K-groups" (continued)

Guest Lecturer: H. Gillet, Princeton University

Mathematical Aspects of Renormalization Group Methods:

"Overview of the hierarchical model" (continued)

Leonard Gross, Cornell University; Visiting Member, School of Mathematics, IAS

Evolution Equations: "The inverse periodic problem for Hill's equation"

Allan J. Finkel, New York University and John Jay College; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Consciousness: the transmutation of a concept"

Patricia S. Churchland, University of Manitoba; Visitor, School of Social Science, IAS

February 4

School of Mathematics

Working Seminar: "K. Uhlenbeck's paper on L^p estimates of gauge field theory" (continued)

Guest Lecturer: N. Mok, Princeton University

School of Natural Sciences

Theoretical Physics Seminar: "Can a gambler tell the difference between 1 and 2?"

Guest Lecturer: Daniel Caldi, Lawrence Berkeley Laboratory

February 7

School of Mathematics

Members' Seminar: "Algebraic relations between critical values of zeta functions and inner products"

Goro Shimura, Princeton University; Visiting Member, School of Mathematics, IAS

February 8

School of Mathematics

Unitary Representations of Real Reductive Groups: "Discrete series for semisimple symmetric spaces"
 Erik van den Ban, Utrecht State University, Netherlands;
 Visiting Member, School of Mathematics, IAS

School of Social Science

Cognitive Seminar: "A conceptual scheme for the interaction of affect and cognition"

Guest Lecturer: Martin Hoffman, University of Michigan

Social Theory/History Group: "P. Bourdieu's *The Outline of a Theory of Practice*"

George E. Marcus, Rice University; Visiting Member, School of Social Science, IAS

February 9

School of Historical Studies

Colloquium in Classical Studies: "Popular acclamations in the Roman Empire"

Christopher P. Jones, University of Toronto; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Triangulation of complete Riemannian manifolds" (continued)

Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

February 10

School of Mathematics

Topology: "Homologically trivial group actions"

Guest Lecturer: S. Weinberger, Princeton University

K-Theory: "Deligne cohomology and regulators from higher K-groups" (continued)

Guest Lecturer: H. Gillet, Princeton University

Mathematical Aspects of Renormalization Group Methods: "Overview of the hierarchical model" (continued)

Leonard Gross, Cornell University; Visiting Member, School of Mathematics, IAS

Evolution Equations: "The inverse periodic problem for Hill's equation" (continued)

Allan J. Finkel, New York University and John Jay College; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "The bourgeois cannibal in Renaissance Italy"

Edward W. Muir, Syracuse University; Visiting Member, School of Historical Studies, IAS

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February 11

School of Mathematics

Working Seminar: "Taubes' theorem on the existence of self-dual connections"
Pit-Mann Wong, University of Notre Dame; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Quantum nucleation and soliton pair production in conducting polymers"
Guest Lecturer: Steven Kivelson, State University of New York at Stony Brook

February 14

School of Mathematics

Members' Seminar: "Proper maps from strongly q-convex domains"
Klas Diederich, Wuppertal University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "The excitation of atoms by slowly moving magnetic monopoles"
Guest Lecturer: Stephen Parke, Stanford Linear Accelerator Center

February 15

School of Mathematics

Unitary Representations of Real Reductive Groups: "Discrete series for semisimple symmetric spaces" (continued)
Erik van den Ban, Utrecht State University, Netherlands; Visiting Member, School of Mathematics, IAS

February 16

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)
S.-T. Yau, Professor, School of Mathematics, IAS

Evolution Equations: "Global existence and cosmic censorship"
Thomas P. Branson, Purdue University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminars: "The calculation of chaos in a real fluid system"
Guest Lecturer: Philip Marcus, Massachusetts Institute of Technology

February 17

School of Mathematics

K-Theory: "Relative cycles and algebraic K-theory"
Guest Lecturer: S. Landsburg, University of Iowa

Mathematical Aspects of Renormalization Group Methods: "Critical exponents for pedestrians"
Daniel Amit, Racah Institute for Physics, Israel; Visiting Member, School of Natural Sciences, IAS

Classical Relativity: "Theory of light cone cuts of null infinity"
Guest Lecturer: T. Newman, University of Pittsburgh

Differential Geometry: "Embedding theorem of non-compact Kähler manifolds of positive bisectional curvature into affine algebraic varieties"

Guest Lecturer: N. Mok, Princeton University

School of Natural Sciences

Theoretical Physics Seminar: "Snowflake growth"

Guest Lecturer: Herbert Levine, Schlumberger-Doll

School of Social Science

Luncheon Seminar: "American marriage and the model for need fulfillment: an application of folk social psychology"

Naomi Quinn, Duke University; Visiting Member, School of Social Science, IAS

February 18

School of Mathematics

Working Seminar: "Taubes' theorem on the existence of self-dual connections" (continued)

Pit-Mann Wong, University of Notre Dame; Visiting Member, School of Mathematics, IAS

Lecture Series: "On Kähler geometry"

Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminars: "Lattice gauge theories and special purpose computers"

Guest Lecturer: Anthony Terrano, Columbia University

February 21

School of Mathematics

Members' Seminar: "Zeros of the Riemann zeta-function on the critical line"

J. Brian Conrey, University of Illinois; Visiting Member, School of Mathematics, IAS

February 22

School of Mathematics

Several Complex Variables: "The Bergman metric on pseudoconvex domains"

Klas Diederich, Wuppertal University, West Germany; Visiting Member, School of Mathematics, IAS

Unitary Representations of Real Reductive Groups: "Discrete series for semisimple symmetric spaces" (continued)

Erik van den Ban, Utrecht State University; Visiting Member, School of Mathematics, IAS

February 23

School of Historical Studies

Colloquium in Classical Studies: "Homonoia: die Wandlung eines politischen Schlagwortes"

Peter R. Franke, University of Saarbrücken; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "Local isometric embeddings of surfaces"

Guest Lecturer: C-S. Lin, Courant Institute, New York University

February 24

School of Mathematics

Topology: "Dickson invariants and projective modules over $GL(V)$ "

Guest Lecturer: C. W. Wilkerson, Wayne State University

K-Theory: "Relative cycles and algebraic K-theory" (continued)

Guest Lecturer: S. Landsburg, University of Iowa

Mathematical Aspects of Renormalization Group Methods: "Critical exponents for pedestrians" (continued)

Daniel Amit, Racah Institute for Physics, Israel; Visiting Member, School of Natural Sciences, IAS

Special Lecture: "Plancherel formula for Lie groups"

Guest Lecturer: M. Duflo, University of Paris VII

Classical Relativity: "Three-body scattering: topology and applications"

Piet Hut, Astronomical Institute, University of Amsterdam; Long-term Member, School of Natural Sciences, IAS

Evolution Equations: "Inverse scattering transforms in 1-dimension, and the Korteweg-de Vries equation"

Guest Lecturer: H. Segur, Princeton University

School of Natural Sciences

Astrophysics Seminar: "Large-scale clustering of galaxies: a quantitative approach"

Guest Lecturer: Jean Einasto, Tartu Astrophysical Observatory, Estonia

School of Social Science

Luncheon Seminar: "Islamic fundamentalism: *mystique* and *politique*"

Guest Lecturer: Emmanuel Sivan, Hebrew University; Visiting Member, School of Historical Studies, IAS

Concert

Daniel Phillips, Violinist

February 25

School of Mathematics

Working Seminar: "Taubes' theorem on the existence of self-dual connections" (continued)

Pit-Mann Wong, University of Notre Dame; Visiting Member, School of Mathematics, IAS

Lecture Series: "On Kähler geometry" (continued)

Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Astrophysics Seminar: "A ground-based compass for interstellar magnetic fields"

Nikolaos D. Kylafis, California Institute of Technology; Visiting Member, School of Natural Sciences, IAS

School of Social Science

International Relations Theory Discussion Group: "Financial aftermath of war"

Guest Lecturer: Charles Kindleberger, Davis Center for Historical Studies, Princeton University

February 28

School of Mathematics

Members' Seminar: "On Wiener's generalized harmonic analysis in functions with bonded quadratic means"

Ka-Sing Lau, University of Pittsburgh; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "Ising model on finitely generated lattices"
Guest Lecturer: Mario Rasetti, Polytechnic Institute, Turin

March 1

School of Mathematics

Unitary Representations of Real Reductive Groups: "Unitary representations of $GL(n, \mathbb{R})$ according to Speh"

Robert P. Langlands, Professor, School of Mathematics, IAS

Special Lecture: "Convergence to equilibrium for the classical Langevin equation"

Guest Lecturer: R. Durrett, University of California at Los Angeles

Several Complex Variables Seminar: "Peak sets on weakly pseudoconvex boundaries"

Guest Lecturer: A. V. Noell, Princeton University

March 2

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Evolution Equations: "Inverse scattering transforms in 2-dimensions: The Kadomtsev-Petviashvili equation"

Guest Lecturer: H. Segur, Princeton University

Differential Geometry: "Isospectral deformations of compact nilmanifolds"

Guest Lecturer: C. Gordon, Lehigh University

March 3-5

School of Social Science

Cognition Seminar Series I on Theoretical Strategies for Understanding Cognition, Consciousness, and Intentionality

Conveners: Paul M. Churchland, The University of Manitoba; Visiting Member, School of Social Science, IAS, and Clifford Geertz, Professor, School of Social Science, IAS

March 3

School of Historical Studies

Art History Colloquium: "Abstract Expressionism and Clyfford Still: idea, form, and context"

Stephen Polcari, University of Illinois at Urbana: Visiting Member, School of Historical Studies, IAS

School of Mathematics

Topology: "Smith equivalence of representations"
Guest Lecturer: K. H. Dovermann, Purdue University and Rutgers University

K-Theory: "Pedersen's delooping of algebraic K-theory"
Guest Lecturer: C. Weibel, Rutgers University

Mathematical Aspects of Renormalization Group Methods:
"Self-avoiding walk and statistical mechanics"
Guest Lecturer: T. Spencer, Courant Institute of Mathematical Sciences, New York University

Classical Relativity: "Existence results for maximal surfaces"
Guest Lecturer: R. Bartnik, Princeton University

School of Social Science

Luncheon Seminar: "Economic change and American women: historical precedents"
Claudia Goldin, University of Pennsylvania; Visiting Member, School of Social Science, IAS

First Cognition Seminar, Series I: "Theoretical strategies for understanding cognition, consciousness, and intentionality"
Guest Lecturer: Charles Taylor, University of Montreal

March 4

School of Mathematics

Special Lecture: "On the degree of hypersurfaces with given singularities"
Guest Lecturer: E. Viehweg, Brandeis University

Working Seminar: "K. Uhlenbeck's paper on 'Removable singularities in Yang-Mills fields' "
John C. Polking, Rice University; Visiting Member, School of Mathematics, IAS

Lecture Series: "On Kähler geometry" (continued)
Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Continuum φ_4^4 exists; lattice theories throw out the baby with the bath water"
Guest Lecturer: Nicola N. Khuri, Rockefeller University

School of Social Science

Second Cognition Seminar, Series I: "Theoretical strategies for understanding cognition, consciousness, and intentionality"
Guest Lecturer: Douglas Hofstadter, Indiana University

Third Cognition Seminar, Series I: "Theoretical strategies for understanding cognition, consciousness, and intentionality"
Guest Lecturer: Hubert Dreyfus, University of California at Berkeley

- March 5*
School of Social Science
- Fourth Cognition Seminar, Series I: "Theoretical strategies for understanding cognition, consciousness, and intentionality"
Guest Lecturer: Daniel Dennett, Tufts University
- March 7*
School of Mathematics
- Lecture Series: "On Kähler geometry" (continued)
Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS
- Hermann Weyl Lecture Series: "A smooth manifold homeomorphic to Euclidean 4-space"
Guest Lecturer: M. Freedman, University of California at San Diego
- March 7-30*
Exhibition
- Precursors of Postmodernism: Milan 1920-30's
A collection of photographs by Gabriele Basilico
- March 8*
School of Mathematics
- Several Complex Variables: "Multiplicities for pseudoconvex hypersurfaces"
Guest Lecturer: J. d'Angelo, Princeton University
- Unitary Representations of Real Reductive Groups: "Unitary representations of $GL(n, \mathbf{R})$ according to Speh" (continued)
Robert P. Langlands, Professor, School of Mathematics, IAS
- Hermann Weyl Lecture Series: "Whitney disks, Casson handles, and classifying 4-manifolds"
Guest Lecturer: Michael Freedman, University of California at San Diego
- March 9*
School of Historical Studies
- Colloquium in Classical Studies: "Athenian 'politicians' 403-322"
Mogens H. Hansen, University of Copenhagen; Visiting Member, School of Historical Studies, IAS
- School of Mathematics
- Mathematical Aspects of Renormalization Group Methods: "Beyond the saddle point approximation"
Daniel Amit, Racah Institute for Physics, Israel; Visiting Member, School of Natural Sciences, IAS
- Lecture Series: "Course in minimal surfaces and related topics" (continued)
S.-T. Yau, Professor, School of Mathematics, IAS
- Differential Geometry: "Classification of 3-dimensional compact Kähler manifolds with non-negative bisectional curvature"
Guest Lecturer: S. Bando, Princeton University
- Hermann Weyl Lecture Series. "Parametrizing Casson handles"
Guest Lecturer: M. Freedman, University of California at San Diego

March 10

School of Mathematics

Topology: "The Bryant-Giffen exotic triangulation of S^5 "
T. Benny Rushing, University of Utah; Visiting Member, School of Mathematics, IAS

Special Lecture: "New directions in 4-manifolds"
Guest Lecturer: Frank Quinn, Virginia Polytechnic Institute and State University

Classical Relativity: "Causality violation in general relativity"
Guest Lecturer: Vincent E. Moncrief, Yale University

Hermann Weyl Lecture Series: " ϵ -control and the annulus conjecture (after Quinn)"
Guest Lecturer: M. Freedman, University of California at San Diego

School of Social Science

Luncheon Seminar: "The comparative politics of contemporary industrial reorganization"
Charles Sabel, Massachusetts Institute of Technology; Visiting Member, School of Social Science, IAS

March 11

School of Mathematics

Working Seminar: "Local topology of moduli space"
Guest Lecturer: H. D. Rees, Princeton University

Lecture Series: "On Kähler geometry" (continued)
Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

Hermann Weyl Lecture Series: "The nonsimply connected theory"
Guest Lecturer: M. Freedman, University of California at San Diego

School of Social Science

International Relations Theory Discussion Group: "Toward a new foreign policy: where to begin"
Guest Lecturer: Thomas Farer, Woodrow Wilson School of Public and International Affairs, Princeton University

March 14

School of Historical Studies

Art History Colloquium: "Books of wisdom and books of vanity"
Jan Białostocki, University of Warsaw; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "On Kähler geometry" (continued)
Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

Members' Seminar: "Combinatorics of polynomial functions on o_{ghn} "
Ranee K. Gupta, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

March 15

School of Mathematics

Several Complex Variables: "The Cauchy-Riemann equations on pseudoconvex polyhedra"

John C. Polking, Rice University; Visiting Member, School of Mathematics, IAS

Unitary Representations of Real Reductive Groups: "Unitary representations of $GL(n, \mathbf{R})$ according to Speh" (continued)

Robert P. Langlands, Professor, School of Mathematics, IAS

March 16

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Working Seminar: "Local topology of moduli space" (continued)

Guest Lecturer: H. D. Rees, Princeton University

March 17

School of Mathematics

Topology: "The moduli space of stable curves"

Guest Lecturer: R. Lee, Yale University

K-Theory: "Suslin's work on K-theory of algebraically closed fields"

Robert W. Thomason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

Mathematical Aspects of Renormalization Group Methods: "Beyond the saddle point approximation" (continued)

Daniel Amit, Racah Institute for Physics, Israel; Visiting Member, School of Natural Sciences, IAS

Evolution Equations: "Representation theory approach to soliton equations"

Igor B. Frenkel, Yale University; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "An open elite? England 1540-1880"

Guest Lecturer: Lawrence Stone, Princeton University

March 18

School of Mathematics

Calabi Conference: "Deformations of surfaces preserving principal curvatures or lines of curvature"

Guest Lecturer: S. S. Chern, Mathematical Sciences Research Institute, Berkeley

Calabi Conference: "Characteristic numbers of a complete manifold of bounded curvature and finite volume"

Guest Lecturer: J. Cheeger, State University of New York at Stony Brook

Calabi Conference: "Calabi's conjecture and K-3 surfaces"

Guest Lecturer: Y.-T. Siu, Harvard University

Calabi Conference: "The Dirichlet problem for the Monge-Ampère equation"

Guest Lecturer: L. Nirenberg, Courant Institute of Mathematical Sciences, New York University

School of Natural Sciences

Theoretical Physics Seminar: "Studies of chiral symmetry on the lattice"

Guest Lecturer: J. Kogut, University of Illinois

March 21

School of Mathematics

Lecture Series: "On Kähler geometry" (continued)

Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

Members' Seminar: "W-graphs of representations of Coxeter groups and Hecke algebras"

Akihiko Gyoja, Osaka University; Visiting Member, School of Mathematics, IAS

March 22

School of Mathematics

Unitary Representations of Real Reductive Groups:

"Reducibility of principal series representations of p-adic groups"

Guest Lecturer: D. Keys, Rutgers University

March 23

School of Historical Studies

Colloquium in Classical Studies: "*Polis migadôn andrôn*: ethnicity and integration in Ptolemaic Memphis"

Dorothy J. Thompson, Girton College; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)

S.-T. Yau, Professor, School of Mathematics, IAS

Differential Geometry: "K-3 surfaces after Siu's paper"

Guest Lecturer: N. Mok, Princeton University

School of Natural Sciences

Theoretical Physics Seminar: "A funny thing happened on the way to space-time"

Guest Lecturer: Marvin Weinstein, Stanford Linear Accelerator Center

March 24

School of Mathematics

Topology: "A theorem of Miller implies a conjecture of Serre"

Guest Lecturer: J. Niesendorfer, Ohio State University

K-theory: "Suslin's work on K-theory of algebraically closed fields" (continued)

Robert W. Thomason, Massachusetts Institute of Technology; Visiting Member, School of Mathematics, IAS

Mathematical Aspects of Renormalization Group Methods:
 "Renormalization and the renormalization group"
 Daniel Amit, Racah Institute for Physics, Israel; Visiting
 Member, School of Natural Sciences, IAS

Special Lecture: "Possible applications of Morse theory to the
 structure of self-dual moduli spaces"
 Guest Lecturer: C. Taubes, Harvard University

Evolution Equations: "Tomography and the Radon transform"
 James V. Peters, C. W. Post Center, Long Island University;
 Visitor, School of Mathematics, IAS

School of Natural Sciences

Quantum Gravity Seminar: "Supersymmetry breaking in
 superspace"
 Guest Lecturer: Martin Roček, State University of New York at
 Stony Brook

School of Social Science

Luncheon Seminar: "Psychological space of Polish workers a
 year after the 'Polish Summer': an experimental social
 psychology approach"
 Grazyna Kochanska, University of Massachusetts; Visiting
 Member, School of Social Science, IAS

March 25

School of Mathematics

Working Seminar: "Local topology of moduli space"
 (continued)
 Guest Lecturer: H. D. Rees, Princeton University

Lecture Series: "On Kähler geometry" (continued)
 Eugenio Calabi, University of Pennsylvania; Visiting Member,
 School of Mathematics, IAS

March 26

Conference

New Jersey State Council on the Humanities

March 28

School of Mathematics

Lecture Series: "On Kähler geometry" (continued)
 Eugenio Calabi, University of Pennsylvania; Visiting Member,
 School of Mathematics, IAS

Members' Seminar: "Conformally invariant differential
 equations and representations of $SO(n,2)$ "
 Thomas P. Branson, Purdue University; Visiting Member,
 School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Studies of chiral symmetry on
 the lattice"
 Guest Lecturer: J. Kogut, University of Illinois

Theoretical Physics Seminar: "Status report on the state of
 dimensional reduction"
 Daniel Amit, Racah Institute for Physics, Israel; Visiting
 Member, School of Natural Sciences, IAS

Lunchtime Seminar: "Zero energy theorem for scale invariant gravity"
Andrew E. Strominger, Massachusetts Institute of Technology;
Visiting Member, School of Natural Sciences, IAS

March 29

School of Mathematics

Several Complex Variables: "Nonexistence of plurisubharmonic defining functions"
Klas Diederich, Wuppertal University; Visiting Member, School of Mathematics, IAS

Unitary Representations of Real Reductive Groups:
"Reducibility of principal series representations of p-adic groups" (continued)
Guest Lecturer: D. Keys, Rutgers University at Newark

Working Seminar: "Local topology of moduli space" (continued)
Pit-Mann Wong, University of Notre Dame; Visiting Member, School of Mathematics, IAS

School of Social Science

Cognitive Seminar: "Cognitive psychology"
George Miller, Princeton University; Visitor, School of Social Science, IAS

March 30

School of Mathematics

Lecture Series: "Course in minimal surfaces and related topics" (continued)
S.-T. Yau, Professor, School of Mathematics, IAS

Special Lecture: "Sharp constants in the Hardy-Littlewood-Sobolev inequalities"
Guest Lecturer: E. Lieb, Princeton University

Differential Geometry: "Equivariant Morse theory and closed geodesics"
Guest Lecturer: N. Hingston, University of Pennsylvania

School of Natural Sciences

Astrophysics Seminar: "Dwarf galaxies"
Guest Lecturer: Edwin E. Salpeter, Cornell University

March 31

School of Mathematics

Topology: "The Weil measures of a foliated manifold"
Guest Lecturer: S. Hurder, Princeton University

K-Theory: "Relative cycles and algebraic K-theory" (continued)
Guest Lecturer: S. Landsbury, University of Iowa

Special Lecture: "On the Benedicks-Carleson proof of Jakobson's theorem on iteration of quadratic maps"
Enrico Bombieri, Professor, School of Mathematics, IAS

Classical Relativity: "Equation of motion in general relativity"
Guest Lecturer: A. Rosenblum, Temple University

Evolution Equations: "Representation theory approach to soliton equations" (continued)
Igor B. Frenkel, Yale University; Visiting Member, School of Mathematics, IAS

School of Social Science

Luncheon Seminar: "Iranian women's magical narrative"
Judith Goldstein, Vassar College; Visiting Member, School of Social Science, IAS

April 4

School of Mathematics

Lecture Series: "On Kähler geometry" (continued)
Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Lunchtime Seminar: "Recent results on cellular automata"
Stephen Wolfram, Long-term Member, School of Natural Sciences, IAS

April 5

School of Mathematics

Informal Seminar: "Infinitesimal deformations of conformally flat structures"
Hubert Goldschmidt, University of Nice, France, and Columbia University; Visiting Member, School of Mathematics, IAS

April 6

School of Natural Sciences

Theoretical Physics Seminar: "Rigorous construction and Borel summability for planar 4-dimensional field theory"
Vincent Rivasseau, Ecole Polytechnique; Visiting Member, School of Natural Sciences, IAS

April 7

School of Historical Studies

Art History Colloquium: "Profane imagery in medieval Rome"
Dale Kinney, Bryn Mawr College; Visiting Member, School of Historical Studies, IAS

School of Social Science

Luncheon Seminar: "Diplomacy and political economy in North-South relations"
Michael Doyle, Princeton University; Visiting Member, School of Social Science, IAS

April 8

School of Mathematics

Lecture Series: "On Kähler geometry" (continued)
Eugenio Calabi, University of Pennsylvania; Visiting Member, School of Mathematics, IAS

April 11

School of Natural Sciences

Lunchtime Seminar: "Radiative corrections to the Heisenberg-Euler Lagrangian"
Walter Dittrich, Tübingen University; Visiting Member, School of Natural Sciences, IAS

April 14

School of Social Science

Luncheon Seminar: "Two Benthamites: an experiment in the history of ideas"

Robert Webb, University of Maryland; Visiting Member, School of Historical Studies, IAS

April 15

School of Natural Sciences

Theoretical Physics Seminar: "Critical wetting"
Guest Lecturer: Edouard Brézin, Harvard University and Centre d'Etudes Nucléaires de Saclay

April 21

School of Social Science

Luncheon Seminar: "Surrogate families in medieval peasant communities"
Barbara Hanawalt, Indiana University; Visiting Member, School of Historical Studies, IAS

April 25

School of Natural Sciences

Lunchtime Seminar: "The massless limit of supersymmetric QCD"
Nathan Seiberg, Weizmann Institute; Visiting Member, School of Natural Sciences, IAS

April 28

School of Social Science

Luncheon Seminar: "Fourteenth-century Oxford mathematical physics and its historical context"
Edith Sylla, North Carolina State University; Visiting Member, School of Historical Studies, IAS

April 29

School of Natural Sciences

Theoretical Physics Seminar: "Minimizing group-invariant potentials in orbit space"
Guest Lecturer: Jai Sam Kim, California Institute of Technology

April 29-May 1

Conference

Mosaic Pavements
Sponsor, Irving Lavin, Professor, School of Historical Studies, IAS

May 2

School of Natural Sciences

Theoretical Physics Seminar: "Topological charge in lattice gauge theory"
Guest Lecturer: P. Woit, Princeton University

May 4

School of Natural Sciences

Lunchtime Seminar: "Lattice supersymmetry and the Nicolai mapping"
Guest Lecturer: Norisuke Sakai, Harvard University and Tokyo Institute of Technology

May 5

School of Historical Studies

Art History Colloquium: "Raphael's *Expulsion of Heliiodorus*"
Guest Lecturer: John K. G. Shearman, Princeton University

School of Natural Sciences

Astrophysics Seminar: "Adonais: The life of James Edward Keeler and the early development of American astrophysics"

Donald E. Osterbrock, University of California at Santa Cruz;
Visiting Member, School of Natural Sciences, IAS

May 12-14

School of Social Science

Cognition Seminar, Series II, on Neuroscience, Mathematics,
and Biophysics: Naturalistic Approaches to Mind-Brain
Function

Conveners: Paul M. Churchland, University of Manitoba;
Visiting Member, School of Social Science, IAS, and Clifford
Geertz, Professor, School of Social Science, IAS

First Cognition Seminar, Series II: "Tensor-network models of
motor control and perceptual processing"

Guest Lecturer: Rodolfo Llinas, New York University Medical
Center

May 12-15

School of Social Science

Folk Models Conference

Convener: Naomi Quinn, Duke University; Visiting Member,
School of Social Science, IAS

May 13

School of Social Science

Second Cognition Seminar, Series II: "The role of the
hippocampus in spatial cognition, learning, and memory"

Guest Lecturer: Lynn Nadel, University of California at Irvine

Third Cognition Seminar, Series II: "Autopoiesis and self-
organizing systems"

Guest Lecturer: Gabe Stolzenberg, Northeastern University,
Boston

May 14

School of Natural Sciences

Fourth Cognition Seminar, Series II: "Five types of neurological
embodiments of knowledge in an evolutionary
epistemology"

Guest Lecturer: Donald Campbell, Syracuse University

May 18

School of Natural Sciences

Lunchtime Seminar: "Large N reduced models: twisted Eguchi-
Kawai model"

Guest Lecturer: Masanori Okawa, Brookhaven National
Laboratory

May 19

School of Natural Sciences

Astrophysics Seminar: "Pancakes and the formation of galaxies:
neutrinos and other 'inos' "

Guest Lecturer: Paul R. Shapiro, University of Texas at Austin

May 20

School of Natural Sciences

Lunchtime Seminar: "High energy elastic pp scattering at the
collider"

Guest Lecturer: André Martin, Centre Européen de la
Recherche Nucléaire

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May 23

School of Natural Sciences

Lunchtime Seminar: "Static properties of neutrons in the Skyrme model"
Chiara R. Nappi, Harvard University; Visiting Member, School of Natural Sciences, IAS

May 25

School of Natural Sciences

Theoretical Physics Seminar: "New results from Monte Carlo simulations for meson and hadron masses"
Guest Lecturer: G. Martinelli, University of Rome-Frascati

May 27

School of Natural Sciences

Theoretical Physics Seminar: "Geometrical hierarchy in $N = 1$ supergravity"
Guest Lecturer: Burt Ovrut, The Rockefeller University

June 9

School of Natural Sciences

Lunchtime Seminar: "Stochastic differential equations and supersymmetry"
Guest Lecturer: Nicolas Sourlas, Ecole Normale Supérieure

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

October 13

Lecture Series: "Archaeology: scientist versus humanist"
Guest Lecturer: Peter Kuniholm, Cornell University

November 10

Lecture Series: "The Alhambra"
Guest Lecturer: James Dickie, University of Lancaster, Great Britain

December 8

Lecture Series: "Mithras in Athens and in Ostia"
Homer A. Thompson, Professor Emeritus, School of Historical Studies, IAS

February 9

Lecture Series: "Sardis in the age of Croesus"
Guest Lecturer: Crawford H. Greenewalt, Jr., University of California at Berkeley

March 9

Lecture Series: "Masters in marble: the earliest sculptors of the Cyclades"
Guest Lecturer: Pat Getz-Preziosi, New Haven

April 13

Lecture Series: "The lure of ancient art for artists and collectors in the Renaissance"
Guest Lecturer: Phyllis Bober, Bryn Mawr College

Report of the Treasurer

The market value of the Institute's endowment totaled \$124,421,781 on June 30, 1983.

During the fiscal year, total operating expenditures were \$10,294,850. After applying \$2,225,906 in operating fund gifts and grants against these expenditures, the Institute was required to provide \$8,068,944 from endowment resources. This represents approximately 7.6 percent of the average of the endowment market values at June 30, 1983 and June 30, 1982, as compared to 7.4 percent of the comparable endowment totals for fiscal year 1982.

The performance of the Institute's portfolio is measured annually by Hamilton, Johnston & Co., Inc. Over the ten year period ending

June 30, 1983, dividend and interest income and net realized and unrealized gains combined for a total average annual compound rate of return on Institute investments of 14 percent. Over the past five years, the average annual compound rate of return was 22 percent. For fiscal 1983, the annual rate of return was 44.4 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, 1983, follow this report.

Ralph E. Hansmann
Treasurer

Institute for Advanced Study
Louis Bamberger and Mrs. Felix Fuld Foundation
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Summary of Significant Accounting Policies

Notes to Financial Statements

Deloitte Haskins+Sells

111 Madison Avenue
Post Office Box 2086
Morristown, New Jersey 07960
(201) 540-0940
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The Board of Trustees,
Institute for Advanced Study -
Louis Bamberger and
Mrs. Felix Fuld Foundation
Princeton, New Jersey

October 3, 1983

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, 1983 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, 1983 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, 1983

Exhibit A

ASSETS**Operating Funds:**

Cash and temporary investments	\$ 244,347
Accounts and notes receivable	78,572
Government receivable	218,813
Specific purpose funds receivable	61,699
Accrued income on investments	485,155
Deferred charges	190,458
Total operating funds	\$ 1,279,044

Plant Funds:

Cash	\$ 18,626
Debt service fund deposits	428,926
Accrued income on investments	45,981
Marketable securities, at cost which approximates market	2,052,170
Unamortized debt expense	87,000
Land, buildings and improvements, equipment and library books (including rare book collection) at cost, less accumulated depreciation of \$8,436,449 (Notes C and D)	14,705,671
Total plant funds	\$ 17,338,374

Endowment and Similar Funds: (Note B)

Marketable securities, at cost (Note D)	\$104,210,803
Mortgages and notes receivable	1,147,066
Total endowment and similar funds	\$105,357,869

LIABILITIES AND FUND BALANCES**Operating Funds:**

Accounts payable, accrued expenses, etc.	\$ 652,244
Deferred restricted revenue (Note G)	229,073
Fund balance (Exhibit B)—unrestricted	397,727
Total operating funds	\$ 1,279,044

Plant Funds:

Interest payable (Note D)	\$ 323,926
Bonds payable (Note D)	9,038,209
Notes payable	45,547
Plant funds balance (Exhibit B)	7,930,692
Total plant funds	\$ 17,338,374

Endowment and Similar Funds:

Investment accounts payable	\$ 172,044
Fund balances (Exhibit B):	
Endowment funds	31,066,218
Quasi-endowment funds	74,119,607
Total endowment and similar funds	\$105,357,869

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, 1983**

	Operating Funds			Plant Funds	Endowment and Similar Funds	Total All Funds
	Unrestricted	Restricted	Total			
Support and Revenue:						
Endowment income (net of management fees)	\$5,584,835	\$1,709,200	\$7,294,035			\$ 7,294,035
Contributions	350,547	1,452,042	1,802,589			1,802,589
Government contracts	142,455	280,862	423,317			423,317
Total support and revenue	6,077,837	3,442,104	9,519,941			9,519,941
Expenses:						
School of Mathematics	1,287,820	792,093	2,079,913	\$96,206		2,176,119
School of Natural Sciences	1,061,492	677,084	1,738,576	148,249		1,886,825
School of Historical Studies	1,466,792	384,904	1,851,696	166,125		2,017,821
School of Social Science	68,056	883,724	951,780	57,267		1,009,047
Libraries	851,273	532	851,805	67,737		919,542
Director's Special Purpose Fund	55,425	34,020	89,445	813		90,258
Administration and General	1,760,364	16,599	1,776,963	159,277		1,936,240
Auxiliary Activity — tenants' housing expenses net of \$90,227 of revenue	130,708	76,982	207,690	51,308		258,998
Total expenses	6,681,930	2,865,938	9,547,868	746,982		10,294,850
Excess (deficiency) of support and revenue over expenses before capital additions	(604,093)	576,166	(27,927)	(746,982)		(774,909)
Capital Additions:						
Gifts				334,207	\$4,393,395	4,727,602
Realized net gains on investments				3,915	3,946,678	3,950,593
Investment income				304,585		304,585
Total capital additions				642,707	8,340,073	8,982,780
Excess (deficiency) of support and revenue over expenses after capital additions	(604,093)	576,166	(27,927)	(104,275)	8,340,073	8,207,871
Fund Balances at Beginning of Year	1,511,956	-0-	1,511,956	7,236,371	96,558,046	105,306,373
Transfers:						
Proceeds from disposal of plant facilities	15,700		15,700	(15,700)		
Plant acquisitions and principal debt service payments	(814,296)		(814,296)	814,296		
Portion of quasi-endowment funds appropriated	288,460		288,460		(288,460)	
Transfers to endowment and similar funds		(576,166)	(576,166)		576,166	
Fund Balances at End of Year	\$ 397,727	\$ -0-	\$ 397,727	\$7,930,692	\$105,185,825	\$113,514,244

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, 1983**

	Operating Funds	Plant Funds	Endowment & Similar Funds	Total All Funds
Resources Provided:				
Excess (deficiency) of support and revenue over expenses before capital additions	\$ (27,927)	\$ (746,982)		\$ (774,909)
Capital additions:				
Gifts		334,207	\$ 4,393,395	4,727,602
Realized net gains on investments		3,915	3,946,678	3,950,593
Investment income		304,585		304,585
Excess (deficiency) of support and revenue over expenses after capital additions	(27,927)	(104,275)	8,340,073	8,207,871
Items not using (providing) resources:				
Provision for depreciation		738,646		738,646
Decrease in unamortized debt service expense		3,107		3,107
(Gain) on disposition of investments - net		(3,915)	(3,946,678)	(3,950,593)
Proceeds from sale of investments		15,700	215,616,174	215,631,874
Decrease in marketable securities		636,110		636,110
Decrease in accrued income	380,237	26,262		406,499
Decrease in receivables	102,324			102,324
Increase in payables	408,082			408,082
Increase in deferred restricted revenue	39,602			39,602
Total resources provided	902,318	1,311,635	220,009,569	222,223,522
Resources Used:				
Purchases of investments			220,345,514	220,345,514
Purchases of plant facilities and equipment		1,957,307		1,957,307
Increase in deferred charges	66,975			66,975
Decrease in accounts payable		2,938	575,052	577,990
Increase in debt service fund deposits		2,062		2,062
Reduction of bond and note payables		146,431		146,431
Total resources used	66,975	2,108,738	220,920,566	223,096,279
Transfers:				
Proceeds from disposal of plant facilities	15,700	(15,700)		
Plant acquisitions and principal debt service payments	(814,296)	814,296		
Portion of quasi-endowment funds appropriated	288,460		(288,460)	
Transfers to endowment and similar funds	(576,166)		576,166	
Total transfers	(1,086,302)	798,596	287,706	
Increase (decrease) in cash	\$ (250,959)	\$ 1,493	\$ (623,291)	\$ 872,757

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

Summary of Significant Accounting Policies

June 30, 1983

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, 1983

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:

	<i>Pooled Assets</i>		<i>Net</i>	<i>Market</i>
	<i>Market</i>	<i>Carrying</i>	<i>Increase</i>	<i>Value</i>
	<i>Value</i>	<i>Value</i>	<i>(Decrease)</i>	<i>Per Unit</i>
July 1, 1982	\$82,852,603	\$92,941,893	\$(10,089,290)	\$3,609
June 30, 1983	124,421,781	105,185,825	<u>19,235,956</u>	4,899
Unrealized appreciation (depreciation) for the year ended June 30, 1983			29,325,246	
Realized net gain for the year ended June 30, 1983			<u>3,946,678</u>	
Net change for the year ended June 30, 1983			<u>\$33,271,924</u>	

Earnings per unit, for the year ended June 30, 1983, exclusive of realized gains and losses, amounted to \$292, after deducting management fees.

The pooled investments at June 30, 1983 are comprised of the following:

	<i>Carrying</i>	<i>Market</i>
	<i>Value</i>	<i>Value</i>
Cash equivalents	\$ 7,126,499	\$ 7,126,499
Equity securities	62,742,388	81,286,620
Debt securities	34,341,916	35,033,640
Mortgages and notes receivable	1,147,066	1,147,066
Investment accounts payable	<u>(172,044)</u>	<u>(172,044)</u>
	<u>\$105,185,825</u>	<u>\$124,421,781</u>

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 sub-

sequent 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	\$ 1,965,291
Buildings and improvements	17,764,158
Equipment	3,213,163
Library books	199,508
Total	<u>23,142,120</u>
Less accumulated depreciation	8,436,449
Net book value	<u>\$14,705,671</u>

D.

A summary of bonds payable follows:

2.75%, 1956—Apartment Bonds	\$ 564,000
7.804%, 1980—NJFEA Series A Revenue Bonds	<u>8,580,000</u>
Total	9,144,000
Less unamortized bond discount	105,791
Total bonds payable	<u>\$ 9,038,209</u>

On July 24, 1980, the Institute for Advanced Study received proceeds of the New Jersey Educational Facilities Authority (NJFEA) 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 mature on July 1 of the years 1981 through 1995 with the final balance of \$6,630,000 maturing on July 1, 2011. Bond principal in the amount of \$105,000 matured on July 1, 1983 and bond principal in the amount of \$110,000 (1984), \$115,000 (1985), \$120,000 (1986) and \$130,000 (1987) will mature on July 1 of the designated years. The obligation to pay the Authority on a periodic basis, in amounts sufficient to cover principal and interest due on the bonds, is a general obligation of the Institute. The bonds are 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 1983, 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, 1983 was \$686,702.

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, 1983 amounted to \$455,990.

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 \$61,084 for the year ended June 30, 1983 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 \$1,096,000 as of June 30, 1983 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:

	<i>Specific Purpose Funds</i>	<i>Government Contracts</i>	<i>Total</i>
Balance at beginning of year	\$ 90,596	\$ 98,875	\$ 189,471
Additions:			
Contributions	1,590,519	181,987	1,772,506
Net endowment income	<u>1,709,200</u>		<u>1,709,200</u>
Total additions	<u>3,299,719</u>	<u>181,987</u>	<u>3,481,706</u>
Deductions:			
Funds expended during year	2,585,076	280,862	2,865,938
Transfer to endowment and similar funds	<u>576,166</u>		<u>576,166</u>
Total deductions	<u>3,161,242</u>	<u>280,862</u>	<u>3,442,104</u>
Balance at end of year	<u>\$ 229,073</u>	<u>-0-</u>	<u>\$ 229,073</u>

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 (\$236,480 net of \$199,728 in revenues) and Members' Housing (\$584,056 net of \$553,530 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 \$7,517,275.90 received between July 1, 1982 and June 30, 1983. Space limitations prohibit listing all of those who supported

the Institute during this period. Following are the names of individuals and organizations who made contributions of \$1,000 or more. To all of the contributors, the Institute expresses its deepest appreciation.

Individuals

Anonymous donors
Association of Members of the Institute for
Advanced Study

Mr. and Mrs. Edward L. Barnes
Charles Lee Brown
Fletcher L. Byrom
Anthony Camps
Mr. and Mrs. J. Richardson Dilworth
Elizabeth S. Ettinghausen
Michael V. Forrestal
Ralph E. and Doris Hansmann
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Inc.
Western Electric

Government Agencies

The German Marshall Fund of the U.S.
Ministry of Education and Science, Federal
Republic of Germany
National Aeronautics and Space Administration
National Endowment for the Humanities
National Science Foundation
State of New Jersey
U.S. Department of Energy
U.S. Office of Naval Research

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