The Institute for Advanced Study

Annual Report 1981/82

The Institute for Advanced Study

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The Institute for Advanced Study
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Designed by Bruce Campbell

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

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

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The Institute for Advanced Study: Background and Purpose

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

The Institute for Advanced Study, an independent, private institution devoted to the encouragement, support and patronage of learning, was founded in 1930 as a community of scholars where intellectual inquiry could be carried out in the most favorable circumstances. Focused on mathematics and classical studies at the outset, the Institute today consists of the School of Historical Studies, the School of Mathematics, the School of Natural Sciences and the School of Social Science. Each School has a small permanent Faculty, and some 160 fellowships are awarded annually to visiting members from other research institutions and universities throughout the world.

The objectives of the Institute were described as follows in the Founders' original letter to the first Trustees: "The primary purpose is the pursuit of advanced learning and exploration in the fields of pure science and high scholarship to the utmost degree that the facilities of the institution and the ability of the faculty and students will permit." During the past half-century, these goals have been implemented by a Faculty of exceptional merit; by an annually renewed group of visiting members chosen from among the many who apply; and by the development of facilities and a mode of operation designed specifically to support and assist the Institute's intellectual purposes in every way possible.

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

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

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

many separate fields of study, maintains no laboratories and determines its programs in terms of individual intellectual imperatives rather than the collective aims of research teams or the particular interests of potential donors.

For more than five decades the Institute for Advanced Study has made a substantial contribution to the world of higher learning by providing support—intellectual and material—to visiting members whose development and growth constitute one of its principal purposes. More than one third of these visiting members are young men and women 35 years of age or less whose work at the Institute involves the Faculty in a substantial amount of postdoctoral training. Though none of the visiting members is a student in the narrow sense of being a degree candidate, the communal atmosphere and many opportunities for discussion with Faculty members and peers, both within and outside seminar meetings, are propitious to scholarly growth.

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

The varied work of the Institute is, of course, specialized; no advanced study or deep scholarship can be otherwise. Formal attempts to organize scholarly work at the Institute are minimized, although lectures and seminars are a regular feature of its internal life. Schools may, for limited periods of time, select certain themes or programmatic arrays under which members are encouraged to apply, but no concentration guarantees entry and no focus excludes those outside it. The choice and conduct of research are matters which are decided entirely by each individual member of the Institute.

The Institute is nonetheless an intellectual community and not a mere collection of scholars. Community is possible because Faculty and members have some substantial knowledge outside their own fields of specialization. The fact that the visiting members live together in Institute housing, eat in the same dining hall, share the same common rooms 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

In this, my first year as Chairman of the Board, I have become increasingly aware of how strongly the traditional qualities of the Institute persist and how committed all its constituent parts are to the continuity of its enterprise. The abilities of a most distinguished faculty, the impressive credentials and energies of the members, the dedication of the administrative staff, each contribute to a growing collegiality in the community and to the importance and viability of the Institute as it moves into the second half of its first century.

To assure a future which will match and extend the achievements of the past, a reinforcement of the endowment is being sought through the Fiftieth Anniversary Fund, income from which will be used to provide permanent annual stipend support for 50 visiting members from each year's total group of some 160. Such support remains vital to ensure that ebb and flow of scholars who carry the fruits of their work at the Institute to universities distributed around the world. It is our intention that this fruitful exchange should rest on as secure a financial basis as possible. To this end, a fund-raising program was approved by the Board of Trustees at its April 25, 1981, meeting and the campaign was launched in June. As of March 31, 1982, a total of $1,382,407 had been received and pledged as well as $750,000 towards two Andrew W. Mellon professorships in the Humanities to be established in the School of Historical Studies, one as a visiting professorship and the other as a permanent appointment.

At the April 1982 meeting of the Board, the corporate officers were all reelected for an additional term, with the exception of John Hunt who has resigned as Secretary of the Corporation. Reelected to the Board for terms expiring in April 1987 were Ralph E. Hansmann and Michael V. Forrestal.

During the past year, three new trustees were elected to the Board in the class of 1987: Thornton F. Bradshaw, Dr. Wilfried Guth, and Professor G. Daniel Mostow.

Thornton F. Bradshaw was born in Washington, D.C. and educated at Phillips Exeter Academy, Harvard College, and the Harvard Graduate School of Business Administration, from which he earned a Ph.D. In 1956 he joined the Atlantic Richfield Corporation and was elected President in 1964. In 1981, he became Chairman of the Board and Chief Executive officer of RCA Corporation, having served as a director of RCA since 1962. An industrialist and civic leader, Mr. Bradshaw is a member of the Board of Directors of Champion International Corporation and Atlantic Richfield Corporation. His other directorships include the Academy of Educational Development, the Aspen Institute for Humanistic Studies, the Center for Communication, The Conference Board, and The Conservation Foundation. He is also a member of the Board of Overseers, Harvard College; a member of the Visiting Committee to the John Fitzgerald Kennedy School of Government; and a member of the Visiting Committee on University Resources of Harvard University.

Dr. Wilfried Guth was born in Erlangen and educated at the Universities of Bonn, Geneva, Heidelberg, and the London School of Economics. After having served in the Bank Deutscher Länder and the Deutsche Bundesbank, Dr. Guth went to the International Monetary Fund in Washington as Executive Director for the Federal Republic of Germany. Following that he was a member of the Board of Managing Directors of the Reconstruction Loan Corporation in Germany from 1962 to

1967, the agency responsible for administering Marshall Plan funds in Germany. In early 1968, Dr. Guth joined the Board of Managing Directors of Deutsche Bank where he was appointed as co-spokesman of the Board in 1976. A member of many international bodies concerned with international monetary policy and questions of economic cooperation and development, he also heads the Supervisory Boards of Daimler-Benz AG, Philipp Holzmann AG, the Metallgesellschaft AG, and is a Director of the European American Banks, New York.

Professor G. Daniel Mostow was born in Boston and attended Harvard University where he received his A.B., M.A., and Ph.D. degrees. He has taught mathematics at Harvard, Princeton, Syracuse, and The Johns Hopkins Universities, and since 1961 has been a professor at Yale University where he served as Chairman of the Department of Mathematics from 1971 to 1974, and became the Henry Ford II Professor of Mathematics in 1981. He has twice been a member of the School of Mathematics at the Institute, in 1956-57 and in 1975. He has also taught at mathematical institutes in Rio de Janeiro, Paris, Jerusalem, and Bombay. He has served as editor of the *American Journal of Mathematics* from 1963 to 1968 and as Associate Editor for the *Annals of Mathematics*, the *Transactions of the American Mathematical Society*, and the *American Scientist*. He has been a member of the Council of the American Mathematical Society, the American Mathematical Society Committee on Relations with Government, and was chairman of the U.S. National Committee for Mathematics in 1971-73 and 1982-84. He was Chairman of the Office of Mathematical Sciences (National Research Council), 1975-78, and is currently Chairman, Section of Mathematics, National Academy of Sciences, 1981-84. His particular subject of research is differential geometry and the theory of Lie groups.

This spring, Professor Joseph L. Doob retired as trustee, and the Board presented to him the following resolution:

> "To our colleague Joseph L. Doob, our affectionate and deep appreciation for his numerous contributions as Trustee from 1974 to 1982. His sound judgment and clear counsel, not only with regard to the particular academic area which he represented, but also with respect to the well-being of the entire Institute for Advanced Study were always present. We herewith express our gratitude for his sensitivity and his friendship for this institution, and we wish him health and happiness in his retirement."

J. Richardson Dilworth
Chairman

Report of the Director

The Schools

The past academic year has seen a number of interesting developments within the Institute, all of which will strengthen the Faculties of each School. While some undulation in Faculty numbers will occur as retirements and appointments to newly endowed Chairs take place, it is our intention to remain within the limits established by the special committee of the Board of Trustees (chaired by Trustee Martin Segal) in 1976.

Thanks to a generous grant from The Andrew W. Mellon Foundation combined with matching funds raised elsewhere, the School of Historical Studies will be able to establish two Andrew W. Mellon Professorships in the Humanities. One will function in the traditional manner, supporting a permanent appointment, and the other will provide endowed support for distinguished professorial visitors. We are most grateful to the Mellon Foundation for the imaginative and flexible character of this gift and mean to use the Visiting Professorship in particular to explore new academic possibilities or to consider new intellectual directions.

In keeping with the general assessment of our activities which we began last year by appointing a Visiting Committee to the School of Natural Sciences, we have established this year a Visiting Committee for the School of Historical Studies. Under the Chairmanship of Professor Zeph Stewart of The Department of the Classics, Harvard University, the Committee consists of Professor Bernard Bailyn, Harvard University; Sir Isaiah Berlin, Oxford University, 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. The invitation to serve on the Committee included a request "to examine briefly the record of accomplishment of the School's permanent scholars and to comment on the functions of its visiting member program in the fields of the classics, history of art, modern history, history of modern philosophy, American intellectual history and the history of mathematics and the sciences." Recognizing the preeminence which the School has achieved, the Visiting Committee will be asked also to consider "that status with an eye either to continuing present patterns or to suggesting a somewhat different future. For example, should literature other than that of the classical epoch be represented, and if so, in what manner or what kind? History and philosophy as humanities are imbedded in our present practice; should the future replicate the present identically and if not, what direction might our pattern of appointments and invitations to visitors take and what disciplines might we reach for beyond our present activities?" Additional questions to be placed before the Committee include the following:

—Do the fields represented by the permanent faculty indicate an adequate focus and/or a sufficient spread of disciplines? What areas ought to be strengthened or encouraged by new appointments, now made possible by two new Andrew W. Mellon Chairs?

—Is the visiting membership broadly enough constituted (age, sex, geographical provenance, university affiliation, research subjects)? Is the process by which visiting members are chosen an effective and efficient one? Should more long-term appointments be sought and what effect would this have on the present turnover and number of visiting members?

—Are the physical facilities adequate (library space and holdings, office space, secretarial and copying services, housing for members, recreational areas)?

—What further financial support is to be recommended and for what purposes?

In the School of Mathematics, a newly endowed Professorship, to be known as the Hermann Weyl Professorship, will be established primarily with funds from the Julius Bär family and IBM. Additional monies as needed to bring the endowment to a completely supporting level will also be sought.

The academic year 1981-82 was an especially active one for the School of Mathematics, in part because of the series of seminars associated with the special program for this year in algebraic geometry. The report of the School itself will describe the seminars on Moduli Problems, on Transcendental Topics in Algebraic Geometry, and on Intersection Homology. Other seminars connected with the Algebraic Geometry Year dealt with singularities, p-adic cohomology, abelian varieties, and the classification of varieties of low-dimension.

A special program is also being planned for 1983-84 in keeping with the School's desire to sponsor research and discussion in areas in which its Faculty may have no special competence. However, under the title of "L-functions and Automorphic Forms," for which the School hopes to have a program in 1983-84, there is a considerable overlapping of interests with that of permanent members. As described in the proposal for the program, "L-functions, especially those of Riemann and Dirichlet, had their origins in the study of the asymptotic distribution of primes. During the last decades, very broad classes of L-functions have been introduced, and it is becoming evident that their study has implications for strictly arithmetic questions as well, especially in the study of diophantine equations. There are a large number of conjectures, and a number of special, but very serious, results, and new techniques are being developed steadily. We intend to bring together a mixture of mathematicians whose interests cover the whole spectrum of problems posed by these L-functions in the hope that the exchange of ideas will encourage progress with their solution."

This year was an especially important one in the School of Natural Sciences because of the installation of a VAX 11/780, as the Executive Officer for the School for the year noted, "the first such computational machine to be located at the Institute in the modern era." We were able to acquire this computer as a result of financing from the National Science Foundation and the Department of Energy, and it has led to a considerable broadening of research undertaken by members of the School. In the past certain computational projects were impossible because of the excessive cost of buying computer time elsewhere, and more complex projects that would have been prohibitively expensive before can now be carried out economically. Some examples of this gain are discussed in the School's own report.

Perhaps it is also worthwhile to indicate that another first event took place for the School this year with the visit of two members from the People's Republic of China, both of whom stayed the full year and worked on model field theories and the theoretical and phenomenological aspects of grand unified theories.

The report of the Visiting Committee of the School of Natural Sciences, chaired by Professor Sidney D. Drell, noted that "since its creation by Robert Oppenheimer in the late 1940's, the School of Natural Sciences has developed a vigorous and stimulating tradition in theoretical physics. It has been distinguished . . . [by] creative faculty and postdoctoral visitors who have made it one of the most important centers of theoretical physics in the world. Throughout its existence the School has contributed importantly to the advancement of knowledge at the frontiers of fundamental physics. These [include] elementary particle physics, and . . . astrophysics and cosmology. We believe that this tradition of maintaining a strong and important position in these areas of fundamental physics must be continued and that fundamental physics must remain the primary focus of the activities of the School of Natural Sciences. At the same time we recognize the value of ex-

ploring new areas of intrinsic importance." The report urged that for the near future there be an increase in five-year appointments and one-year senior visiting faculty to the Institute. These are to be seen as devices for broadening the intellectual domain of the School of Natural Sciences and a possible path to appointments of a more permanent nature. In addition to the intellectual suggestions, many useful comments were made on improving the physical facilities at the Institute, as well as its communal life, and a number of these have already been put into practice or will be in the very near future. They involved everything from improving the copying services and local transportation to organizing appropriate social affairs to accelerate the accommodation to life at the Institute.

In the School of Social Science, it is my sad duty to report this year the death of one of our members, who had come to us with the support of a Ford Foundation minorities grant. Dr. Vera M. Green from Rutgers University died before she could complete her work here.

The activities of the School this year included the traditional Thursday luncheon seminars. These, as usual, were attended by members of the School, others from the School of Historical Studies, and still others from the Princeton academic community at large. The topics ranged widely as is normal to the seminar, from the ethical and philosophical foundations of economics to studies of Javanese culture and society, but the principal focus touched on an overlapping set of problems in political philosophy.

A group of political theorists met on a regular basis every two weeks throughout the year with others from the School of Historical Studies and from Princeton University who presented papers and joined in the discussion. The population for these seminars was normally drawn from people whose special interests were history, political science and philosophy. A second informal group came together to form a seminar dealing with the question of interpretation in anthropology. Formal papers were distributed in advance, enabling critical discussion to follow among individuals drawn from the University, the Davis Center, and the Faculty and members of the Institute.

This was also the year in which the three-year Andrew W. Mellon Foundation program, devoted to the theme of Self-Perception, Mutual Perception and Historical Development, came to an end. This support had made possible a cooperative endeavor between the School of Social Science and the School of Historical Studies, and in this final year the seminar, which met every two weeks, discussed various aspects of the topic "The Perception of Others and Self-Definition."

In the year to come the focus for the School will be Cognitive and Social Psychology, with eight people (six members and two visitors) invited to form the core group.

Finally, a three-year membership has been offered to and accepted by Dr. Wolf Lepenies, a distinguished sociologist from the Free University of Berlin whose field of work centers on the relationship between the human and the social sciences and literature since the end of the eighteenth century. Dr. Lepenies was a member of the School in 1979-80.

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 with long-term appointments is demonstrated by the following list of this year's honors and distinctions.

Enrico Bombieri was elected to Foreign Membership in the Royal Swedish Academy of Sciences in 1982.

Armand Borel was elected to a Foreign Associateship of the French Academy of Sciences in 1981.

Marshall Clagett was awarded the Koyré medal of the Académie International d'Histoire des Sciences in August, 1981.

Freeman J. Dyson was awarded the Wolf Foundation Prize in Physics.

Clifford Geertz received an Honorary Doctorate of Humane Letters from Knox College, Illinois, and was voted by the Board of Trustees to the Harold F. Linder chair in the School of Social Science.

Felix Gilbert was elected a member of the order "Pour le Mérite für Wissenschaften und Künste"; he was awarded the Howard R. Marraro prize by the American Catholic Historical Association and was given an honorary doctorate by the University of Bologna.

Herman H. Goldstine was given the Computer Pioneer Award by the Computer Society of the Institute of Electric and Electronics Engineers.

Harish-Chandra was elected a Member of the United States National Academy of Sciences in 1981.

Albert O. Hirschman gave the Marc Bloch Lecture in Paris.

George F. Kennan was the recipient of the Grenville Clark Prize in November, 1981.

Robert P. Langlands was elected a Fellow of the Royal Society in 1981 and received the Cole Prize of the American Mathematical Society in 1982.

John W. Milnor received the Steele Prize of the American Mathematical Society in 1982.

Otto E. Neugebauer was elected honorary member of the Royal Irish Academy.

Atle Selberg was elected to Foreign Membership in the Indian National Academy of Sciences in 1981.

Michael Walzer received a Creative Arts Award (for nonfiction) from Brandeis University.

Harry Woolf received an honorary Doctorate of Science from The American University.

Shing-Tung Yau received the Veblen Prize of the American Mathematical Society in 1981, the Carty Prize of the National Academy of Sciences in 1981, the Fields Medal in 1982, and the Humboldt Award in 1982.

Members' Program

The total number of members this year was 159. Of these, forty-five were under the age of 35 and ten percent were women. Members in 1981-82 came from 110 institutions located in twenty-three countries. The names, academic backgrounds and fields of interest of this year's members and visitors are described in the pages which follow. Among the many individuals of note who have been part of our community this year, special mention should be made of the Director's Visitors, Sir Isaiah Berlin, from All Souls College in Oxford, and Jacobo Timerman, formerly editor of *La Opinion* in Argentina and now resident in Israel.

Other events

Among other events of note, a fund has been established in memory of Richard Llewelyn-Davies, the British architect who was a Director's Visitor during the 1980-81 academic year, to endow an annual lecture in his name.

On November 14, 1981, the Tony Smith sculpture placed near the Institute pond was unveiled. Tony Smith had presented this "New Piece" to the Institute to commemorate the accomplishments of Albert Einstein and to demonstrate his respect for the institution which had come to be his American and final home. Tony Smith died before the installation itself so that the dedication of the sculpture served to express the Institute's respect for both men and its honor for their memory. Professor Dore Ashton of the Cooper Union for the Advancement of Science and Art gave a lecture on this occasion entitled "Sculpture on the Edge of Dreams," to be published in booklet form by the Institute.

A memorial gathering was held at the Institute for Helen Dukas on March 15, 1982. Miss Dukas, who died on February 9, 1982, was the secretary to Albert Einstein from 1927 until his death in 1955. She was archivist and co-trustee of his papers, and was an able, active, and extraordinary woman to the very end.

The School of Historical Studies

Faculty

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

Professors Emeriti

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

Members with Long-term Appointments

Herman H. Goldstine
Bernard Lewis
Otto E. Neugebauer

The School of Historical Studies

The School of Historical Studies is concerned with all learning for which the use of the historical method is a principal instrument. Over the years it has mirrored the varied interests of its individual Faculty and visiting members, but certain 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 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, 1981-82

The School was host to forty-one long-term, term and annual members in 1981-82. During the summer of 1981 it also provided research facilities for fourteen summer visitors. Twenty-two members came from foreign countries, including Belgium, Canada, England, France, the Federal Republic of Germany, Israel, Italy, Poland, Turkey 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. This was the third year of a program funded by The Andrew W. Mellon Foundation, in which members from the Schools of Historical Studies and Social Science met together at regular two-week intervals to pursue the theme of "Self-Perception, Mutual Perception and Historical Development." Relevant articles and texts were circulated in advance of the session, so that all members, however remote the subjects of their own specialized interests, came to the meetings with a shared background of reading.

In addition to this collaborative project, there were formal colloquia—lectures followed by discussions—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.

Faculty

Professor Glen W. Bowersock completed the manuscript of his book on Roman Arabia, published several articles, gave six lectures in this country and three in Germany. His earlier work on *Augustus and The Greek World* was reprinted.

Professor Marshall Clagett published "William of Moerbeke: Translator of Archimedes," *Proceedings of the American Philosophical Society*, Vol. 126 (1982), pp. 356-66, and continued with the preparation of the fifth volume of *Archimedes in the Middle Ages*. He was awarded the Koyré Medal of the Académie Internationale d'Histoire des Sciences in Bucharest, 27 August 1981, for his *Archimedes in the Middle Ages*.

Professor John H. Elliott published several articles and has supervised new translations of two of his books. He was elected a member of the American Philosophical Society.

Professor James F. Gilliam continued his study of Roman Egypt and the Roman Army. He attended a conference in Germany and published an obituary of Andrew Alföldi.

Professor Christian Habicht prepared his Sather lectures on *Pausanias' "Description of Greece"* to be given at the University of Cali-

fornia at Berkeley. A second volume of his studies on Athenian history in Hellenistic times, *Studien zur Geschichte Athens in hellenistischer Zeit*, was published in Germany.

Professor Irving Lavin lectured at various American museums in connection with an exhibition of drawings by Gianlorenzo Bernini from the Museum der bildenden Künste in Leipzig; he organized the exhibition and edited the catalogue produced in a graduate seminar at Princeton University. Besides additional lecturing, he served on several national and international committees and boards.

Professor Kenneth M. Setton turned over to the press the fifth and sixth volumes of *A History of the Crusades*, of which he is editor-in-chief, and has now finished work on the third and fourth volumes of *The Papacy and the Levant (1204-1571)*.

Professor Morton White had four of his books reprinted in the past academic year, one of them written in collaboration with his wife. Two other books by him were translated, one into Japanese and the other into Chinese. He completed several articles and recently published a memoir of the late Takeo Iwasaki of the University of Tokyo. He is preparing a book on the philosophy of *The Federalist Papers* and one on Freedom of the Will.

As for the members with long term appointments, professor Herman H. Goldstine was at work on a book, "The Mathematics of Computer Science," and undertook to edit two volumes in a proposed publication of the mathematical works of the Bernoulli family. He was given the Computer Pioneer Award established by the Computer Society of the Institute of Electric and Electronics Engineers.

Professor Bernard Lewis completed his book, *The Muslim Discovery of Europe*, and published several articles. He delivered the Robb Memorial Foundation lectures at the University of Auckland, and guest lectures at other universities in New Zealand as well as at Tel Aviv and Cincinnati. He read a paper at the Institute Symposium on "Mutual Perceptions: East and West." Four of his earlier books were published in French, German, or Hungarian translations.

Professor Otto E. Neugebauer published a number of learned articles and worked on a detailed study of the Ethiopic version of Abu Shaker on the Syriac and Coptic "Computus." He was elected honorary member of the Royal Irish Academy.

Professors Emeriti

Professor Harold F. Cherniss pursued his investigations of the epistemology of Plato and Aristotelian criticism of Plato and the Academy.

Professor Felix Gilbert continued his work on the history of Venice and on the history of historiography; he published several articles and reviews. He was elected member of the order 'Pour le Mérite für Wissenschaften und Künste,' given an honorary doctorate by the University of Bologna, and awarded the Marraro Prize by the American Catholic Historical Association.

Professor George F. Kennan has been bringing to completion his multi-volume work on the Franco-Russian Alliance of 1894. He was the recipient of the Grenville Clark Prize in November, 1981, and continued to put before the public his views on Soviet relations and on nuclear war.

Professor Homer Thompson published several obituaries and articles, among which was "Architecture as a Medium of Public Relations among the Successors of Alexander," *Studies in the History of Art*, National Gallery of Art, Washington, D.C. (1982). He continued his research on the Athenian Agora and in particular on the cult of Mithras in Athens.

The School of Historical Studies

Members with Long-term Appointments, Members, Visitors and Assistants 1981-82

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 Semitiques 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

Marcel Benabou, *Violence in Roman foundation myths.*

Born 1939, Meknes, Morocco. University of Paris, Bacc. 1957; Lic. 1961; Doct. ès lettres 1972.

University of Paris, Ecole Normale Supérieure 1960-64; Centre National de la Recherche Scientifique 1964-72; University of Orléans, maître-assistant 1972-74; University of Paris VIII, professor 1974- .

Richard J. Betts, *Francesco di Giorgio's architectural treatises and theory.*

Born 1937, Waynesville, North Carolina. Rice University, BA 1959; University of Pennsylvania, MA 1967; Princeton University, PhD 1971.

United States Navy, Lieutenant 1959-64;

Princeton University, preceptor 1970; Occidental College, Los Angeles, assistant professor of art 1971-73; University of Illinois at Urbana-Champaign, assistant to associate professor of architecture 1973- .

Carlrichard Brühl, *Edition of and commentary on the "Honorantiae civitatis papiae."*

Born 1925, Frankfurt, Germany. University of Frankfurt, Dr. Phil. 1949; Cologne, Habil. 1961.

Cologne, assistant, dozent 1958-66; Giessen, professor ordinarius 1966- ; Pisa, Scuola Normale Superiore 1971; Ecole des Hautes Etudes, director 1975-76; Magdalen College, Oxford, visiting research fellow 1978.

Guido Clemente, *Sumptuary laws and Roman politics in the early Republic.*

Born 1942, Sassari, Italy. University of Rome, Libera Docenza 1971.

University of Cagliari, 1964-70; Pisa, Scuola Normale Superiore and University 1970-75; University of Siena 1975-76; University of Florence, professor 1976- .

Lee Walter Congdon, *Hungarian émigré intellectuals in Germany and Austria between the World Wars.*

Born 1939, Chicago, Illinois. Wheaton College, BA 1961; Northern Illinois University, MA 1967, PhD 1973.

James Madison University, assistant professor of History 1972-78; associate professor of History 1978- .

Istvan Deak, *History of the Habsburg Monarchy, 1815-1918.*

Born 1926, Hungary. Universities of Paris, Budapest, Munich; Columbia University, MA 1958, PhD 1964.

Columbia University, instructor 1963-64, assistant professor to professor 1964- ; Institute on East Central Europe, Columbia University, director 1967-78.

Carlo Del Bravo, *History of Italian Baroque Art.*

Born 1935, San Casciano, Italy. University of Florence, laurea in Lettere 1959; libera docenza 1968.

University of Florence, assistente volontario 1961-66, assistente ordinario 1966-68; Harvard University Center for Italian Renaissance Studies, Villa I Tatti, Florence 1968-70; University of Florence, professore incaricato 1969-80, professore ordinario 1981- .

Brian Dobson, *Further studies in the Primipilares.*

Born 1931, Hartlepool, England. University of Durham, BA 1952, PhD 1955.

University of Birmingham, research fellow in arts 1957-59; Durham University, staff tutor (archaeology) 1960-80; reader, 1980- .

Robert J. W. Evans, *Hungary between 1765 and 1945.*

Born 1943, Leicester, England. University of Cambridge, BA 1965, MA 1968, PhD 1968.

Brasenose College, Oxford, research fellow 1968- . Oxford University, lecturer in the modern history of East-Central Europe 1969- .

Carter V. Findley, *Social History of the Ottoman Bureaucracy in the Reform Era, 1789-1922.*

Born 1941, Atlanta, Georgia. Yale University, BA 1963; Harvard University, PhD 1969.

Ohio State University, assistant professor 1972-79, associate professor 1979- .

Robert G. Finlay, *Venetians, Turks, and Habsburgs in the Renaissance.*

Born 1940, Worcester, Massachusetts. University of Massachusetts, Amherst, BA 1963, MA 1967; University of Chicago, PhD 1973.

Hartwick College, assistant professor 1973-79.

Benjamin Z. Kedar, *Cultural History of the Crusader Kingdom of Jerusalem.*

Born 1938, Nitra, Czechoslovakia. Hebrew University, BA 1963, MA 1965; Yale University, PhD 1969.

Hebrew University, lecturer 1969-76, senior lecturer 1976- .

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.

Ludwig Koenen, *Decipherment of the Cologne Mani Codex.*

Born 1931, Cologne, Germany. University of

Cologne, Dr. Phil. 1956, Habil. 1969.

University of Michigan, Ann Arbor, professor of papyrology 1975- .

Frank Peter Kolb, *Third century Roman imperial history.*

Born 1945, Rheinbach-Merzbach, Germany. University of Bonn, PhD 1970.

Cologne, studienreferendar 1969; Institute for Advanced Study, research assistant 1970-72; Free University, West Berlin, 1973-77; Christian-Albrechts University, Kiel, professor 1977-

Hayden B. J. Maginnis, *Art history: Sienese trecento painting.*

Born 1946, London, Ontario, Canada. University of Western Ontario, BA 1968; Princeton University, MA 1971, PhD 1975.

Harvard University Center for Italian Renaissance Studies, Villa I Tatti, 1972-74; McMaster University, assistant professor 1977- .

Partha Mitter, *Perception of western art by Indian artists.*

Born 1938, Calcutta, India. University of London, BA 1965; University of Cambridge, MA 1968; University of London, PhD 1970.

University of Cambridge, Clare Hall, fellowship 1970-74; University of Victoria, visiting assistant professor 1970-71, 1973-74; University of Sussex, lecturer in history 1980- .

Leon Mooren, *The institutions and upper social classes in the Hellenistic Monarchies.*

Born 1941, Overpelt, Belgium. University of Leuven, MA 1965, PhD 1972.

University of Leuven, Researcher of the National Foundation of Scientific Research of Belgium 1966-76; qualified researcher 1976- , extraordinary docent 1977- ; University of Brussels, extraordinary docent 1979- .

Mary Jo Nye, *Science in the French provinces.*

Born 1944, Nashville, Tennessee. University of Wisconsin, BA 1965, PhD 1970.

University of Oklahoma, visiting assistant professor 1970-74; University of Pittsburgh, Andrew Mellon postdoctoral fellow 1974-75; University of Oklahoma, assistant professor 1975-78; associate professor 1978- .

Francis C. Oakley, *Studies in the theory of kingship and consent in medieval and early modern Europe.*

Born 1931, Liverpool, England. Oxford University, BA 1953, MA 1957; Yale University, MA 1958, PhD 1960.

Yale University, instructor in history 1959-61; Williams College, lecturer to professor of history 1961- ; dean of the faculty 1977- .

Martin Ostwald, *Law, society, and philosophy in fifth-century B.C. Athens.*

Born 1922, Dortmund, Germany. University of Toronto, BA 1946; University of Chicago, MA 1948; Columbia University, PhD 1952.

Wesleyan University, instructor in classics and humanities 1950-51; Columbia University, lecturer to assistant professor of Greek and Latin 1951-58; Swarthmore College, associate professor, professor of classics 1958- ; University of Pennsylvania, professor of classical studies 1968- ; Princeton University, visiting lecturer in classics 1964; University of California at Berkeley, visiting lecturer in classics 1969.

René Pillorget, *Rebellion and revolution in early modern European History.*

Born 1924, Le Raincy, France. University of Paris (Sorbonne), Lic. 1946.

Bethune, Amiens, Saigon, Algiers, high school professor of French 1949-60; University of Algiers, assistant professor 1960-62; University of Caen, assistant professor 1962-63; University of Paris (Sorbonne), assistant professor 1963-67, maître-assistant 1967-69; University of Tours, maître de conférences, professor 1969-75; University of Amiens, professor 1975- .

Kent J. Rigsby, *Religious inviolability of places in the Hellenistic world.*

Born 1945, Tulsa, Oklahoma. Yale University, BA 1966; University of Toronto, MA 1968.

Harvard University, Society of Fellows 1968-71; Duke University, assistant to associate professor 1971- .

Guido Ruggiero, *Sex crime and sexuality in Renaissance Venice.*

Born 1944, Connecticut. University of Colorado, BA 1966; University of California at Los Angeles, MA 1967, PhD 1972.

University of Cincinnati, visiting assistant professor of history 1971-72, assistant professor

of history 1972-79, associate professor of history 1979- .

Lyman T. Sargent, *American and British utopianism.*

Born 1940, Rehoboth, Massachusetts. Macalester College, BA 1961; University of Minnesota, MA 1962, PhD 1965.

University of Missouri at St. Louis, assistant professor to professor of political science 1965- .

Jaro Šašel, *Latin inscriptions in Yugoslavia.*

Born 1924, Šmarje pri Jelšah, Yugoslavia. University of Ljubljana, PhD 1969.

Institute for Advanced Study, member 1969; University of Ljubljana, scientific counselor 1980- .

David Neil Sedley, *Edition of Herculaneum papyri.*

Born 1947, London, England. University of Oxford, BA 1969, MA 1973; University of London, PhD 1974.

University of Oxford, Dyson junior research fellow in Greek culture 1973-75; University of Cambridge, assistant lecturer in classics 1975-78, Christ's College, fellow and director of studies in classics 1976- , university lecturer of classics 1978- .

Kevin M. Sharpe, *The personal rule of Charles I, 1628-41.*

Born 1949, Kent, England. University of Oxford, BA 1971, MA 1975, D. Phil. 1975.

University of Oxford, Hertford College, lecturer 1975-76, Wadham College, lecturer 1976-77, Christ Church, lecturer 1977-78, Oriel College, junior research fellow 1974-78; University of Southampton, lecturer 1978- .

Christiane Villain-Gandossi, *Mediterranean ships and fleets, 9th to 15th centuries.*

Born 1935, Strasbourg, France. University of Lille, BA 1957, MA 1958; University of Paris (Sorbonne), PhD 1961.

University of Lille, chargée du centre régional d'Etudes historiques à la faculté des lettres de Lille 1959-62; CNRS Paris, chargée de recherches, Antiquités Nationales et Histoire Médiévale, 1962- ; editor of *Nouveau Glossaire Nautique* 1962- ; University of Paris (Sorbonne), chargée de conférences à l'Ecole Pratique des Hautes Etudes (IV section), histoire maritime et lexicographie maritime 1980- .

Rosario Villari, *Neapolitan revolution 1647-48.*

Born 1925, Bagnara, Italy. University of Messina, Laurea in Lettere 1947; University of Rome, Libera docenza 1957.

University of Messina, professor of modern history 1958-70; University of Florence, professor of modern history 1970-79; St. Antony's College, Oxford, visiting professor 1974; University of Rome, professor of modern history 1979- .

Herman van der Wee, *Monetary history of the Low Countries.*

Born 1928, Lier, Belgium. University of Louvain, BA 1949, MA 1951, PhD 1963.

University of Louvain, professor 1964- ; University of Louvain-la-Neuve, visiting professor 1970- ; member of the executive committee of the International Association of Economic History 1968- .

Michael von Albrecht, *Christian and pagan Latin literature in late antiquity.*

Born 1933, Stuttgart, Germany. University of Tübingen, PhD 1959.

University of Tübingen, wissenschaftlicher assistent 1959-63, dozent 1963-64; University of Heidelberg, professor ordinarius 1964- ; University of Amsterdam, lecturer 1977-78.

David Whitehead, *The demes of Attika in the classical period.*

Born 1949, Nottingham, England. University of Cambridge, BA 1972, MA 1976, PhD 1975.

University of Cambridge, Prendergast studentship 1972-74, Fitzwilliam College, research fellowship 1974-75; University of Manchester, lectureship in ancient history 1975-.

Paul Zanker, *Augustan art and architecture.*

Born 1937, Konstanz a. Bodensee, Germany. University of Freiburg/Brsg. Dr. Phil. 1962.

University of Freiburg/Brsg., dozent 1967-72; University of Göttingen, professor ordinarius 1972-76; University of Munich, professor ordinarius 1976- .

Steven N. Zwicker, *The political context of Dryden's translation of Virgil.*

Born 1943, San Diego, California. University of California at Los Angeles, BA 1965; Brown University, PhD 1969.

Washington University, St. Louis, assistant to associate professor of English 1969- .

Visitors

Robert J. Clark, *Cranbrook and the search for twentieth-century form.*

Born 1937, Honolulu, Hawaii. University of California at Berkeley, BA 1960; Stanford University, MA 1964; Princeton University, MFA 1966, PhD 1974.

Princeton University, lecturer 1968-74, assistant professor 1974-75, associate professor 1975- .

Robert Darnton, *Modern European history.*

See page 57 for biographical entry.

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

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

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

Assistants

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- .

Alfred S. Bradford, Jr., *Ancient history.*

Born 1942, Appleton, Wisconsin. University of Wisconsin, BA 1964; University of Chicago, MA 1966, PhD 1973.

University of Wisconsin, lecturer 1973-74; University of Illinois at Chicago Circle, visiting assistant professor 1977; Institute for Advanced Study, assistant to Professor Christian Habicht 1977-82.

Sheila D. Campbell, *Roman history.*

Born 1938, Toronto, Canada. University of Toronto, BA 1969, 1979, MA 1971, PhD 1978.

University of Toronto, assistant professor 1974- ; Institute for Advanced Study, assistant to the literary estate of the late Professor Andrew Alföldi 1981.

Timothy J. Cornell, *Political and social history of Rome.*

Born 1946, Halesworth, England. University College, London, BA 1968; University of London, PhD 1972.

University College, London, research assistant 1972-73; lecturer 1978- ; British School at Rome, assistant director 1975-77; Institute for Advanced Study, assistant to Professor Glen W. Bowersock, 1981.

Mark Darby, *Medieval political theory.*

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

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

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.

Javier Gil Pujol, *Spanish history.*

Born 1956, Puigcerda, Spain. University of Barcelona, BA 1978.

Institute for Advanced Study, assistant to Professor John Elliott, 1981-82.

Gerd Stumpf, *Classical studies.*

Born 1943, Forbach, France.

University of Saarbrücken, assistant instructor in history; Institute for Advanced Study, assistant to Professor Emeritus Andrew Alföldi 1980-81.

William Tronzo, *Early christian art.*

Born 1951, Detroit Michigan. Haverford College, BA 1973; Harvard University, MA 1974, PhD 1982.

Institute for Advanced Study, assistant to Professor Irving Lavin 1981-82.

The School of Mathematics

Faculty

Enrico Bombieri
Armand Borel
Harish-Chandra
(IBM von Neumann Professor)
Robert P. Langlands
John W. Milnor
(Oswald Veblen Professor)
Atle Selberg
Shing-Tung Yau

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, 1981-82

The academic year 1981-82 was extremely active for the School of Mathematics, in particular because of the seminars associated with the Special Year in Algebraic Geometry. Among the activities for the Special Year were

a series of seminars on Moduli Problems organized by David Mumford, a seminar on Transcendental Topics in Algebraic Geometry (which will be published by Princeton University Press under the title *Topics in Transcendental Algebraic Geometry*) organized by Phillip Griffiths, and a seminar on Intersection Homology organized by Professor Borel. This latter seminar was dedicated to the new fundamental discoveries of William Fulton and R. D. MacPherson, and it included five two-hour lectures by Pierre Deligne on his recent research. Other seminars connected with the Algebraic Geometry Year dealt with singularities, p-adic cohomology, abelian varieties, and the classification of varieties of low-dimension. Spencer Bloch lectured on his theory of algebraic cycles and its connections with K-theory.

Other seminars included our usual Members Seminar organized by Professor Yau, the Topology Seminar organized by Professor Milnor, the Seminar on Differential Geometry and Classical Relativity organized by Professor Yau, and a Seminar on Partial Differential Equations. These activities ran to an average of fifteen seminars each week.

Professor Borel gave a series of lectures on Intersection Homology and Professor Bombieri continued his lecture series on Diophantine Approximation. Professor Weil gave a series of lectures on Curves of Genus 1 from Diophantus to Mordell. Professor Langlands wrote a monograph entitled *Les Débuts d'Une Formule des Traces Stable* which will appear in a series published by the University of Paris. Professor Harish-Chandra continued his research on Whittaker integrals on semisimple groups. Professor Selberg guided the research of several members, particularly in the field of number theory. Professor Yau also edited the *Seminar on Differential Geometry* which appeared recently in the Annals of Mathematics Studies. Professor Milnor worked on the homology of Lie groups with the discrete topology, as well as other miscellaneous topics.

In addition to these activities, there were several contributions by distinguished visitors, among them I. N. Bernstein, Jonathan Wahl, Isadore Singer, J. Pitts, Stephen Hawking, A. Douady, J-L. Brylinski, William Thurston, B. Mandelbrot, P. Kutzko, P. Lelong, J. Palis, I. Dolgachev, A. Libgober, and J. Cheeger. These took the form of special lectures.

The Hermann Weyl Lectures were given by R. D. MacPherson on Intersection Homology, and the Marston Morse Memorial Lecture was given by Blaine Lawson on Dirac Operators, Scalar Curvature, and Spin Cobordism.

The members' activities were not limited to seminars and lectures, but resulted in the production of original research and in a large number of manuscripts ranging through all fields of mathematics including aspects of mathematical physics.

The School of Mathematics

Members, Visitors and Assistants, 1981-82

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

Members

Krishnaswami Alladi, *Analytic number theory.*
Born 1955, Trivandrum, India. University of Madras, BA 1975; University of California at Los Angeles, MA 1976, PhD 1978.
University of Michigan at Ann Arbor, T. H. Hildebrandt Research assistant professorship 1978-81.

Frederick Justin Almgren, Jr., *Geometric measure theory.*
Born 1933, Birmingham, Alabama. Princeton University, BSE 1955; Brown University, PhD 1962.
Princeton University, instructor to professor 1962- ; Institute for Advanced Study, member 1963-65, 1969-70, 1974-75, 1977-78.

Patricio U. Aviles, *Nonlinear partial differential equations.*
Born 1952, Santiago, Chile. Catholic University of Chile, BA 1974, MA 1976; Purdue University, PhD 1981.
Catholic University of Chile, instructor 1975-77; Purdue University, teaching assistant 1977-81.

Lucian Badescu, *Algebraic geometry.*
Born Valeni-Dîmbovita, Rumania. University of Bucharest, BA 1967, PhD 1971.
University of Bucharest, assistant professor 1968-76, associate professor 1976-79; INCREST Bucharest, principal researcher 1979- ; University of Ferrara, visiting professor 1972-73; Humboldt University of Berlin, invited member of the Department of Mathematics 1974.

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, professore incaricato, 1977-81; University of Paris VII, Maître de Conferénce, 1979-80.

Iacopo Barsotti, *Algebra.*
Born 1921, Torino, Italy. University of Pisa, PhD 1942.
University of Padua, professor 1978- .

Don M. Blasius, *Automorphic forms (number theory).*
Born 1950, Paterson, New Jersey. Harvard University, BA 1972; University of Oxford, BA 1977; Princeton University, PhD 1981.

Spencer J. Bloch, *Algebraic geometry.*
Born 1944, New York. Harvard University, BA 1966; Columbia University, PhD 1971.
Princeton University, assistant professor 1971-74; University of Michigan, associate professor 1974-75; Institut des Hautes Etudes Scientifiques, Paris, visiting member 1975-77; University of Chicago, professor 1977- .

Michael Boshernitzan, *Analysis, algebra, number theory.*
Born 1950, Tchernovic, Ukraine, USSR. Moscow University, BA 1971; Hebrew University, MA 1974; The Weizmann Institute, PhD 1981.
Hebrew University, instructor 1978-81.

Fabrizio M. E. Catanese, *Algebraic geometry.*
Born 1950, Florence, Italy. University of Pisa, Laurea in Lettere 1972, Diploma di Licenza 1972.
University of Pisa, assistant professor 1974-76, associate professor 1976-77, 1978-80, professor 1980- .

Bruce C. Crauder, *Algebraic geometry.*
Born 1954, Beirut, Lebanon. Haverford

College, BA 1976; Columbia University, MA 1977, PhD 1981.

Columbia University, graduate research assistant 1978-80, Preceptor 1980-81.

Jan J. Denef, *Logic and algebra.*

Born 1951, Belgium. University of Louvain, BA 1973, PhD 1976.

University of Louvain, teaching assistant 1973-74, lector 1981- ; Institute for Advanced Study, member 1978-79; State University of New York at Stony Brook, assistant professor 1980-81.

Ron Donagi, *Algebraic geometry.*

Born 1956, Tel Aviv, Israel. Tel Aviv University, BA 1973; Harvard University, MA 1977, PhD 1977.

Harvard University, teaching fellow 1976-77; University of California at Los Angeles, assistant professor 1977-79; University of Utah, assistant professor 1979- .

Harold Donnelly, *Differential geometry: partial differential equations.*

Born 1951, New York, New York. Massachusetts Institute of Technology, BA 1971; University of California at Berkeley MA 1972, PhD 1974.

Massachusetts Institute of Technology, Moore instructor 1974-76; The Johns Hopkins University, assistant professor 1976-79; Purdue University, associate professor 1979- .

Lawrence Man-Hou Ein, *Algebraic geometry.*

Born 1955, Hong Kong. University of California at Los Angeles, BA 1976; University of California at Berkeley, PhD 1981.

University of California at Berkeley, teaching assistant 1976-81, research assistant 1979-81.

James J. Faran, V, *Complex differential geometry.*

Born 1953, Boston, Massachusetts. Harvard University, BA 1974; University of California at Berkeley, PhD 1978.

University of California at Berkeley, teaching assistant 1974, 1977-78; Princeton University, instructor 1978- .

William Fulton, *Algebraic geometry.*

Born 1939, Boston, Massachusetts. Brown University, BA 1961; Princeton University, PhD 1966.

Princeton University, instructor 1965-66, assistant professor 1969-70; Brandeis University, instructor, assistant professor 1966-69; University of Genoa, visiting professor 1969; Aarhus University, visiting professor 1975-76; Brown University, associate professor, 1970-75, professor 1975- .

Amit Ghosh, *Analytic number theory.*

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

David A. Gieseker, *Algebraic geometry.*

Born 1943, Oakland, California. Reed College, BA 1967; Harvard University, PhD 1970.

University of California at Los Angeles, professor 1975- .

Patrick M. Gilmer, *Algebraic and differential topology.*

Born 1949, Summit, New Jersey. Haverford College, BA 1971; University of California at Berkeley, MA 1973, PhD 1978.

Yale University, Gibbs instructor 1978-80; Louisiana State University at Baton Rouge, assistant professor 1980- .

Daniel Gorenstein, *Finite group theory.*

Born 1923, Boston, Massachusetts. Harvard University, BA 1943, MA 1948, PhD 1950.

Clark University, assistant professor 1951-55, associate professor 1955-60, professor 1960-64; Cornell University, visiting lecturer 1957-58; University of Chicago, research associate professor 1960-61; Northeastern University, professor 1964-69; Rutgers University, professor 1969- .

Daniel R. Grayson, *Algebraic geometry and K-theory.*

Born 1952, Greenville, Mississippi. University of Chicago, BA 1972, MA 1972; Massachusetts Institute of Technology, PhD 1976.

Massachusetts Institute of Technology, teaching assistant 1972-74, 1975-76. Sloan research assistant 1974-75; Columbia University, Ritt assistant professor 1976-81; Barnard College, acting chairman, Department of Mathematics 1980-81.

Ralph Greenberg, *Algebraic number theory.*

Born 1944, Chester, Pennsylvania.

University of Pennsylvania, BA 1966; Princeton University, PhD 1971.

University of Maryland, assistant professor 1970-74; The Institute for Advanced Study, member 1972-73; Brandeis University, assistant professor 1974-78; University of Washington, associate professor 1978- .

Alain Grigis, *Partial differential equations.*

Born 1949, Troyes, France. Ecole Normale Supérieure Enseignement Technique, 1970-74; University of Paris, Orsay, Maîtrise 1972, Agrégation 1973, Doctorat d'Etat, 1981.

University of Paris, Orsay, Centre National de la Recherche Scientifique et Technique, stagiaire de recherche 1974-75, attaché de recherche 1975-76, 1978-79; University of Algiers, chargé de cours 1976-78.

André Haefliger, *Foliation theory.*

Born 1929, Nyon, Switzerland. University of Paris, PhD 1958.

University of Geneva, professor 1961-1981; Institute for Advanced Study, member 1959-1961, 1972.

James L. Heitsch, *Differential geometry and topology.*

Born 1946, Ypsilanti, Michigan. University of Illinois at Urbana, BA 1967; University of Chicago, MA 1968, PhD 1971.

University of California at Berkeley, lecturer 1971-73, visiting assistant professor 1973-74; Pontificia Universidade Catolica do Rio de Janeiro, visiting associate professor 1975-76; University of Illinois at Chicago, assistant professor 1973-79, associate professor 1979- .

Gary Horowitz, *Mathematical relativity, differential geometry.*

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

George R. Kempf, *Algebraic geometry.*

Born 1944, Globe, Arizona. The Johns Hopkins University, BA 1966; University of Illinois at Urbana, MA 1967; Columbia University, PhD 1970.

Mathematisch Centrum, Amsterdam, researcher 1971; Harvard University, assistant professor 1971-74; The Johns Hopkins University, assistant professor 1974-76, associate professor 1977-78, professor 1978- ; Princeton University, visiting associate professor 1977-78.

Akira Kurihara, *Automorphic functions.*

Born 1949, Tokyo, Japan. University of Tokyo, BA 1973, MA 1975, PhD 1978.

Japan Women's University, associate professor 1979- .

Robert K. Lazarsfeld, *Algebraic geometry.*

Born 1953, New York, New York. Harvard University, BA 1975; Brown University, PhD 1980.

Brown University, teaching assistantship 1978- .

Elliott H. Lieb, *Mathematics and physics.*

Born 1932, Boston, Massachusetts. Massachusetts Institute of Technology, BS 1953; University of Birmingham, 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, 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, visiting member 1972-73; Princeton University, visiting professor 1974-75, professor 1975- .

Saul Lubkin, *Algebraic geometry.*

Born 1939, Brooklyn, New York. Columbia College, BA 1960; Harvard University, PhD 1963.

Brandeis University, research associate, 1962-63; Institute for Advanced Study, member 1965-66, 1970-71; University of California at Berkeley, assistant professor 1966-1970; Harvard University, honorary research associate 1967-69; Pennsylvania State University, associate professor 1971-72, professor 1972-74; University of Rochester, professor 1974- .

Shahla Marvizi, *Symplectic geometry and analysis.*

Born 1954, Iran. Arya-Mehr University of Technology, BA 1977; Massachusetts Institute of Technology, PhD 1981.

Massachusetts Institute of Technology, teaching assistantship 1979-1981.

Howard Masur, *Teichmuller theory, measured foliations, ergodic theory.*

Born 1949, Chicago, Illinois. University of Chicago, BA 1970; University of Minnesota, PhD 1974.

Harvard University, Benjamin Pierce assistant professor 1974-77; University of Illinois, Chicago Circle, assistant professor 1977-80, associate professor 1980- .

James S. Milne, *Arithmetic geometry.*

Born 1942, Invercargill, New Zealand. Otago University, BA 1964; Harvard University, MA 1966, PhD 1967.

University College, London, lecturer 1967-69; University of Michigan, assistant professor to professor 1969- .

Henry P. Miranda, *Algebraic geometry.*

Born 1953, New York, New York. Holy Cross College, BA 1974; Massachusetts Institute of Technology, PhD 1979.

Tufts University, lecturer 1978-79; University of Chicago, instructor 1979-81.

Laurent Moret-Bailly, *Algebraic geometry.*

Born 1951, Chatenay-Malabry, France. University of Paris-Sud, Orsay, PhD 1974.

University of Paris-Sud, Orsay, assistant 1974- .

Shigefumi Mori, *Algebraic geometry.*

Born 1951, Nagoya, Japan. Kyoto University, BA 1973, MA 1975, PhD 1977.

Kyoto University, research assistant 1975; Harvard University, assistant professor 1977- .

Makoto Namba, *Theory of compact Riemann surfaces.*

Born 1943, Kushibiki, Yamagata, Japan. Tohoku University, BA 1965, MA 1967; Columbia University, PhD 1971.

Tohoku University, assistant 1971, instructor 1975, assistant professor 1979- .

Serge Ochanine, *Topology of manifolds, cobordism.*

Born 1950, Sofia, Bulgaria. Moscow University, Diploma 1972; University of Paris, Orsay, Doctorat ès Sciences 1978.

Centre National de la Recherche Scientifique et Technique, Paris, attaché de recherche 1979- .

Arthur E. Ogus, *Algebraic geometry.*

Born 1946, Washington, D.C. Reed College, BS 1968; Harvard University, MA 1969, PhD 1972.

Princeton University, lecturer to assistant professor 1972-75; University of California at Berkeley, assistant to associate professor 1975- .

Ulf A. Persson, *Algebraic surfaces.*

Born 1950, Karlskoga, Sweden. Stockholm University, Fil. Kand. 1970; Harvard University, PhD 1975.

Harvard University, research assistant 1976-77; Columbia University, assistant professor 1975-79; Nordiska Forskningsrådet NFR, Forskningsassistent 1980- .

K. Gopalaiyer Ramanathan, *Algebraic number theory.*

Born 1920, Hyderabad, India. Madras University, MA 1942, MSc 1945; Princeton University, PhD 1951.

Tata Institute, professor 1961-70, senior professor 1970- .

Andrew A. Ranicki, *Algebraic topology.*

Born 1948, London, England. University of Cambridge, BA 1969, MA 1972, PhD 1973.

Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, visiting member 1973-74; Princeton University, instructor 1977-78, assistant professor 1978- .

Michael Rapoport, *Algebraic geometry and automorphic forms.*

Born 1948, Cincinnati, Ohio. University of Paris-Sud, Orsay, Doctorat d'Etat 1976.

Princeton University, research associate 1972-73; Centre National de la Recherche Scientifique et Technique, Paris, attaché de recherche; Humboldt University of Berlin, wissenschaftlicher assistent 1976-80; SFB, Bonn, gastprofessor 1980-81.

John G. Ratcliffe, *Combinatorial group theory and topology.*

Born 1948, Detroit, Michigan. University of Michigan, BA 1970, MA 1972, PhD 1977.

Massachusetts Institute of Technology, instructor 1977-79; University of Wisconsin, assistant professor 1979-81.

Michel Raynaud, *Algebraic geometry.*

Born 1938, Riom, France. PhD 1968.

University of Paris-Sud, Orsay, professor 1968- .

Shi-shyr Roan, *Algebraic geometry.*
Born 1944, Taiwan, China. Taiwan University, BA 1966, MA 1968; Brandeis University, PhD 1974.
University of California at Berkeley, lecturer 1974-76; Tsing Hua University, associate professor 1976- .

Linda P. Rothschild, *Analysis, linear partial differential equations.*
Born 1945, Philadelphia, Pennsylvania. University of Pennsylvania, BA 1966; Massachusetts Institute of Technology, PhD 1970.
Massachusetts Institute of Technology, research staff member 1970-72; Tufts University, assistant professor 1970-72; Columbia University, Ritt assistant professor 1972-74; Institute for Advanced Study, member 1974-75, 1978; Princeton University, visiting assistant professor 1975-76; University of Wisconsin at Madison, associate professor, professor 1976- .

Ernst A. Ruh, *Differential geometry.*
Born 1936, Switzerland. Eidgenössische Technische Hochschule, Zurich, 1960; Brown University, PhD 1964.
Princeton University, instructor 1964-66; Eidgenössische Technische Hochschule, Zurich, research associate 1966-67; Purdue University, assistant professor 1967-71; University of Bonn, associate professor, 1971- .

Paul J. Sally, Jr., *Analysis.*
Born 1933, Boston, Massachusetts. Boston College, BS 1954, MA 1956; Brandeis University, MA 1959, PhD 1965.
Boston College, instructor 1960-63; Washington University, instructor 1963-65; University of Chicago, instructor to professor 1965- ; Institute for Advanced Study, member 1967-68, 1971-72.

Paul A. Schweitzer, S.J., *Differential topology and geometry.*
Born 1937, Yonkers, New York. College of the Holy Cross, BA 1958; Princeton University, PhD 1962.
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; Harvard University, research associate 1972-73; University of Louis Pasteur, Strasbourg professor 1976; Pontifical Catholic University, Rio de Janeiro, associate professor 1971-72, 1973-75, 1977-80, professor 1980- .

Eira Joan Scourfield, *Analytic number theory.*
Born 1935, London, England. University of London, BS 1956; University of Exeter, MSc 1959; University of Glasgow, PhD 1962.
University of Glasgow, assistant 1958-61; Westfield College, University of London, lecturer 1962- ; Institute for Advanced Study, member, spring term 1981.

William F. Shadwick, *Geometry of Bäcklund transformations and soliton equations.*
Born 1951, London, Ontario, Canada. University of Western Ontario, BA 1974, MA 1975; University of London, PhD 1979.
University of North Carolina, visiting lecturer 1979- .

Richard E. Sot, *Algebraic geometry.*
Born 1948, Sewickley, Pennsylvania. University of Toledo, BA 1970; McMaster University, MA 1972; University of Rochester, PhD 1980.

Mina Teicher, *Algebraic geometry.*
Born 1950, Tel Aviv, Israel. Tel Aviv University, BA 1974, MA 1976, PhD 1981.
Tel Aviv University, assistant 1975-78, instructor 1979- .

Andrey N. Todorov, *Algebraic geometry.*
Born 1948, Sofia, Bulgaria. Moscow State University, BA 1971, PhD 1976.
Columbia University, visiting associate professor 1980-81; Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, visitor 1980.

Yue Lin L. Tong, *Several complex variables, modular forms.*
Born 1944, Shanghai, China. The Johns Hopkins University, PhD 1971.
The Johns Hopkins University, instructor 1970-71; Purdue University, assistant professor 1971-72, 1974-76, associate professor 1979- ;

Institute for Advanced Study, member 1972-74; University of Bonn, visiting professor 1976-78.

Loring W. Tu, *Complex algebraic geometry.*
Born 1952, Taipei, Taiwan. Princeton University, BA 1974; Harvard University, MA 1976, PhD 1979.
Harvard University, research assistant 1976-79; University of Michigan at Ann Arbor, Hildebrandt research assistant professor 1979- .

Seiichiro Wakabayashi, *Hyperbolic equations and wave propagation problems.*
Born 1948, Kyoto, Japan. Kyoto University, BA 1971, MA 1973; Tokyo University of Education, PhD 1977.
Tokyo University of Education, assistant 1973-76; University of Tsukuba, assistant professor 1976- .

Andrew J. Wiles, *Algebraic number theory.*
Born 1953, Cambridge, England. University of Cambridge, MA 1976, PhD 1978.
Harvard University, assistant professor 1977- .

Bun Wong, *Differential geometry, complex manifolds, algebraic geometry (transcendental methods).*
Born 1949, Hong Kong. University of California at Berkeley, BA 1970; Princeton University, PhD 1973.
Brandeis University, instructor 1973-74; University of California at Berkeley, visitor 1974-75; The Chinese University of Hong Kong, lecturer 1977- ; The Johns Hopkins University, visiting associate professor 1980-81.

Carol S. Wood, *Mathematical logic.*
Born 1945, Pennington Gap, Virginia. Randolph-Macon Woman's College, BA 1966; Yale University, PhD 1971.
Wesleyan University, instructor to assistant professor 1970- ; Universität Erlangen-Nürnberg, gastdozent 1971-72; Yale University, lecturer 1972-73.

Frederico Xavier, *Complete minimal surfaces in R^3.*
Born 1951, Vitoria De Santo Antad, Brazil. Federal University of Pernambuco, BA 1971, MA 1973; University of Rochester, PhD 1977.
Federal University of Pernambuco, adjunct professor 1979; Conselho Nacional de Pesquisas, pesquisador 1980.

Stephen Shing-Toung Yau, *Algebraic geometry, several complex variables.*
Born 1952, Hong Kong. State University of New York at Stony Brook, MA 1974, PhD 1976.
The Institute for Advanced Study, member 1976-77; Harvard University, assistant professor 1977-80.

Steven Zucker, *Algebraic geometry.*
Born 1949, New York, New York. Brown University, BS 1970; Princeton University, PhD 1974.
Rutgers University, assistant professor 1974- .

Visitors

Arnaud Beauville, *Algebraic geometry.*
Born 1947, Bologne, France. University of Paris VII, Doctorat ès Sciences 1977.
Université d'Anges, professor 1977-80; Ecole Polytechnique, professor 1980- .

Piotr Blass, *Algebraic geometry.*
Born 1948, Warsaw, Poland. Warsaw University, BA 1968; University of Michigan, MA 1969; Harvard University, MA 1976; University of Michigan, PhD 1977.
Harvard University, teaching fellow 1970-71; University of Michigan, teaching fellow 1974-77; University of Oklahoma, instructor 1977-78; Purdue University, assistant professor 1978-80; University of Pennsylvania, lecturer 1980-81.

Pierre Deligne, *Algebraic geometry.*
Born 1944, Etterbeek, Belgium. Université Libre de Bruxelles, MA 1966, PhD 1968.
Institut des Hautes Etudes Scientifiques, visiting member 1968-70, permanent member 1970- ; Institute for Advanced Study, member 1972-73, 1976-77.

Amassa Fauntleroy, *Geometric invariant theory.*
Born 1945, Baltimore, Maryland. The Johns Hopkins University, BA 1965; Northwestern University, MS 1967, PhD 1970.
DePaul University, instructor 1968-69; University of Illinois at Urbana-Champaign, instructor 1972, assistant professor 1972-78, associate professor 1978- .

Phillip A. Griffiths, *Algebraic geometry.*
Born 1938, Raleigh, North Carolina. Wake Forest College, BS 1959; Princeton University, PhD 1962.

University of California at Berkeley, professor 1962-67; Princeton University, visiting professor 1967-68, professor 1969-72; Harvard University, professor 1972- ; Institute for Advanced Study, member 1968-70.

Bruno Harris, *Algebraic geometry.*
Born 1932, Ploesti, Rumania. California Institute of Technology, BA 1952; Yale University, MA 1954, PhD 1956.

Northwestern University, instructor 1957-58, assistant professor 1958-61; Brown University, associate professor 1961-65, professor 1965- ; Institute for Advanced Study, member 1960-61, 1964-65, 1967-68, 1971-72, 1974-75.

Boris Moishezon, *Algebraic geometry.*
Born 1937, Odessa, USSR. Tadjik State University, MA 1959; Mathematical Institute of the Academy of Sciences of USSR, Moscow, PhD 1962.

Academy of Science of Tadjik Republic, resident scholar 1962-64; Pedagogical Institute, Orekhovo-Zuevo, docent 1964-67; Mathematical Institute of Academy of Sciences, Moscow, senior resident scholar 1967-72; University of Tel Aviv, professor 1972-78; Columbia University, professor 1977- .

Shigeru Mukai, *Algebraic geometry.*
Born 1953, Mie Prefecture, Japan. Kyoto University, BA 1976, MA 1978.

Nagoya University, assistant 1978- .

David B. Mumford, *Algebraic geometry.*
Born 1937, Sussex, England. Harvard University, BA 1957, PhD 1962.

Harvard University, instructor to professor, 1961- ; Institute for Advanced Study, member 1962-63.

Henry C. Pinkham, *Algebraic geometry.*
Born 1948, New York. Harvard University, BA 1970, PhD 1974.

Columbia University, assistant professor 1974-78, associate professor 1978- .

Mark E. Sheingorn, *Automorphic forms.*
Born 1944, New York, New York.
Dartmouth College, BA 1965; University of Wisconsin, MA 1967, PhD 1970.

Hofstra University, assistant professor 1972-74; City University of New York, Baruch College, assistant professor 1974-78, associate professor 1978- ; Institute for Advanced Study, member 1975-76.

Yum Tong Siu, *Algebraic geometry.*
Stanford University.

Chih-ta Yen, *Lie groups.*
University of California at Berkeley.

Assistants

Richard G. Klotz, *Differential geometry.*
Born 1954, Patterson, New Jersey. Harvard University, BA 1976; Stanford University, MA 1978.

Stanford University, teaching fellow 1976-80; Institute for Advanced Study, assistant 1980-81.

James D. Mackraz, *Differential geometry.*
Born 1955, Cincinnati, Ohio. University of Michigan, BA 1978; Stanford University, MA 1980.

Institute for Advanced Study, assistant 1980-81.

Julia Huang Mueller, *Analytic number theory.*
Born 1944, China. University of Rochester, BA 1965; Columbia University, MA 1974, PhD 1976.

The Institute for Advanced Study, member 1976-77; Columbia University, visiting scholar 1977-78; Brooklyn College, City University of New York, instructor 1978-79; Fordham University, assistant professor 1979- .

Leslie D. Saper, *Differential geometry.*
Born 1957, Pennsylvania. Yale University, BS 1979, MS 1979.

Hsin-sheng Tai, *Differential geometry.*
Born 1937, Nanking, China. National Taiwan University, BS 1960; Northwestern University, MA 1965, PhD 1967.

Academica Sinica, Taipei, assistant 1960-63; Brown University, instructor 1967-69; University of Saskatchewan, assistant professor 1969-71; Nankai University, Tientsin, lecturer 1973-74; Academica Sinica, Peking, associate professor 1974- ; Harvard University, visitor 1980-81.

The School of Natural Sciences

Faculty

Stephen L. Adler
(New Jersey Albert Einstein Professor)
John N. Bahcall
Roger Dashen
Freeman J. Dyson
Marshall N. Rosenbluth

Visiting Professors

Stanley J. Brodsky
Tullio Regge
Craig L. Sarazin

Permanent Member

Julian H. Bigelow

Members with Long-term Appointments

Bruce T. Draine
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 subdisciplines 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 black body radiation, which is believed to be the remains of radiation which

once filled the universe in an earlier, hotter stage of its expansion. For astrophysicists, general relativity theory thus assumes great importance as they come to grips with the gravitational effects of very large masses. Small well-known 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, 1981-82

The year was particularly notable in Natural Sciences because of the installation of a VAX11/780 computer, the first such computational machine to be located at the Institute in the modern era. The acquisition of this computer, financed by the US Dept. of Energy and the National Science Foundation, has significantly broadened the scope of the research carried out by members of the School. Computational projects that were economically impossible under the previous system of purchasing time at external computer centers are now both affordable and convenient.

As examples, there were two major and important pieces of research done in 1981/82 that simply could not have been carried out before the arrival of the computer. In astrophysics, Pieter Hut made an extensive study of the Newtonian three body problem. This problem, which has resisted analytical attack for three centuries, is important for understanding the interactions of stars in clusters and groups. Hut was able to extend the world's supply of numerical data by about a factor of ten and in doing so developed some qualitatively new insights. In particle physics, Gyan Bhanot and Roger Dashen made a preliminary study of the critical question of universality in the lattice formulation of gauge theories. At present lattice theories are the only well defined (in a mathematical sense) formulation of the modern theory of the nuclear force and the only known way to effectively study these theories is by numerical simulation. Unfortunately their results were rather negative: the most straightforward interpretation is that existing simulations are not large enough to reach the expected point where the physical content of the theory becomes independent of the precise details of the lattice.

More typical use of the computer appeared in the work of Alain Rouet and Adrian Patrascioiu and John Bahcall. Rouet and Patrascioiu used a combination of numerical and analytic methods to study the ergodic behavior of some simple but nontrivial systems. This is again an old problem but one where the use of modern computers has led to new insights as well as a revival of interest. Bahcall studied the effect of unseen matter on the

observable velocities of stars in galaxies, evaluating solutions that were partially analytic by numerical techniques and making use of the convenient graphical facilities in our terminal room. In both these cases the actual amount of computer time involved was not large but the convenience of having one's own system was an important consideration.

Of course the Institute has not given up its tradition of analytical work and "thinking" as well as "computing." What follows is a partial summary of research, some of which used the computer and some of which did not.

A. Particle Physics

Stanley J. Brodsky of Stanford Linear Accelerator and G. Peter Lepage of Cornell both spent a term at the Institute. Over the past several years they had collaborated on problems in high energy, perturbative QCD, and the chance for them to work more closely led, as expected, to a productive interaction. Periodic visits by Alfred H. Mueller of Columbia, another expert in the field, also helped make the Institute a focal point of perturbative QCD during 1981-82.

Another first for the School was the yearlong stay by two members from the People's Republic of China. Yong-Shi Wu worked on a number of methods which are applicable to model field theories and indicate that four dimensional gauge theories might be in some sense exactly solvable, while Chao-hsi Chang worked on both the theoretical and phenomenological aspects of grand unified theories. It is expected that contacts between the School and physicists in the PRC will continue in the future.

Michael Dine, along with M. Srednicki, developed an improved version of the "Supersymmetric Technicolor" model which they proposed (with Fischler) last year. The model was distinctly simpler than the previous one and contained no unwanted light particles. Dine (with M. Fischler) developed the first realistic supersymmetric generalization of the standard model. In this model, supersymmetry partners of ordinary fields (scalar partners of quarks and leptons, fermionic partners of gauge bosons) gained large masses in perturbation theory; the model contained no unwanted light fields or anomalies in gauge currents. Subsequently, these authors developed the first fully realistic grand-unified supersymmetric model, using a similar strategy. The correct pattern of gauge symmetry breaking was obtained, and again there were no unwanted light fields. Currently work is in progress to develop simpler versions of these models and to analyze their experimental implications (new particles, proton decay).

Emil Mottola has continued to work on the problem of the gravitational interaction at short distances, pursuing the line of thought begun last year with Brosl Hasslacher. A theory based on the square of the Weyl tensor was proposed. At ultra-short distances it has the desirable properties of renormalizability and asymptotic freedom, whereas the long-range classical gravitational effects must be accounted for by induced breakdown of conformal invariance by quantum effects. Unitarity can only be handled at present by the Lee-Wick mechanism.

Subsequently, Mottola worked on the different subject of metastability in quantum systems. The initial idea was to develop a clear approach to the Hawking effect in quantum gravity. However, work (with Alan S. Lapedes) has shown that conventional treatments of even one-dimensional systems are less than satisfactory—especially at finite temperature. It has been possible to develop a consistent semi-classical approximation to the functional integral representation of the large N phase transition in the three- and four-dimensional lattice gauge theory as presented. Such a phenomenon occurs in two dimensions but in higher dimensions there had been only speculation as to its existence. This work not only established that this phase transition does, indeed, occur but also calculated the critical coupling to two decimal places.

In collaboration with J. Wess, Burt A. Ovrut studied the role of gravity as a mechanism for supersymmetry breaking at energies small compared to the Planck mass. It was shown

that supergravity can break supersymmetry in a renormalizable manner and that in a class of theories the vacuum with SU(3)XSU(2)XU(1) is uniquely selected. Chiara R. Nappi and Ovrut studied supersymmetric extensions of the standard model: they were able to show that certain seemingly undesirable features of supersymmetry are not fundamental.

Bhanot, Urs Heller and Herbert Neuberger produced a timely and important piece of work on lattice gauge theories. They were the first to show that the Eguchi-Kawai formulation of the large-N theory has a phase transition and to suggest the modification ("quenching") required to make the model useful. Their work involved both analytical estimates and numerical simulation.

David G. Boulware spent the year at the Institute on leave from the University of Washington. Working with Gross (Princeton University) Boulware tried to formulate the Lee-Wick model as a field theory in the usual sense. If successful this could have important implications for quantum gravity. Further work on quantum gravity was done by Smolin and by Strominger. A particularly interesting result was that, in thermodynamic terms, gravitational radiation is the most degraded form of energy.

Stephen Adler continued to develop his effective action approach to QCD. He was able to derive the equations in a formal manner which makes all of the approximations explicit. At the same time he and Tsvi Piran perfected a numerical scheme for solving the nonlinear equations which follow from the formalism. They have now computed a heavy quark potential which interpolates smoothly between asymptotic freedom and linear confinement. Adler also wrote a major review article on induced gravity, the notion that gravity may not be fundamental but might actually be a consequence of vacuum energy associated with other fields.

B. Astrophysics

Many of the exchanges at coffee hours and lunches were enriched this year by the contributions of such senior visitors as S. Michael Fall, R. Sancisi, C. Sarazin, and S. White. There was a great deal of discussion of common problems and many collaborations were begun that involved both younger members and senior visitors.

C. Sarazin of the University of Virginia spent his sabbatical year at the Institute. He completed a surprisingly large number of problems in various fields, including important studies of the abundance of heavy elements in supernova remnants, the effect of accretion of intergalactic gas on the colors and luminosities of CD galaxies, a simple theory of the origin of the global properties of spiral galaxies (with D. Burstein of NRAO), and calculations of the intensities of radio recombination lines produced by stimulated emission in quasars (with J. Wadiak of the University of Virginia and R. Brown of NRAO).

Renzo Sancisi from the Kapteyn Observatory in Groningen, the Netherlands, was the principal observational visitor in 1982. During his three month stay at the Institute, Sancisi analyzed data he had obtained in Holland and the United States on the large radio halos around edge-on spiral galaxies. He also educated the Princeton community in the intricacies and significance of radio observations of the dynamics of galaxies.

John Tonry investigated the theoretical properties of elliptical galaxies whose velocity dispersion is not isotropic. He concluded that the anisotropy should be detectable and may provide a clue to a galaxy's formation and history.

Tonry also wrote a set of general-purpose graphic routines for use with the VAX computer and Versatec plotter. These routines are very convenient and are now used by most of the researchers at the Institute in understanding and displaying their numerical work.

During a three month visit to the Institute, Simon White studied the accretion of satellite galaxies by their parent (larger galactic) systems using a variety of simulation techniques. He found an unexpected dependence of the orbital decay rate on the details of the simulation method—and showed which method

must be used to obtain reliable results. White also made use of his time in Princeton to extend previous work on the dynamical properties of the globular cluster system of our Galaxy and their implications for the overall distribution of mass in the Milky Way.

Bruce Draine continued his work on the astrophysics of shock waves in molecular clouds. Together with Wayne Roberge, a model was proposed for the intense molecular line emission from Orion Molecular Cloud 1 (OMC-1). This model explains, for the first time, the process by which a relatively fast shock wave is able to radiate a large fraction of the energy dissipated in the shock in the vibration-rotation lines of molecular hydrogen, as well as a significant amount of power in the high-J rotational lines of CO. The key to the model is that it assumes the existence of a relatively strong magnetic field. Since the predicted line intensities for the model are in good agreement with a large number of observed emission lines, the model of the shock can actually be used to *determine* both the density and the magnetic field strength in this molecular cloud. Draine, Roberge, and Alexander Dalgarno (of Harvard) completed a general study of the structure of and emission from magnetohydrodynamic shock waves in molecular clouds.

In addition, Draine proposed that high velocity outflows in molecular clouds, for which no plausible acceleration mechanism was previously known, are in fact accelerated by magnetic forces resulting from the rotation of magnetized protostars. The resulting structure is referred to as a "magnetic bubble." The theory of these magnetic bubbles was investigated both analytically and numerically.

C. G. Lacey and S. Michael Fall, both of Cambridge University, developed a series of models that include the infall of gas, the formation of stars, stochastic acceleration by clouds and metal enrichment of the galactic disk. Among several new results, the most interesting is that the same form of the acceleration mechanism required to explain the dependence of velocity dispersion on age for stars in the solar neighborhood also accounts for the constant scale heights observed in the stellar disks of edge-on galaxies.

Nikolaos D. Kylafis derived analytic expressions for the amount of polarization and the brightness temperature expected in radio and infrared lines from sources undergoing one-dimensional or two-dimensional axisymmetric collapse or expansion. A relation between the polarization vector and the magnetic field direction was obtained.

Raymond M. Soneira analyzed the angular, redshift, and spatial clustering of Abell clusters in collaboration with Neta Bahcall (Princeton University Observatory). They used a large number of statistical estimators and morphological tests to determine the superclustering of clusters. They showed that the Abell clusters have the same power-law clustering that has been found for galaxies, but with an amplitude that is ~20 times larger and a clustering scale that extends to about 150 Mpc ($H_0 = 100$). This is the largest known scale of structure in the universe.

J. Bahcall and Soneira continued their systematic study of the distribution of stars in the Milky Way. With M. Schmidt of Caltech, they determined the parameters of the galactic spheroid using all the available observational data. With D. Morton of the Anglo-Australian Observatory and K. Tritton of Oxford, J. Bahcall and Soneira showed that many of the stars in the samples now being obtained at major observatories are giants and that the color-brightness relation for giants is important in interpreting the observational data. These results are contrary to previous beliefs held by many observers. J. Bahcall, Schmidt, and Soneira also showed that the available observatories are much less definitive in determining the distribution of unseen matter in galaxies than many previous workers have thought.

J. Bahcall completed a four-year project to determine the uncertainties in predicting solar neutrino capture rates. Together with his collaborators at Los Alamos (W. Huebner), IAS (S. Lubow), Yale (P. Parker), and the University of California (R. Ulrich), Bahcall showed what can be learned from different solar neu-

trino experiments and what data most needs to be improved. The predicted rate for the ^{37}Cl experiment is 7.6 SNU, with an effective $3-\sigma$ uncertainty of $+-3.3$ SNU. The experimental value obtained by R. Davis Jr. of Brookhaven National Laboratory is 2 SNU. Bahcall continues to collaborate with workers at Brookhaven, the Max Planck Institute of Heidelberg, and the Weizmann Institute on a large-scale gallium solar neutrino experiment. This experiment should indicate whether the physicists or the astronomers have caused the solar neutrino problem.

C. Mathematical Physics

The mathematical physicists worked, as usual, in many different areas without any central theme. Elliott Lieb developed a rigorous theory of the partial differential equation which Adler derived for the gluon field around two quarks. Lieb was able to prove existence and uniqueness of a solution. This means that quark confinement is a rigorous consequence of Adler's semi-classical approximation. Lieb also solved two technical problems arising in quantum field theory and statistical mechanics.

Vincent Rivasseau studied the statistical mechanics of lattice spin systems in the high-temperature region, and proved that the (1/n) expansion is Borel summable. He also solved two other technical problems of quantum theory.

Roger Dyson worked on a problem in population-biology, setting up a chemical-kinetic model for the origin of life. This work was published in the Journal of Molecular Evolution.

The School of Natural Sciences

Permanent Member, Members with Long-term Appointments, Members and Visitors, 1981-82.

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

Bruce T. Draine, *Astrophysics.*

Born 1947, Calcutta, India. Swarthmore College, BA 1969; Cornell University, MA 1975, PhD 1978.

Harvard University, Center for Astrophysics, research fellow 1977-79; Institute for Advanced Study, member 1979-80.

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

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

Members

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.

David G. Boulware, *Particle physics and quantum gravity.*

Born 1937, Oakland, California. University of California, BS 1958; Harvard University, MA 1960, PhD 1962.

Harvard University, junior fellow 1962-65; University of Washington, assistant professor 1965-68, associate professor 1968-73, professor 1973- .

Chao-hsi Chang, *Theories of particle physics.*

Born 1940, Hopei, China. University of Science and Technology of China, MA 1963; Institute of Atomic Energy, Beijing, PhD 1966.

CERN, Geneva, visiting scientist 1978-79; Institute of High Energy Physics, Beijing, associate professor 1979- .

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- .

S. Michael Fall, *Theoretical astrophysics.*

Born 1951, Tucson, Arizona. University of Utah, BS 1972; University of Cambridge, MA 1978; University of Oxford, PhD 1976.

Urs M. Heller, *High energy physics.*

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

John Richard Hiller, *Quantum chromodynamics.*
Born 1953, Scranton, Pennsylvania. Drexel University, BS 1976; University of Maryland, MS 1978, PhD 1980.
Harry Diamond Labs, student trainee 1972-75, physicist 1975-76; University of Maryland, research assistant 1979-80.

Pieter Hut, *Astrophysics.*
Born 1952, Utrecht, The Netherlands. Astronomical Institute, Amsterdam, PhD 1981.

Nikolaos D. Kylafis, *Theoretical astrophysics.*
Born 1949, Nea-Avorani, Greece. University of Patras, BS 1971; University of Illinois at Chicago Circle, MA 1973; University of Illinois at Urbana-Champaign, PhD 1978.
University of Illinois at Urbana-Champaign, teaching assistant 1972-74, research assistant 1975-78, research associate 1979.

G. Peter Lepage, *Bound state problems.*
Born 1952, Montreal, Canada. McGill University, BS 1972; Stanford University, MA 1975, PhD 1978.
Stanford Linear Accelerator Center, research associate 1978; Cornell University, research associate 1978-80, assistant professor 1980- .

Elliott H. Lieb. See page 35 for biographical entry.

Emil Mottola, *Theoretical physics: field theory, elementary particles.*
Born 1953, Bronx, New York. Columbia College, BA 1974; Columbia University, MA 1976, PhD 1979.
Columbia University, graduate teaching fellow 1974-76, Pfister fellow 1976-79; Institute for Advanced Study, member 1979-82; University of California at Santa Barbara, Institute for Theoretical Physics, research associate 1982- .

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.

Herbert Neuberger, *Particle physics.*
Born 1949, Cluj, Romania. Tel Aviv University, BS 1974, PhD 1980.
University of California at Berkeley, research associate 1979-81.

Yee Jack Ng, *Q.C.D. jets, quarkonium structure.*
Born 1946, China. University of California, Berkeley, BS 1968; Harvard University, MA 1969, PhD 1974.
Stanford Linear Accelerator Center, research associate 1976-78; University of North Carolina, assistant professor 1978- .

Izumi Ojima, *Quantum theory of gauge fields.*
Born 1949, Japan. Kyoto University, BM 1975, MSc 1977, PhD 1980.
Institute for Advanced Study, member 1980-81; Kyoto University, assistant professor 1981- .

Burt A. Ovrut, *Theoretical particle physics.*
Born 1946, New York. McGill University, BS 1968; University of North Carolina, MA 1972; University of Chicago, PhD 1978.
Brandeis University, research associate 1978- .

Adrian Patrascioiu, *Field theory and statistical mechanics.*
Born 1944, Romania. Massachusetts Institute of Technology, PhD 1973.
University of California, San Diego, research associate 1975-77; University of Arizona, assistant professor 1978-80, associate professor 1980- .

Tsvi Piran, *General relativity and relativistic astrophysics.*
Born 1949, Tel Aviv, Israel. Tel Aviv University, BS 1970, MA 1972; Hebrew University, PhD 1976.
Tel Aviv University, research assistant 1969-72; Racah Institute of Physics, Hebrew University, teaching assistant 1975-76; Oxford University, research assistant 1976-77; Center for Relativity, University of Texas, Austin, research associate 1977- .

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- .

Wayne G. Roberge, *Theoretical astrophysics.*
Born 1954, Northampton, Massachusetts. Williams College, BS 1976; Harvard University, PhD 1981.
Harvard University, research assistant 1978- .

Alain Rouet, *Semi-classical approach to quantum gauge field theories.*
Born 1942, France. Ingénieur Ecole Centrale Paris, 1969; Marseille, DEA Physique Theorique 1970, Doctorat ès Sciences 1974.
Max Planck Institut, Munich, 1975; CERN, Geneva, 1976-77; CNRS, Marseilles, 1978- .

Renzo Sancisi, *Structure and dynamics of normal galaxies.*
Born 1940, Forlì, Italy. University of Bologna, PhD 1965.
Kapteyn Laboratory, Groningen, principal scientific officer 1969- .

Lee Smolin, *Quantum theory of gravity.*
Born 1955, New York City. Hampshire College, BS 1975; Harvard University, MA 1978, PhD 1979.
Institute for Advanced Study, member, fall term 1979-80; University of California at Santa Barbara, research associate, spring term 1979-80, 1980-81.

Raymond M. Soneira, *Astrophysics.*
Born 1949, New York City. Columbia College, BS 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- .

Rafael Dolnick Sorkin, *General relativity.*
Born 1945, Orlando, Florida. Harvard University, BS 1966; California Institute of Technology, PhD 1974.
University College, research assistant 1974-77; University of Chicago, research associate 1979- .

Larry Spruch, *Long-range interactions and radiative corrections.*
Born 1923, Brooklyn, New York. Brooklyn College, BS 1943; University of Pennsylvania, PhD 1948.
University of Pennsylvania, instructor 1943-46; New York University, assistant professor to professor 1950- .

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.

John Landis Tonry, *Extragalactic astrophysics.*
Born 1953, Boston, Massachusetts. Princeton University, BS 1975; Harvard University, MA 1976, PhD 1980.
Harvard University, teaching assistant 1975-77, research assistant 1978- .

Simon D. M. White, *Theoretical and observational extragalactic astronomy.*
Born 1951, Kent, England. University of Cambridge, BA 1972; University of Toronto, MA 1974, PhD 1977.
University of Cambridge, research fellow 1978-80; Institut d'Astrophysique, Paris, chercheur associé 1980- ; University of California at Berkeley, senior fellow 1980-81, adjunct to assistant professor 1981- .

Stephen Wolfram, *Grand unified gauge models for cosmology.*
Born 1959, London, England. California Institute of Technology, PhD 1979.
California Institute of Technology, research associate 1980- .

Yong-shi Wu, *Theoretical particle physics.*
Born 1942, China. University of Peking, BS 1965.
Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, 1979.

Visitors

Kenneth M. 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, 1975-76, 1976-77, 1978-79, 1979-80, 1980-81.

Shau-Jin Chang, *Theoretical particle physics: transition to chaotic system.*

Born 1937, Kiangsu, China. National Taiwan University, BS 1959; National TsingHua University, MA 1961; Harvard University, PhD 1967.

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; Harvard University, assistant professor 1975-80; Exxon Research and Engineering Company, 1980-81.

Alan S. Lapedes, *Particle physics, quantum gravity.*

Born 1951, New Jersey. University of Virginia, BS 1973; University of Cambridge, PhD 1978.

Institute for Advanced Study, member 1979-81; Los Alamos Scientific Laboratory, research associate 1981- .

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- .

Bohdan Paczyński, *Astrophysics.*

Born 1940, Wilno, Poland. University of Warsaw, MA 1962, PhD 1964.

University of Colorado, JILA, 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; University of California at Berkeley, visiting professor 1979.

Herbert J. Rood, *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; The Institute for Advanced Study, member 1972-73, long-term visiting member, 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; University of Texas at Austin, associate professor 1980- .

Louis Witten, *Supergravity; gravitational collapse.*

Born 1921, Baltimore, Maryland. The Johns Hopkins University, BS 1941, PhD 1951.

RIAS (Martin-Marietta Research Laboratory), associate director 1955-68; University of Cincinnati, professor 1968- .

The School of Social Science

Faculty

Clifford Geertz
(*Harold F. Linder Professor*)
Albert O. Hirschman
(*1907 Foundation Professor*)
Michael Walzer

Member with Long-Term Appointment

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, 1981-82

As is now traditional, 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. Four out of the twenty-eight seminars (through May 20) were given by members of the School of Historical Studies, two by assistants and four by guest scholars from Princeton University. The seminars were remarkably well-attended, each topic attracting, 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 problems in political philosophy. Six members of the School

formed a core group, with several others sharing in its interests. A political theory seminar met regularly on every second Monday throughout the year. Five guests, two from Historical Studies, three from the University, joined in the discussions of papers and work in progress. The seminar brought together people who normally work in History, Political Science, and Philosophy departments, and the sometimes sharp arguments among these people will undoubtedly show up in their completed work.

Another informal group, together with several guests from the University and the Davis Center, formed a seminar on interpretation in anthropology. Papers were circulated in advance and in-depth discussions followed.

Four Members of the School were appointed as participants in the "Self-Perception, Mutual Perception and Historical Development" group. This was the third year of an ongoing grant from The Andrew W. Mellon Foundation that made this project possible for both this School and that of Historical Studies. The seminar met regularly every other Tuesday evening to discuss various aspects of the topic "The Perception of Others and Self-Definition."

Faculty

Professor Clifford Geertz was appointed the Harold F. Linder Professor of Social Science. He continued his research and published articles on anthropology and epistemology, gave a Bicentennial Lecture at the American Academy of Arts and Sciences, and received an Honorary Doctorate of Humane Letters from Knox College, Illinois. He became Editorial Advisor to the Association for Social Anthropology in Great Britain and a member of the Assembly of Behavioral and Social Sciences for the National Research Council.

Professor Albert O. Hirschman published two books, *Essays in Trespassing: Economics to Politics and Beyond*, and *Shifting Involvements: Private Interest and Public Action*. His earlier book, *Exit, Voice, and Loyalty*, was published in an Italian edition. In May, 1982, he gave the Marc Bloch Lecture in Paris, upon the invitation of the Ecole des Hautes Etudes en Sciences Sociales. He attended a session of the Advisory Board of the International Institute for Comparative Social Research of the Wissenschaftszentrum in Berlin, chaired a meeting of the Academic Advisory Board to the Latin American Program of the Wilson Center, participated in conferences held in Mount Kisco, New York, and São Paulo, Brazil; and lectured in Buenos Aires, Argentina; Santiago, Chile; and Madrid, Spain.

Professor Michael Walzer continued his work on distributive justice. He published articles in scholarly journals and in journals of opinion; his book *Just and Unjust Wars* appeared in German and Spanish translations. Throughout the year, he served as a member of a committee of scholars helping to rebuild the graduate faculty of the New School for Social Research. In May, he received one of Brandeis University's Creative Arts Awards (for nonfiction). In June, he delivered a paper at a colloquium in memory of J. L. Talmon held in Jerusalem under the sponsorship of the Israel Academy of Science and Humanities.

The School of Social Science

Member with Long-term Appointment, Members, Visitors, and Assistants, 1981-82

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

Member with Long-term Appointment

Bernard Lewis. See page 25 for biographical entry.

Members

Shaul Bakhash, *Institutional change in Iran: 1921-41.*

Born 1936, Tehran, Iran. Harvard University, BA 1959, MA 1968; University of Oxford, PhD 1972.

University of Oxford, St. Antony's College, fellowship 1969-72; University of Tehran, Iran, lecturer in history 1968-69, 1972-73; Kayhan Research Associates, Tehran, Iran, director 1975-77; Shomal University, Iran, associate professor of history 1977-79; Princeton University, visiting associate professor, Near Eastern Studies Department 1980- .

Alton L. Becker, *Linguistics and anthropology: South East Asian aesthetic systems.*

Born 1932, Monroe, Michigan. University of Michigan, BA 1954; University of Connecticut, MA 1956; University of Michigan, PhD 1966.

Ripon College, instructor 1956-58; Kambawza College, Burma, Fulbright teacher 1958-61; Malang, Indonesia, Ford Foundation consultant (linguistics) 1969-71; University of California at Berkeley, visiting professor 1976; All Souls College of Oxford University, 1976-77; University of Michigan, lecturer to professor 1961- .

Marshall Cohen, *Law, morality, and international relations.*

Born 1929, New York, New York. Dartmouth, BA 1951; Harvard University, MA 1953, PhD 1955.

Harvard University, assistant professor 1958-62; University of Chicago, assistant to associate professor 1962-66; The Rockefeller University, associate professor 1966-70; City University of New York, professor of philosophy 1970- ; Barnard College, visiting professor of philosophy 1979- .

Robert C. Darnton, *The rise of the intelligentsia in the eighteenth century.*

Born 1939, New York, New York. Harvard College, AB 1960; University of Oxford, BPhil 1962, DPhil 1964.

Harvard University, junior fellow 1965-68; Princeton University, assistant professor to professor 1968- ; Ecole Pratique des Hautes Etudes, VI Section, directeur d'études 1970-71; Institute for Advanced Study, School of Social Science, member 1979-82, School of Historical Studies, member 1979-82.

Jean Bethke Elshtain, *The family and politics: moral and political education.*

Born 1941, Windsor, Colorado. Colorado State University, BA 1963; University of Colorado, MA 1965; Brandeis University, PhD 1973.

Colorado State University, Northeastern University, University of Massachusetts, Boston University, instructor 1965-73; Smith College, Yale University, visiting associate professor 1979-80; University of Massachusetts, Amherst, assistant to associate professor 1973- .

Mark S. Granovetter, *Sociological and economic approaches to income inequality.*

Born 1943, Jersey City, New Jersey. Princeton University, BA 1965; Harvard University, MA 1967, PhD 1970.

Johns Hopkins University, assistant professor of social relations 1970-73; Harvard University, assistant professor of sociology 1973-75; associate professor of sociology 1975-77; University of New York at Stony Brook, associate professor of sociology 1977- .

Philip Green, *Egalitarianism in political theory.*
Born 1932, New York, New York. Swarthmore College, BA 1954; Princeton University, MPA 1960, PhD 1965.
Haverford College, Department of Political Science 1963-64; Smith College, Department of Government 1964- .

Vera M. Green, *Heterogeneity of minority groups.*
Born 1928, Chicago, Illinois. Roosevelt College, BA 1952; Columbia University, MA 1955; University of Arizona at Tuscon, PhD 1969.
University of Iowa, visiting assistant professor 1969; University of Houston, assistant professor 1969-72; Rutgers University, graduate director 1973-74; Livingston College, 1973-75; Rutgers University, 1975-76, associate professor 1980-82; Latin American Institute, director 1980.

Steven E. G. Kemper, *Interpretive anthropology and its philosophical foundations.*
Born 1944, Indianapolis, Indiana. Dartmouth College, BA 1966; University of Chicago, MA 1969, PhD 1973.
Bates College, assistant professor 1980- .

Michael S. McPherson, *Ethical and philosophical foundations of economics.*
Born 1947, United States. University of Chicago, BA 1967, MA 1970, PhD 1974.
University of Illinois at Chicago Circle, instructor in economics 1971-74; Williams College, assistant professor 1974-81, associate professor 1981- .

Mark Perlman, *Development of macroeconomics.*
Born 1923, Wisconsin. University of Wisconsin at Madison, BA 1947, MA 1947; Columbia University, PhD 1950.
University of Hawaii, assistant professor 1951-52; Cornell University, assistant professor 1952-55; Johns Hopkins University, assistant professor, associate professor, visiting professor 1955-64; Harvard University, research associate 1955-57; University of Pittsburgh, professor of economics and history 1963- ; University of Melbourne, senior Fulbright lecturer 1968; University of Cambridge, visiting fellow 1977.

John E. Schrecker, *Chinese conceptions of other societies and cultures.*
Born 1937, Czechoslovakia. University of Pennsylvania, BA 1958; Harvard University, MA 1959, PhD 1968.
Harvard University, teaching fellow in social sciences 1963-64; Princeton University, instructor, assistant professor of history 1965-71; Brandeis University, associate professor of history 1971- .

Daniel A. Sperber, *Theory of culture.*
Born 1942, Cagnes, France. University of Paris (Sorbonne), Licence ès Lettres 1962; University of Oxford, BLitt 1968.
CNRS, Paris, attaché de recherche 1965-71; chargé de recherche 1971- .

Charles Taylor, *Political theory and philosophy of language.*
Born 1931, Montreal, Canada. McGill University, BA 1952; University of Oxford, BA 1955, MA 1960, PhD 1961.
University of Oxford, fellow of All Souls College 1956-61; McGill University, professor of political science 1961- ; University of Montreal, professor of philosophy 1962-71; Princeton University, visiting professor 1965; University of California at Berkeley, visiting professor 1974; University of Oxford, professor and fellow of All Soul's College 1976-81.

Visitors

Amy Gutmann, *Political philosophy: the state and education.*
Born 1949, New York, New York. Radcliffe College, BA 1971; London School of Economics, MA 1972; Harvard University, PhD 1976.
Princeton University, assistant to associate professor 1976- ; bicentennial preceptorship 1979-82.

Stanley N. Katz, *Social Role of private foundations.*
Born 1934, Chicago, Illinois. Harvard University, BA 1955, MA 1959, PhD 1961.
Harvard University, instructor to assistant professor 1961-65; University of Wisconsin, assistant to associate professor 1965-71; University of Chicago Law School, professor 1971-78; Princeton University, professor 1978- .

Gabriella Rossetti, *Education and symbolism.*
Born 1942, Milan, Italy. Laurea in Filosofia 1968.

University of Milan, assistant professor 1969-77; University of Ferrara, associate professor 1977- , professore incaricato stabilizzato 1979- .

Assistants

Enrique Cárdenas, *Economic history of Mexico: the depression of the thirties.*

Born 1954, Torreón, Mexico. Instituto Tecnológico Autónomo de México, BA 1977; Yale University, MA 1979, PhD 1982.

Centro de Estudios Económicos del Sector Privado, Mexico, researcher 1975; Grupo Secretaría de Hacienda-Banco de México, Mexico 1975-76; Banco de México, Mexico 1976-78.

Robert W. Hefner, *South East Asian studies: Javanese culture and society.*

Born 1952, Columbus, Ohio. University of Michigan, BA 1974, MA 1975, PhD 1982.

Universitas Gadjah Mada, Java, visiting lecturer; University of Michigan, Project of Asian Studies in Education, instructional associate.

Marc W. Stier, *Politics and reason: philosophical foundations of political and moral theory.*

Born 1955, United States. Wesleyan University, BA 1976; Harvard University.

Record of Events, 1981-82

The following events of interest to the Institute community took place between July 1, 1981 and June 30, 1982. 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.

August 24-26
Colloquium

Bi-National Colloquium for Alexander von Humboldt Foundation Awardees on "Science, Technology and Culture" (made possible by a grant from the Alexander von Humboldt Stiftung)

September 1-3
School of Historical Studies
School of Social Science

Colloquium: "Mutual Perceptions: East and West" (made possible by a grant from the Exxon Education Foundation)
Convener: Bernard Lewis, member with long-term appointment, School of Historical Studies and School of Social Science

September 14
School of Natural Sciences

Theoretical Physics Seminar: "Scaling properties branch polymers"
Guest Lecturer: Nicholas Sourlas, l'Ecole Normale Supérieure

September 15
School of Natural Sciences

Astrophysics Lecture: "The distribution of dark matter in spiral galaxies"
Guest Lecturer: Pieter C. van der Kruit, Kapteyn Laboratorium, Groningen

September 23
School of Natural Sciences

Theoretical Physics Seminar: "The boost problem"
Guest Lecturer: D. Christodoulou, Max Planck Institute, Munich, and Courant Institute

September 24

School of Mathematics

Transcendental Topics in Algebraic Geometry Seminar: "Extensions of classical Hodge theory: variation of Hodge structure"
Phillip A. Griffiths, Harvard University; Visitor, School of Mathematics, IAS

Topology Seminar: "Fundamental group problems related to Poincaré duality"
Guest Lecturer: Jean-Claude Hausmann, University of Geneva

Moduli Problems Seminar: "The Brill-Noether problem"
David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS

September 25

School of Mathematics

Algebriac Geometry Seminar: "Curves on Abelian varieties and torsion points"
Michel Raynaud, University of Paris-Sud; Visiting Member, School of Mathematics, IAS

September 28

School of Mathematics

Members Seminar: "Rational curves on algebraic varieties"
Shigefumi Mori, Harvard University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Properties of the vacuum"
Stephen Wolfram, California Institute of Technology; Visiting Member, School of Natural Sciences, IAS

September 30

School of Mathematics

Classical Relativity Seminar: "The boost problem"
Guest Lecturer: D. Christodoulou, Max Planck Institute, Munich

Lecture Series: "Curves of genus 1 from Diophantus to Mordell"
André Weil, Professor Emeritus, School of Mathematics, IAS

Differential Geometry Seminar: "On the cuspidal spectrum of locally symmetric space of finite volume"
Harold Donnelly, Purdue University; Visiting Member, School of Mathematics, IAS

October 1

School of Historical Studies

Art History Colloquia: "Introduction to a history of Sienese painting"
Hayden B. J. Maginnis, McMaster University; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Intersection Homology: "Introduction"
Armand Borel, Professor, School of Mathematics, IAS

Topology: "Euler characteristics of 3-manifold groups and discreet sub-groups of SL(2,C)"
John Ratcliffe, University of Wisconsin; Visiting Member, School of Mathematics, IAS

Algebraic Geometry: "Curves on Abelian varieties and torsion points" (continued)
Michel Raynaud, University of Paris-Sud; Visiting Member, School of Mathematics, IAS

October 2

School of Mathematics

Cycles and K-Theory: "A survey of intersection theory"
William Fulton, Brown University; Visiting Member, School of Mathematics, IAS

Moduli Problems: "The Kodaira dimension of the moduli space of curves"
David B. Mumford, Harvard University; Visitor, School of Mathematics, IAS

October 5

School of Mathematics

Members Seminar: "Ergodic theory of measured foliations and interval exchange maps"
Howard Masur, University of Illinois at Chicago Circle; Visiting Member, School of Mathematics, IAS

October 6

School of Historical Studies
School of Social Science

Andrew W. Mellon Foundation Program: "The discovery of America and the discovery of man"
John H. Elliott, Professor, School of Historical Studies, IAS

School of Mathematics

Surfaces and P-adic Cohomology Seminar: "K3 surfaces (introduction)"
Guest Lecturer: David Morrison, Princeton University

October 7

School of Mathematics

Differential Geometry Seminar: "Almost flat manifolds"
Ernst A. Ruh, University of Bonn; Visiting Member, School of Mathematics, IAS

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor Emeritus, School of Mathematics, IAS

Classical Relativity Seminar: "Gravitational energy cannot become negative"
Gary Horowitz, University of Oxford; Visiting Member, School of Mathematics, IAS

October 8

School of Mathematics

Intersection Homology Seminar: "The P.L. theory"
William Fulton, Brown University; Visiting Member, School of Mathematics, IAS

Topology Seminar: "Embedding 3-manifolds in 4-space"
Patrick M. Gilmer, Louisiana State University; Visiting Member, School of Mathematics, IAS

Moduli Problems Seminar: "The unirationality of $\mathcal{A}_5$"
Ron Donagi, University of Utah; Visiting Member, School of Mathematics, IAS

Algebraic Geometry Seminar: "Deformation theory of varieties with trivial canonical bundle"
Guest Lecturer: F. A. Bogomolov, Steklov Institute, Moscow

October 9

School of Mathematics

Transcendental Topics in Algebraic Geometry Seminar: "Monodromy and regularity theorems. Theorem of the fixed part"
Philip A. Griffiths, Harvard University; Visitor, School of Mathematics, IAS

Algebraic Geometry Seminar: "Deformation theory of varieties with trivial canonical bundle" (continued)
Guest Lecturer: F. A. Bogomolov, Steklov Institute, Moscow

October 12

School of Mathematics

P-Adic Cohomology Seminar: "Introduction"
Saul Lubkin, University of Rochester; Visiting Member, School of Mathematics, IAS

Introduction to Crystalline Cohomology Seminar: "Definition of crystalline cohomology"
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Members Seminar: "Phragmén-Lindelöf principle and removable singularities for some nonlinear equations"
Patricio U. Aviles, Purdue University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Is the distinction between quantum and thermal fluctuations relativistically invariant in the presence of gravitational fields?"
Lee Smolin, University of California at Santa Barbara; Visiting Member, School of Natural Sciences, IAS

October 13

School of Mathematics

Surfaces and P-Adic Cohomology Seminar: "Classification of ordinary K3 surfaces over finite fields"
Guest Lecturer: Niels O. Nygaard, Princeton University

October 14

School of Mathematics

Differential Geometry Seminar: "Vanishing theorems and the complex-analyticity of harmonic maps"
Yum Tong Siu, Stanford University; Visitor, School of Mathematics, IAS

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor Emeritus, School of Mathematics, IAS

October 15

School of Mathematics

Intersection Homology Seminar: "The P.L. theory" (continued)
William Fulton, Brown University; Visiting Member, School of Mathematics, IAS

Topology Seminar: "On deformations of transversally holomorphic foliations"
André Haefliger, University of Geneva; Visiting Member, School of Mathematics, IAS

Moduli Problems Seminar: "Unirationality via intermediate Jacobians of Fano threefolds"
Ron Donagi, University of Utah; Visiting Member, School of Mathematics, IAS

Partial Differential Equations Seminar: "Propagation of singularities for some pseudodifferential operators"
Alain Grigis, Ecole Polytechnique, Palaiseau, France; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Trimming the tree of knowledge: the epistemological strategy of the *Encyclopédie*"
Robert Darnton, Princeton University; Visiting Member, School of Social Science, and Visitor, School of Historical Studies, IAS

October 16

School of Mathematics

Cycles and K-Theory Seminar: "Introduction to high algebraic K-theory"
Daniel R. Grayson, Barnard College, Columbia University; Visiting Member, School of Mathematics, IAS

Algebraic Geometry Seminar: "Fano 3-folds and extremal rays"
Shigefumi Mori, Harvard University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Hot Potts soup—quantum Potts gauge-matter systems at finite temperature"
Guest Lecturer: Yadin Goldschmidt, Brown University

October 19

School of Mathematics

P-Adic Cohomology: "Introduction" (continued)
Saul Lubkin, University of Rochester; Visiting Member, School of Mathematics, IAS

Marston Morse Memorial Lecture: "Dirac operators, scalar curvature, and spin cobordism"
Guest Lecturer: H. B. Lawson, State University of New York, Stony Brook

	Introduction to Crystalline Cohomology: "Definition of crystalline cohomology" (continued) Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS
School of Natural Sciences	Theoretical Physics Seminar: "Metric from matter" Guest Lecturer: D. Amati, CERN
October 20	
School of Historical Studies School of Social Science	Andrew W. Mellon Foundation Program: "Discussion by Mellon fellows of research in progress"
School of Mathematics	Surfaces and P-Adic Cohomology: "Classification of ordinary K3 surfaces over finite fields" (continued) Guest Lecturer: Niels O. Nygaard, Princeton University
	Special Lecture: "On supercuspidal characters of GL_n and SL_n over a p-adic field" Guest Lecturer: P. Kutzko, University of Iowa
October 21	
School of Historical Studies	Colloquium in Classical Studies: "Manichaean monasteries in Egypt and their influence on the origins of Christian monasticism" Ludwig Koenen, University of Michigan, Visiting Member, School of Historical Studies, IAS
School of Mathematics	Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued) André Weil, Professor Emeritus, School of Mathematics, IAS
	Differential Geometry: "Characterization of bounded domains covering Zariski open sets on compact complex manifolds" Bun Wong, The Johns Hopkins University; Visiting Member, School of Mathematics, IAS
	Classical Relativity: "Some questions concerning topological particles in pure gravity" Rafael D. Sorkin, University of Chicago; Visiting Member, School of Natural Sciences, IAS
October 22	
School of Mathematics	Intersection Homology Seminar: "Sheaf theoretical constructions" Armand Borel, Professor, School of Mathematics, IAS
	Moduli Problems Seminar: "The Kodaira dimension of the moduli space of curves" (continued) David B. Mumford, Harvard University; Visiting Member, School of Mathematics, IAS

	Partial Differential Equations Seminar: "Propagation of singularities for some pseudodifferential operators" (continued) Alain Grigis, Ecole Polytechnique, Palaiseau, France; Visiting Member, School of Mathematics, IAS
School of Social Science	Seminar: "Distributive justice and the theory of goods" Michael Walzer, Professor, School of Social Science, IAS
October 23	
School of Mathematics	Transcendental Topics in Algebraic Geometry Seminar: "Infinitesimal variation of Hodge structures" Phillip A. Griffiths, Harvard University; Visitor, School of Mathematics, IAS
	Algebraic Geometry Seminar: "Fano 3-folds and extremal rays" (continued) Shigefumi Mori, Harvard University; Visiting Member, School of Mathematics, IAS
School of Natural Sciences	Theoretical Physics Seminar: "A confining model of the weak interactions" Guest Lecturer: Eddie Farhi, Massachusetts Institute of Technology
	Astrophysics Seminar: "Shocking supernovae" Guest Lecturer: Hans A. Bethe, Cornell University
Institute Lecture	Joseph H. Hazen-Albert Einstein Lecture: "The Energy Problem" Guest Lecturer: Hans A. Bethe, Cornell University
October 26	
School of Mathematics	Introduction to Crystalline Cohomology Seminar: "Definition of crystalline cohomology" (continued) Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS
	Members Seminar: "On constructing a 4-dimensional topological manifold with index 8" Guest Lecturer: M. Freedman, University of California, San Diego.
School of Natural Sciences	Theoretical Physics Seminar: "Spin-½ Solitons *are* really Fermions" Rafael D. Sorkin, University of Chicago; Visiting Member, School of Natural Sciences, IAS
October 27	
School of Mathematics	P-Adic Cohomology Seminar: "Survey" (continued) Saul Lubkin, University of Rochester; Visiting Member, School of Mathematics, IAS and Arthur E. Ogus, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

Special Lecture: "Bifurcation and stability of gradient vector fields"
Guest Lecturer: J. Palis, Jr., IMPA, Rio de Janeiro

Surfaces and P-Adic Cohomology Seminar: "Moduli of K3 surfaces of degree 2"
Henry P. Miranda, University of Chicago; Visiting Member, School of Mathematics, IAS

October 28

School of Mathematics

Differential Geometry Seminar: "Special cycles in locally symmetric spaces and automorphic forms"
Yue Lin L. Tong, Purdue University; Visiting Member, School of Mathematics, IAS

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor Emeritus, School of Mathematics, IAS

October 29

School of Mathematics

Intersection Homology Seminar: "Sheaf theoretical constructions" (continued)
Armand Borel, Professor, School of Mathematics, IAS

Moduli Problems Seminar: "Invariant theory and compactification"
David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS

Partial Differential Equations Seminar: "Local solvability of invariant differential operators on Lie groups"
Linda P. Rothschild, University of Wisconsin; Visiting Member, School of Mathematics, IAS.

School of Social Science

Seminar: "Philanthrophy and social policy: the American foundation"
Stanley N. Katz, Princeton Unversity; Visitor, School of Social Science, IAS

October 30

School of Mathematics

Cycles and K-Theory Seminar: "Cycles and arithmetic"
Spencer J. Bloch, University of Chicago; Visiting Member, School of Mathematics, IAS

Algebraic Geometry Seminar: "Classification of Fano 3-folds"
Shigeru Mukai, Nagoya University; Visitor, School of Mathematics, IAS

November 2

School of Mathematics

Introduction to Crystalline Cohomology: "Definition of crystalline cohomology" (continued)
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Members Seminar: "Elliptic curves and cyclotomic fields"
Andrew J. Wiles, Harvard University; Visiting Member, School of Mathematics, IAS

November 3

School of Historical Studies
School of Social Science

Andrew W. Mellon Foundation Program: "Perceptions of Greece in nineteenth-century Germany and England"
Glen W. Bowersock, Professor, School of Historical Studies, IAS

School of Mathematics

P-Adic Cohomology: "Survey of crystalline cohomology"
Arthur E. Ogus, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

Surfaces and P-Adic Cohomology: "Degeneration of K3 surfaces with Hasse invariant zero"
Guest Lecturer: David Morrison, Princeton University

November 4

School of Mathematics

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor Emeritus, School of Mathematics, IAS

Differential Geometry: "Classification of VII_0-surfaces with $b_2 = 0$"
Guest Lecturer: F. A. Bogomolov, Steklov Institute, Moscow

Classical Relativity: "The existence of surfaces with Tr K = constant"
Guest Lecturer: S. Stumbles, Cambridge University

November 5

School of Historical Studies

Art History Colloquia: "A question of choice? Western art, tradition and Indian artists (c. 1850-c. 1920)"
Partha Mitter, Sussex University; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Intersection Homology: "Sheaf theoretical constructions" (continued)
Armand Borel, Professor, School of Mathematics, IAS

Moduli problems: "The Kodaira dimension of the moduli space of curves" (continued)
David B. Mumford, Harvard University; Visitor, School of Mathematics, IAS

Partial Differential Equations: "The Cauchy problem for hyperbolic operators with constant principal part"
Seiichiro Wakabayashi, University of Tsukuba; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "The utopian tradition"
Lyman T. Sargent, University of Missouri; Visiting Member, School of Historical Studies, IAS

November 6

School of Mathematics

Transcendental Topics in Algebraic Geometry: "Nilpotent and SL_2 orbit theorems, Clemens-Schmid and invariant cycle theorem"
Guest Lecturer: David Morrison, Princeton University

Algebraic Geometry: "Decomposition theorem for varieties with $K = 0$"
Guest Lecturer: F. A. Bogomolov, Steklov Institute

School of Natural Sciences

Theoretical Physics Seminar: "Monte Carlo simulations with Fermions"
Guest Lecturer: Herbert Hamber, Brookhaven National Laboratory

November 9

School of Mathematics

Introduction to Crystalline Cohomology: "Crystals"
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Members Seminar: "An update on the representation theory of GL_n and SL_n over a p-adic field"
Paul J. Sally, Jr., University of Chicago; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "A new mechanism for supersymmetry breaking"
Burt Ovrut, Brandeis University; Visiting Member, School of Natural Sciences, IAS

November 10

School of Mathematics

Surfaces and P-Adic Cohomology: "Degeneration of K3 surfaces with Hasse invariant zero" (continued)
Guest Lecturer: David Morrison, Princeton University

November 11

School of Mathematics

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor Emeritus, School of Mathematics, IAS

Differential Geometry: "Lie albegras of order zero over manifolds"
Guest Lecturer: P. Lecomte, University of Liège

Classical Relativity: "Unified theories of gravitation"
Tullio Regge, Visiting Professor, School of Natural Sciences, IAS

Concert

Music from Marlboro

November 12

School of Mathematics

Intersection Homology: "Sheaf theoretical constructions" (continued)
Armand Borel, Professor, School of Mathematics, IAS

Topology: "Geometric descriptions for 3-manifolds which are regular branched coverings"
Guest Lecturer: William P. Thurston, Princeton University

Moduli Problems: "Invariant theory and compactification" (continued)
David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "On the spectrum of towers"
Harold Donnelly, Purdue University; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Bohemia and the boundaries of the bourgeois society"
Guest Lecturer: Jerrold E. Seigel, Princeton University

November 13

School of Mathematics

Cycles and K-theory: "K-theory and intersection theory on singular varieties"
Guest Lecturer: Henri Gillet, Princeton University

Algebraic Geometry: "Classification of Fano 3-folds" (continued)
Shigeru Mukai, Nagoya University; Visitor, School of Mathematics, IAS

November 14

Sculpture Dedication

Dedication of a sculpture by Tony Smith to commemorate the accomplishments of Albert Einstein: "Sculpture on the edge of dreams"
Guest Lecturer: Dore Ashton, Cooper Union for the Advancement of Science and Art

November 16

School of Mathematics

Introduction to Crystalline Cohomology: "Crystals" (continued)
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Members Seminar: "An embedding theorem for real hypersurfaces"
James J. Faran, V, Princeton University; Visiting Member, School of Mathematics, IAS

November 17

School of Historical Studies
School of Social Science

Andrew W. Mellon Foundation Program: "Perception and understanding"

	Partha Mitter, University of Sussex; Visiting Member, School of Historical Studies, IAS
School of Mathematics	Surfaces and P-Adic Cohomology: "The Torelli theorem for super-singular K3's" Arthur E. Ogus, University of California at Berkeley; Visiting Member, School of Mathematics, IAS
November 18	
School of Historical Studies	Colloquium in Classical Studies: "Religious inviolability of places in the Hellenistic Age" Kent J. Rigsby, Duke University; Visiting Member, School of Historical Studies, IAS
School of Mathematics	Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued) André Weil, Professor Emeritus, School of Mathematics, IAS
	Differential Geometry: "The structure of real transitive Lie algebras" Guest Lecturer: J. F. Conn, California Institute of Technology
School of Natural Sciences	Theoretical Physics Seminar: "Submarines and the strategic balance: A low-level tutorial" Guest Lecturer: Curt Callan, Princeton University
November 19	
School of Mathematics	Intersection Homology: "Sheaf theoretical constructions" (continued) Armand Borel, Professor, School of Mathematics, IAS
	Topology: "The chain complex of an S^1-bundle" Andrew Ranicki, Princeton University; Visiting Member, School of Mathematics, IAS
	Moduli Problems: "Invariant theory and compactification" (continued) David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS
	Partial Differential Equations: "On the singularities of some nonlinear partial differential equations" Patricio U. Aviles, Purdue University; Visiting Member, School of Mathematics, IAS
School of Social Science	Seminar: "War endings and prudent victors in the twentieth century" Guest Lecturer: Nissan Oren, Princeton University
November 20	
School of Mathematics	Transcendental Topics in Algebraic Geometry: "Compactification questions. Deligne's conjecture" Guest Lecturer: E. Cattani, University of Massachusetts

Algebraic Geometry: "Braid monodromies"
Boris Moishezon, Columbia University; Visitor, School of Mathematics, IAS

School of Natural Sciences — Theoretical Physics Seminar: "Solving ϕ^4 with Monte Carlo"
Guest Lecturer: Barry Freedman, Indiana University

November 23

School of Mathematics — Introduction to Crystalline Cohomology: "Crystals" (continued)
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Members Seminar: "Classical analysis. An extension of Hardy's class of 'orders of infinity' "
Michael Boshernitzan, Weizmann Institute; Visiting Member, School of Mathematics, IAS

School of Natural Sciences — Theoretical Physics Seminar: "Mass hierarchies in supersymmetric theories"
Guest Lecturer: Ed Witten, Princeton University

November 24

School of Mathematics — P-Adic Cohomology: "The de Rham-Witt complex"
Michel Raynaud, University of Paris; Visiting Member, School of Mathematics, IAS

November 30

School of Mathematics — Introduction to Crystalline Cohomology: "Crystals" (continued)
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Members Seminar: "A resolution for modules of SU-bordism"
Serge Ochanine, CNRS, France; Visiting Member, School of Mathematics, IAS

School of Natural Sciences — Film on Nuclear Arms Race: "Survival—or suicide"
Freeman Dyson, Professor, School of Natural Sciences, IAS; and
Guest Lecturer: H. J. Feiveson, Princeton University

December 1

School of Mathematics — Surfaces and P-Adic Cohomology: "The Torelli theorem for super-singular K3's" (continued)
Arthur E. Ogus, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

December 2

School of Historical Studies — Colloquium in Classical Studies: "The debate on luxury in the third and second centuries B.C. in Republican Rome"
Guido Clemente, University of Florence; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor, School of Mathematics, IAS

Differential Geometry: "On non-compact symmetric spaces"
Chih-ta Yen, University of California at Berkeley; Visitor, School of Mathematics, IAS

December 3

School of Historical Studies

Art History Colloquia: "Alberti's dream made real: The architectural theory of Francesco di Giorgio"
Richard J. Betts, University of Illinois at Urbana-Champaign; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Intersection Homology: "Intersection homology and nilpotent varieties"
Guest Lecturer: R. D. MacPherson, Brown University

Topology: "Exotic characteristic classes for measured foliations"
Guest Lecturer: S. Hurder, Princeton University

Moduli Problems: "$\mathcal{A}_g$ is of general type, $g \geq 9$"
Guest Lecturer: Y. S. Tai, Haverford College

Partial Differential Equations: "Approximation of solutions of linear partial differential equations with analytic coefficients"
Guest Lecturer: F. Trèves, Rutgers University

School of Social Science

Seminar: "Is freedom academic?"
Amy Gutmann, Princeton University; Visitor, School of Social Science, IAS

December 4

School of Mathematics

Transcendental Topics in Algebraic Geometry: "Degeneration of Hodge bundles (after Steenbrink)"
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS; and
"Computation of ϕ_* (interior and on boundary), examples including curves, global Torelli for curves and K3"
Guest Lecturer: R. Friedman, Columbia University

Algebraic Geometry: "Braid monodromies" (continued)
Boris Moishezon, Columbia University; Visitor, School of Mathematics, IAS

December 7

School of Mathematics

Special Lecture: "Extensions of Abel-Jacobi mappings"
Guest Lecturer: H. Clemens, University of Utah

Introduction to Crystalline Cohomology: "Connections"
Amassa Fauntleroy, University of Illinois; Visitor, School of Mathematics, IAS

Members Seminar: "A uniform coprimality result for Euler's function"
Eira J. Scourfield, University of London; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Induced gravitation: a survey"
Stephen L. Adler, Professor, School of Natural Sciences, IAS

December 8

School of Mathematics

Special Lecture: "Petri's conjecture"
David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS

Surfaces and P-Adic Cohomology: "Crystalline cohomology and the Kuga-Satake construction"
Arthur E. Ogus, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

December 9

School of Mathematics

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor, School of Mathematics, IAS

Differential Geometry: "Foliations by minimal leaves and invariant currents"
André Haefliger, University of Geneva; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "A formula for G in a background space-time"
Stephen L. Adler, Professor, School of Natural Sciences, IAS

December 10

School of Historical Studies
School of Social Science

Andrew W. Mellon Foundation Program: "Muslim perceptions of the West"
Bernard Lewis, Princeton University; Long-Term Member, School of Historical Studies and School of Social Science, IAS

School of Mathematics

Intersection Homology: "Morse theory for stratified spaces"
Guest Lecturer: M. Goresky, Northeastern University

Moduli Problems: "Rationality of some moduli spaces for curves"
Fabrizio M. E. Catanese, University of Pisa; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "Invariants of the billiard ball map"
Shahla Marvizi, Massachusetts Institute of Technology; Visiting Member, School of Historical Studies, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Gauge invariant effective actions, and induced gravitation with a quantized metric"
Stephen L. Adler, Professor, School of Natural Sciences, IAS

School of Social Science

Seminar: "Bringing social structure back in: the sociology of labor markets"
Mark S. Granovetter, State University of New York at Stony Brook; Visiting Member, School of Social Science, IAS

December 11

School of Mathematics

Algebraic Geometry: "Rational double points and factorization in dimension 3"
Henry Pinkham, Columbia University; Visitor, School of Mathematics, IAS

Cycles and K-Theory: "Vector bundles on cones"
Guest Lecturer: V. Srinivas, University of Chicago

School of Natural Sciences

Theoretical Physics Seminar: "Multiplicity of Hadrons in QCD jets"
Al Mueller, Columbia University

December 14

School of Mathematics

Special Lecture: "Weyl Groups and Cremona transformations"
Guest Lecturer: Igor Dolgachev, University of Michigan

Introduction to Crystalline Cohomology: "Connections" (continued)
Amassa Fauntleroy, University of Illinois; Visitor, School of Mathematics, IAS

Members Seminar: "Additive functions and special sets of integers (number theory)"
Krishnaswami Alladi, University of Michigan; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Problems in the semiclassical approximation"
Alain Rouet, CNRS, Marseille, France; Visiting Member, School of Natural Sciences, IAS

December 15

School of Mathematics

Special Lecture: "Petri's conjecture" (continued)
David Gieseker, University of California at Los Angeles; Visiting Member, School of Mathematics, IAS

Special Lecture: "Alexander invariants for plane algebraic curves"
Guest Lecturer: Anatoly S. Libgober, University of Illinois at Chicago Circle

Special Lecture: "Effective results of irrationality for a class of algebraic numbers"
Enrico Bombieri, Professor, School of Mathematics, IAS

December 16

School of Historical Studies

Colloquium in Classical Studies: "The Ptolemaic nobility:

leading families and their role in the public life of Hellenistic Egypt"
Leon Mooren, University of Leuven; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Lecture Series: "Curves of genus 1 from Diophantus to Mordell" (continued)
André Weil, Professor Emeritus, School of Mathematics, IAS

Special Lecture: "Canonical classes in p-adic cohomology"
Richard E. Sot, University of Rochester; Visiting Member, School of Mathematics, IAS

Differential Geometry: "Finite propagation speed and kernel estimates"
Guest Lecturer: J. Cheeger, State University of New York at Stony Brook

School of Natural Sciences

Theoretical Physics Seminar: "The peace movement in Europe"
Guest Lecturer: Amelia Rechel-Cohn, Harvard University

December 17
School of Mathematics

Intersection Homology: "Perverse sheaves"
Pierre Deligne, Institut des Hautes Etudes Scientifiques; Visitor, School of Mathematics, IAS

Topology: "Poincaré's theorem on fundamental domains"
Guest Lecturer: David B. A. Epstein, University of Warwick

Moduli Problems: "Stability of local rings"
Guest Lecturer: Jayant Shah, Northeastern University

Special Lecture: "Hodge theory of complex cones"
Guest Lecturer: J. Cheeger, State University of New York at Stony Brook

Partial Differential Equations: "Airy functions"
Guest Lecturer: Mark Farris, Princeton University

School of Social Science

Seminar: "Faith in and disillusionment with economic 'fine tuning': some recent contributions of 'ants, spiders, and bees' "
Mark Perlman, University of Pittsburgh; Visiting Member, School of Social Science, IAS

December 18
School of Mathematics

Transcendental Topics in Algebraic Geometry: "Torelli for K3 surfaces"
R. Friedman, Columbia University, and
"Torelli for Pryms and nets of quadrics"
Guest Lecturer: Roy Smith, University of Georgia

Algebraic Geometry: "Rational double points and factorization in dimension 3" (continued)

Henry Pinkham, Columbia University; Visitor, School of Mathematics, IAS

January 6

School of Mathematics

Classical Relativity: "A twistor description on non self-dual gravitational fields"
P. Yaskin, University of California at Berkeley

January 7

School of Mathematics

Intersection Homology: "Perverse sheaves" (continued)
Pierre Deligne, Institut des Hautes Etudes Scientifiques; Visitor, School of Mathematics, IAS

Moduli Problems: "Higher order variational theory of linear systems on curves"
Guest Lecturer: Mark L. Green, University of California at Los Angeles; and
"Linear systems of quadrics and isometric embeddings of Riemannian manifolds"
Phillip A. Griffiths, Harvard University; Visitor, School of Mathematics, IAS

January 8

School of Mathematics

Transcendental Topics in Algebraic Geometry: "The infinitesimal Torelli problem and counterexamples arising from special surfaces"
Fabrizio M. E. Catanese, University of Pisa; Visiting Member, School of Mathematics, IAS; and
"Infinitesimal variations of Hodge structure and global Torelli questions"
Phillip A. Griffiths, Harvard University; Visitor, School of Mathematics, IAS

January 11

School of Mathematics

Members Seminar: "Classification of hypersurface singularities by their moduli algebras"
Stephen S.-T. Yau, University of Illinois at Chicago; Visiting Member, School of Mathematics, IAS

January 12

School of Mathematics

Diophantine Approximation: "Lemmas of Gauss, Roth, and Dyson"
Enrico Bombieri, Professor, School of Mathematics, IAS

January 13

School of Mathematics

Differential Geometry: "Riemannian manifolds with bounded curvature ratios"
Ernst A. Ruh, University of Bonn; Visiting Member, School of Mathematics, IAS

Classical Relativity: "Global behavior of solutions of nonlinear scalar wave equations"
Guest Lecturer: D. Christodoulou, Max Planck Institute, Munich, and Courant Institute

January 14

School of Historical Studies

Art History Colloquia: "The palace chapel of King Roger II of Sicily and its mosaics"
Ernst Kitzinger, Harvard University; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Intersection Homology: "Perverse sheaves" (continued)
Pierre Deligne, Institut des Hautes Etudes Scientifiques; Visitor, School of Mathematics, IAS

School of Social Science

Seminar: "The proprietorship of Allah: the struggle over land in revolutionary Iran"
Shaul Bakhash, Princeton University; Visiting Member, School of Social Science, IAS

January 15

School of Mathematics

Cycles and K-Theory: "Excess intersection of hypersurfaces"
Robert K. Lazarsfeld, Brown University; Visiting Member, School of Mathematics, IAS

Algebraic Geometry: "Example of a simply-connected surface of general type with $p_g = 0$"
Guest Lecturer: Richard L. Barlow, University of Warwick

January 18

School of Mathematics

Members Seminar: "Surfaces with a hyperelliptic hyperplane section"
Lawrence M.-H. Ein, University of California at Berkeley; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Explicit representation of hidden symmetry"
Yong-Shi Wu, Academia Sinica; Visiting Member, School of Natural Sciences, IAS

January 19

School of Historical Studies
School of Social Science

Andrew W. Mellon Foundation Program: "Nationality in eastern Europe: perception and definition before 1848"
Robert J. W. Evans, Brasenose College; Visiting Member, School of Historical Studies

School of Mathematics

Diophantine Approximation: "Enflo's inequality and other stories"
Enrico Bombieri, Professor, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Properties of gravity with a cosmological constant"
Guest Lecturer: Larry Abbott, Brandeis University

January 20

School of Historical Studies

Colloquium in Classical Studies: "Deme and polis: local government and central government in classical Athens"

David Whitehead, University of Manchester; Visiting Member, School of Historical Studies, IAS

January 21

School of Mathematics

Intersection Homology: "Perversity and purity"
Pierre Deligne, Institut des Hautes Etudes Scientifiques; Visitor, School of Mathematics, IAS

Abelian Varieties: "Introduction to the algebraic 'theta functions' plus organization"
George A. Kempf, The Johns Hopkins University; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "Microlocalization of subelliptic estimates"
Guest Lecturer: Joseph J. Kohn, Princeton University

School of Social Science

Seminar: "Theories of meaning"
Charles Taylor, McGill University; Visiting Member, School of Social Science, IAS

January 22

School of Mathematics

Transcendental Topics in Algebraic Geometry: "Intermediate Jacobians and normal functions"
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS; and
"Infinitesimal invariant of normal functions"
Phillip A. Griffiths, Harvard University; Visitor, School of Mathematics, IAS

Algebraic Geometry: "Symmetric curves and surfaces with maximal Picard number"
Ulf Persson, Mittag-Leffler Institut; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Monte Carlo computation in non-compact QCD_4"
Guest Lecturer: I. O. Stamatescu, Max-Planck Institut

January 25

School of Mathematics

Members Seminar: "Langlands' conjecture on conjugates of Shimura varieties"
James S. Milne, University of Michigan; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "An effective action approach to spin potentials for heavy quark systems"
John R. Hiller, University of Maryland; Visiting Member, School of Natural Sciences, IAS

January 26

School of Mathematics

Special Lecture: "Localization of modules of reductive Lie algebras"
Guest Lecturer: I. N. Bernstein, University of Maryland

Diophantine Approximation: "Effective approximations to algebraic numbers and proofs of theorems"
Enrico Bombieri, Professor, School of Mathematics, IAS

January 27

School of Mathematics

Differential Geometry: "Boundedness properties of complete minimal surfaces in R^3"
Frederico Xavier, Federal University of Pernambuco, Brazil; Visiting Member, School of Mathematics, IAS

Classical Relativity: "Asymptotic structure of spacetime"
Guest Lecturer: A. Ashtekar, Syracuse University

January 28

School of Mathematics

Intersection Homology: "Perversity and purity" (continued)
Pierre Deligne, Institut des Hauts Etudes Scientifiques; Visitor, School of Mathematics, IAS

Topology: "Flat bundles and residues for foliations"
James L. Heitsch, University of Illinois; Visiting Member, School of Mathematics, IAS

Abelian Varieties: "Formal groups"
Iacopo Barsotti, University of Padua; Visiting Member, School of Mathematics, IAS

Special Lecture: "The Kazhdan-Lusztig conjecture"
Guest Lecturer: I. N. Bernstein, University of Maryland

Partial Differential Equations: "Hilbert integrals and boundary value problems"
Guest Lecturer: Elias M. Stein, Princeton University

School of Social Science

Seminar: "The Chinese Revolution in historical perspective"
John Schrecker, Brandeis University; Visiting Member, School of Social Science, IAS

January 29

School of Mathematics

Cycles and K-Theory: "Algebraic cycles and special values of Hasse-Weil L-series and Einstein-Kronecker-Lerch series"
Spencer J. Bloch, University of Chicago; Visiting Member, School of Mathematics, IAS

Special Lecture: "Some precise connections between polar invariants and some roots of the Bernstein-Sato polynomial"
Guest Lecturer: B. Lichtin, Villanova University

School of Natural Sciences

Theoretical Physics Seminar: "High precision tests of QED and related topics"
Guest Lecturer: T. Kinoshita, Cornell University

February 1

School of Mathematics

Members Seminar: "The unitary spectrum for real rank one simple Lie groups"

	Maria Welleda Baldoni-Silva, University of Trent; Visiting Member, School of Mathematics, IAS
February 2	
School of Mathematics	P-Adic Cohomology: "Dwork's theory and an application to Picard's F_1-function" Guest Lecturer: F. Baldassarri, Padua and Princeton University
February 3	
School of Historical Studies School of Social Science	Andrew W. Mellon Foundation Program: "Local knowledge: fact and law in comparative perspective" Clifford Geertz, Professor, School of Social Science, IAS
School of Mathematics	Differential Geometry: "A new inequality for surfaces of general type" Richard Klotz, Stanford University; Assistant, School of Mathematics, IAS
	Classical Relativity: "Supersymmetry and Morse theory" Guest Lecturer: E. Witten, Princeton University
School of Natural Sciences	Arms Control Seminar: "The SALT negotiations: history and prospects" Guest Lecturer: Paul C. Warnke, Former Chief SALT Negotiator
February 4	
School of Historical Studies	Art History Colloquia: "Nuovi campi d'indagine per l'influenza della cultura classica sull'arte italiana" Carlo Del Bravo, University of Florence; Visiting Member, School of Historical Studies, IAS
School of Mathematics	Topology: "Iteration of analytic functions" Guest Lecturer: D. Sullivan, City University of New York
	Abelian Varieties: "Formal groups" (continued) Iacopo Barsotti, University of Padua; Visiting Member, School of Mathematics, IAS
	Partial Differential Equations: "Non smooth pseudodifferential operators and nonlinear propagation of singularities" Guest Lecturer: R. Michael Beals, Rutgers University
School of Social Science	Seminar: "Symmetry and soporifics: a critique of feminist accounts of gender development" Jean Bethke Elshtain, University of Massachusetts; Visiting Member, School of Social Science, IAS
February 5	
School of Mathematics	Transcendental Topics in Algebraic Geometry: "Generic Torelli for hypersurfaces"

Ron Donagi, University of Utah; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Initial state interactions, factorization, and the Drell-Yan process"
G. Peter Lepage, Cornell University; Visiting Member, School of Natural Sciences, IAS

February 8

School of Mathematics

Members Seminar: "Multiplicity one theorem for GSp(k,2n)"
Mina Teicher, Tel Aviv University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "An accessible heavy neutral Lepton?"
Chao-hsi Chang, Academica Sinica; School of Natural Sciences, IAS

February 9

School of Mathematics

Diophantine Approximation: "Effective approximations to algebraic numbers and proofs of theorems" (continued)
Enrico Bombieri, Professor, School of Mathematics, IAS

February 10

School of Historical Studies

Colloquium in Classical Studies: "The development of the Tetrarchy"
Frank J. Kolb, University of Kiel; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Differential Geometry: "L^2 cohomology of negatively curved manifolds"
Harold Donnelly, Purdue University; Visiting Member, School of Mathematics, IAS

February 11

School of Mathematics

Intersection Homology: "L_2 cohomology"
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS

Special Lecture: "Milnor fibers of smoothings of surface singularities"
Guest Lecturer: J. Wahl, University of North Carolina, Chapel Hill

Abelian Varieties: "Polarized families of abelian varieties"
Laurent Moret-Bailly, University of Paris-Sud; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "Solvability of left invariant differential operators on the Heisenberg group"
Guest Lecturer: Lawrence J. Corwin, Rutgers University

School of Social Science

Seminar: "Legitimation by consent: the historical roots of a political theory"

	Francis C. Oakley, Williams College; Visiting Member, School of Historical Studies, IAS
February 12	
School of Mathematics	Cycles and K-Theory: "Riemann-Roch revisited" William Fulton, Brown University; Visiting Member, School of Mathematics, IAS; and Guest Lecturer: H. Gillet, Princeton University
	Algebraic Geometry: "Surfaces of general type with vector fields" Guest Lecturer: William E. Lang, Massachusetts Institute of Technology
	Differential Geometry: "L^2 cohomology of negatively curved manifolds" Harold Donnelly, Purdue University; Visiting Member, School of Mathematics, IAS
February 15	
School of Mathematics	Members Seminar: "Branched coverings over complex manifolds" Shi-shyr Roan, Tsing Hua University; Visiting Member, School of Mathematics, IAS
School of Natural Sciences	Theoretical Physics Seminar: "Borel summability of the 1/N expansion" Vincent Rivasseau, Ecole Polytechnique; Visiting Member, School of Natural Sciences, IAS
February 16	
School of Historical Studies School of Social Science	Andrew W. Mellon Foundation Program: "The palace chapel of King Roger II of Sicily and its mosaics" Ernst Kitzinger, Harvard University; Visiting Member, School of Historical Studies, IAS
School of Mathematics	Cohomology of Algebraic Varieties: "Ample divisors and applications" Lucian Badescu, INCREST, Bucharest, Rumania; Visiting Member, School of Mathematics, IAS
	Diophantine Approximation: "Effective approximations in the field $K = k(\xi^{1/r})$" Enrico Bombieri, Professor, School of Mathematics, IAS
Concert	Da Ming Zhu, pianist
February 17	
School of Mathematics	Differential Geometry, I: "Variational problems connected with Monge-Ampère equations" Guest Lecturer: Ilya Bakelman, Texas A & M University

Differential Geometry, II: "Existence theorems of the elliptic Monge-Ampère equations with given asymptotic cone as the normal image of solutions"
Guest Lecturer: Ilya Bakelman, Texas A & M University

February 17-18

School of Mathematics

Meeting of the International Committee on Mathematical Instruction
Hassler Whitney, Professor Emeritus, School of Mathematics, IAS

February 18

School of Mathematics

Intersection Homology: "L_2 cohomology (continued): conical metrics"
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS

Topology: "Harmonic volumes and iterated integrals"
Bruno Harris, Brown University; Visitor, School of Mathematics, IAS

Abelian Varieties: "Polarized families of Abelian varieties" (continued)
Laurent Moret-Bailly, University of Paris-Sud; Visiting Member, School of Mathematics, IAS

K3 Surfaces and Quadratic Forms: "Singular K3 surfaces (after Shioda and Inose)"
Henry P. Miranda, University of Chicago; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "Boundary regularity of proper holomorphic mappings"
Guest Lecturer: Steven R. Bell, Princeton University

School of Social Science

Seminar: "Economists (re)discover morality: recent work on the relation between ethics and efficiency"
Michael S. McPherson, Williams College; Visiting Member, School of Social Science, IAS

February 19

School of Mathematics

Cycles and K-Theory: "Numerical positivity of ample vector bundles"
Robert K. Lazarsfeld, Brown University; Visiting Member, School of Mathematics, IAS

Algebraic Geometry: "Uniruledness of the moduli space of curves of genus eleven (with Mukai)"
Shigefumi Mori, Harvard University; Visiting Member, School of Mathematics, IAS

February 22

School of Mathematics

Lecture Series: "Thomas-Fermi theory"
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

Members Seminar: "Minimal surface forms"
Frederick J. Almgren, Jr., Princeton University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Supersymmetric extension of the standard model"
Chiara Nappi, Harvard University; Visiting Member, School of Natural Sciences, IAS

February 23

School of Mathematics

P-Adic Cohomology: "Equality of Euler-characteristic $\chi = \chi_c$ in étale cohomology"
Guest Lecturer: G. Laumon, University of Paris-Sud, Orsay

Cohomology of Algebraic Varieties: "Branched coverings of projective space"
Robert K. Lazarsfeld, Brown University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Iterative maps and their phase transitions"
Shau-Jin Chang, University of Illinois at Urbana-Champaign; Visiting Member, School of Natural Sciences, IAS

February 24

School of Mathematics

Lecture Series: "Thomas-Fermi theory" (continued)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

Differential Geometry: "Harmonic maps and measure foliations"
Guest Lecturer: Barbara L. Tabak, Brown University

School of Historical Studies

Colloquium in Classical Studies: "Philosophical biography and dialogue: some new fragments from Oxyrhynchus"
David N. Sedley, Christ's College, University of Cambridge; Visiting Member, School of Historical Studies, IAS

February 25

School of Mathematics

Intersection Homology: "L_2 cohomology: conical metrics" (continued)
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS

Abelian Varieties: "Polarized families of abelian varieties" (continued)
Laurent Moret-Bailly, University of Paris-Sud; Visiting Member, School of Mathematics, IAS

K3 Surfaces and Quadratic Forms: "Nikulin's work on K3 lattices"
Guest Lecturer: David Morrison, Princeton University

Partial Differential Equations: "Finite dimensional approximation of bifurcation problems"
Guest Lecturer: G. Raugel, CNRS, France

School of Social Science

Seminar: "World renunciation and monastic landlordism in colonial Sri Lanka"
Steven E. G. Kemper, Bates College; Visiting Member, School of Social Science, IAS

February 26

School of Mathematics

Algebraic Geometry: "Geometric applications of the de Rham-Witt complex"
Guest Lecturer: L. Illusie, University of Paris-Sud, Orsay

Special Lecture: "Some infinite dimensional geometries associated with quantum field theory"
Guest Lecturer: Isadore Singer, University of California at Berkeley

School of Natural Sciences

Theoretical Physics Seminar: "Remarks on the mass gap in 2 + 1 dimensional QCD"
Guest Lecturer: Ivan Singer, University of California at Berkeley

March 1

School of Mathematics

Lecture Series: "Thomas-Fermi theory" (continued)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

Members Seminar: "The remainder in the formula for the number of zeros of the Riemann zeta-function in the critical strip"
Amit Ghosh, England and University of Illinois; Visiting Member, School of Mathematics, IAS

March 2

School of Historical Studies
School of Social Science

Andrew W. Mellon Foundation Program: "Exemplary model or great Satan? Random thoughts on Iranian perception of the West"
Shaul Bakhash, Princeton University; Visiting Member, School of Social Science, IAS

School of Mathematics

Cohomology Seminar: "Porteous formula for symmetric and skew-symmetric determinantal varieties"
Loring W. Tu, University of Michigan; Visiting Member, School of Mathematics, IAS

Cohomology of Algebraic Varieties: "Stable vector bundles on projective spaces"
Lawrence M.-H. Ein, Hong Kong and University of California at Berkeley; Visiting Member, School of Mathematics, IAS

Diophantine Approximation: "Some remarks on the continued fraction of algebraic numbers"
Enrico Bombieri, Professor, School of Mathematics, IAS

March 3

School of Mathematics

Lecture Series: "Thomas-Fermi theory" (continued)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

March 4

School of Historical Studies

Art History Colloquia: "Observations on the first illustrations of Tasso's *Gerusalemme Liberata*"
Guest Lecturer: Rensselaer W. Lee, Princeton University

School of Mathematics

Intersection Homology: "L_2 cohomology" (continued)
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS

Moduli Problems, I: "Moment map of symplectic geometry and invariant theory, I"
David B. Mumford, Harvard University; Visitor, School of Mathematics, IAS

Moduli Problems, II: "Moment map of symplectic geometry and invariant theory, II"
Guest Lecturer: L. Ness, University of Washington

Differential Geometry: "Hausdorff dimension of singularities of Navier-Stoke equations"
Guest Lecturer: L. Caffarelli, Courant Institute

Partial Differential Equations: "The uncertainty principle and PDE estimates"
Guest Lecturer: C. Fefferman, Princeton University

School of Social Science

Seminar: "The novelty of Rousseau's discontent with modern men and institutions"
Guest Lecturer: Bernard Yack, Princeton University

March 5

School of Mathematics

Cycles and K-Theory: "Positive intersections"
Robert K. Lazarsfeld, Brown University; Visiting Member, School of Mathematics, IAS

Algebraic Geometry: "Tate conjecture for Hilbert-Blumenthal surfaces"
Michael Rapoport, University of Bonn; Visiting Member, School of Mathematics, IAS

K3 Surfaces and Quadratic Forms: "Stable classes of even lattices"
Henry P. Miranda, University of Chicago; Visiting Member, School of Mathematics, IAS

March 8

School of Mathematics

Members Seminar: "A description of the moduli space of Einstein metrics on K3 surfaces"
Andrey N. Todorov, Bulgaria and Columbia University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Analytical investigations of lattice gauge theories with fermions"
Guest Lecturer: Werner Kerler, Brookhaven National Laboratory and University of Marburg

Concert

Mordecai Shehori, pianist

March 9

School of Mathematics

P-Adic Cohomology: "Bounded Witt vectors"
Saul Lubkin, University of Rochester; Visiting Member, School of Mathematics, IAS

Cohomology of Algebraic Varieties: "Kähler manifolds with trivial canonical bundle"
Arnaud Beauville, Ecole Polytechnique, Palaiseau; Visitor, School of Mathematics, IAS

Diophantine Approximation: "Introduction to Baker's method"
Enrico Bombieri, Professor, School of Mathematics, IAS

March 10

School of Mathematics

Lecture Series: "Thomas-Fermi theory" (continued)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

Classical Relativity: "Conformally covariant equations on differential forms"
Guest Lecturer: Thomas P. Branson, Purdue University

Differential Geometry: "Defect relations for meromorphic functions on C^n"
Guest Lecturer: Bernard Shiffman, Johns Hopkins University

School of Historical Studies

Colloquia in Classical Studies: "Apollo Palatinus und Porticus der Danaiden"
Paul Zanker, University of Munich; Visiting Member, School of Historical Studies, IAS

March 11

School of Mathematics

Intersection Homology: "L_2 cohomology and intersection homology of certain arithmetic varieties"
Armand Borel, Professor, School of Mathematics, IAS

Topology: "The 3-body problem: gravitational scattering and general orbit structure"
Pieter Hut, Astronomical Institute, University of Amsterdam; Visiting Member, School of Natural Sciences, IAS

	Abelian Varieties: "Polarized families of Abelian varieties" (continued) Laurent Moret-Bailly, University of Paris-Sud; Visiting Member, School of Mathematics, IAS
	Partial Differential Equations: "Korteweg-de Vries equations with steplike initial data" Guest Lecturer: Amy Cohen, Rutgers University
School of Social Science	Seminar: "Scheherazade in the women's movement: stories about women and language" Gabriella Rossetti, University of Ferrara; Visitor, School of Social Science, IAS
March 12	
School of Mathematics	Cycles and K-Theory: "A relative algebraic cycle" Spencer J. Bloch, University of Chicago; Visiting Member, School of Mathematics, IAS
	Algebraic Geometry: "Tate conjecture for Hilbert-Blumenthal surfaces" (conclusion) Michael Rapoport, University of Bonn; Visiting Member, School of Mathematics, IAS
	K3 Surfaces and Quadratic Forms: "The p-adic theory for quadratic forms" Guest Lecturer: David Morrison, Princeton University
School of Natural Sciences	Theoretical Physics Seminar: "Exact integrability and Kac-Moody algebras in spin models and Yang-Mills theory" Guest Lecturer: L. Dolan, Rockefeller University
March 15	
School of Mathematics	Lecture Series: "Thomas-Fermi theory" (continued) Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS
	Members Seminar: "A geographical survey of surfaces of general type" Ulf Persson, Mittag-Leffler Institut, Sweden; Visiting Member, School of Mathematics, IAS
March 16	
School of Historical Studies School of Social Science	Andrew W. Mellon Foundation Program: "Vertical inter-cultural perceptions" Irving Lavin, Professor, School of Historical Studies, IAS
School of Mathematics	P-Adic Cohomology: "P-adic cohomology using bounded Witt vectors" Saul Lubkin, University of Rochester; Visiting Member, School of Mathematics, IAS

Moduli Problems: "Special equivalence liaison classes of curves in P^3"
Guest Lecturer: P. Rao, Notre Dame University

March 17

School of Mathematics

Lecture Series: "Thomas-Fermi theory" (continued)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

Special Lecture: "The index of instability of minimal surfaces obtained by variational methods in the large"
Guest Lecturer: J. Pitts, Texas A & M University

Differential Geometry: "Three manifolds with positive Ricci curvature"
Guest Lecturer: R. Hamilton, Cornell University

Partial Differential Equations: "On the gaps of the eigenvalues of the Laplacian with potential"
Stephen S.-T. Yau, University of Illinois at Chicago; Visiting Member, School of Mathematics, IAS

March 18

School of Mathematics

Abelian Varieties: "Polarized families of Abelian varieties" (continued)
Laurent Moret-Bailly, University of Paris-Sud; Visiting Member, School of Mathematics, IAS

Cohomology of Algebraic Varieties: "Theta theory"
Iacopo Barsotti, University of Padua; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "On the gaps of the eigenvalues of the Laplacian with potential"
Stephen S.-T. Yau, University of Illinois at Chicago; Visiting Member, School of Mathematics, IAS

School of Social Science

Seminar: "Biography of a sentence"
Alton L. Becker, University of Michigan; Visiting Member, School of Social Science, IAS

March 19

School of Mathematics

Cycles and K-Theory: "Algebraically nontrivial cycles on Jacobians"
Ron Donagi, University of Utah; Visiting Member, School of Mathematics, IAS

Algebraic Geometry: "Rational and unirational varieties (a survey)"
Arnaud Beauville, Ecole Polytechnique; Visitor, School of Mathematics, IAS

K3 Surfaces and Quadratic Forms: "The existence of even lattices over $\mathbf{Z}$"
Guest Lecturer: David Morrison, Princeton University

March 22

School of Mathematics

Lecture Series: "Thomas-Fermi theory" (continued)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

Members Seminar: "Finite simple groups: revising the classification"
Daniel Gorenstein, Rutgers University; Visiting Member, School of Mathematics, IAS

School of Mathematics
School of Natural Sciences

Relativity and Quantum Gravity Seminar: "Supercooled phase transitions in the very early universe"
Guest Lecturer: Stephen W. Hawking, University of Cambridge

March 23

School of Mathematics

Algebraic Geometry: "The Hodge structure of fibered surfaces"
Steven Zucker, Rutgers and Indiana Universities; Visiting Member, School of Mathematics, IAS

Cohomology of Algebraic Varieties: "Degenerations of surfaces and smoothability of minimally elliptic singularities"
Henry P. Miranda, University of Chicago; Visiting Member, School of Mathematics, IAS

Diophantine Approximation: "Introduction to Baker's method" (continued)
Enrico Bombieri, Professor, School of Mathematics, IAS

School of Mathematics
School of Natural Sciences

Relativity and Quantum Gravity Seminar: "Nontrivial spacetime topology, and its physical effects, I"
Guest Lecturer: Stephen W. Hawking, University of Cambridge

March 24

School of Historical Studies

Colloquium in Classical Studies: "Trials for impiety in Athens: their origins and early history"
Martin Ostwald, Swarthmore College; Visiting Member, School of Historical Studies, IAS

School of Mathematics
School of Natural Sciences

Relativity and Quantum Gravity Seminar: "The positive mass theorem with black holes"
Guest Lecturer: Stephen W. Hawking, University of Cambridge

March 25

School of Mathematics

Intersection Homology: "L^2 cohomology and intersection homology of certain arithmetic varieties" (continued)
Armand Borel, Professor, School of Mathematics, IAS

Topology: "On the KO-part of the Brown-Kervaire invariants for spin-manifolds"
Serge Ochanine, CNRS, Paris, France; Visiting Member, School of Mathematics, IAS

K3 Surfaces and Quadratic Forms: "Kneser's work on uniqueness of quadratic forms"
Henry Pinkham, Columbia University; Visiting Member, School of Mathematics, IAS

Partial Differential Equations: "Analysis of a nonlinear PDE from atomic physics"
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

School of Mathematics
School of Natural Sciences

Relativity and Quantum Gravity Seminar: "Nontrivial space-time topology and its physical effects, II"
Guest Lecturer: Stephen W. Hawking, University of Cambridge

School of Natural Sciences

Theoretical Physics Seminar: "Recent developments concerning the large-N phase transition *and* Non-leading behavior of Wilson and 't Hooft loops"
Guest Lecturer: Stuart Samuel, Columbia University

School of Social Science

Seminar: "Why the dog doesn't bark: beliefs of the American poor about distributive justice"
Guest Lecturer: Jennifer Hochschild, Princeton University

March 26
School of Mathematics

Hermann Weyl Lecture Series: "Intersection homology"
Guest Lecturer: R. D. MacPherson, Brown University

K3 Surfaces and Quadratic Forms: "Kneser's work on uniqueness of quadratic forms"
Henry Pinkham, Columbia University; Visitor, School of Mathematics, IAS

March 29
School of Mathematics

Hermann Weyl Lecture Series: "Intersection homology"
Guest Lecturer: R. D. MacPherson, Brown University

March 30
School of Mathematics

Algebraic Varieties: "On moduli of surfaces of general type"
Fabrizio M. E. Catanese, University of Pisa; Visiting Member, School of Mathematics, IAS

Diophantine Approximation: "Baker's method: the rational case"
Enrico Bombieri, Professor, School of Mathematics, IAS

Classical Relativity: "Global existence theorems for classical gauge theories . . . and gravity?"
Guest Lecturer: D. Eardley, Harvard University

March 31
School of Mathematics

Lecture Series: "Thomas-Fermi theory" (concluded)
Elliott H. Lieb, Princeton University; Visiting Member, School of Mathematics, IAS

School of Natural Sciences

Theoretical Physics Seminar: "Polyacetylene"
Guest Lecturer: David Campbell, Los Alamos

April 1

School of Historical Studies

Art History Colloquia: "The many faces of Augustus"
Paul Zanker, University of Munich; Visiting Member, School of Historical Studies, IAS

School of Mathematics

Intersection Homology: "Cohomology of Hilbert-Blumenthal varieties and applications"
Guest Lecturer: J-L. Brylinski, Ecole Polytechnique, Palaiseau

Topology: "Universal links"
Guest Lecturer: William Thurston, Princeton University

Algebraic Geometry: "Enumerative geometry of curves"
Guest Lecturer: J. Harris, Brown University

Special Lecture: "Iteration of quadratic polynomials in the complex plane"
Guest Lecturer: A. Douady, University of Paris

School of Social Science

Seminar: "Latin American industrialization in the great depression: the Mexican experience"
Enrique Cárdenas, Yale University; Assistant, School of Social Science, IAS

April 2

School of Mathematics

Cycles and K-Theory: "Geometry of cuspidal curves"
Guest Lecturer: J. Harris, Brown University

Hermann Weyl Lecture Series: "Intersection homology"
Guest Lecturer: R. D. MacPherson, Brown University

April 5

School of Natural Sciences

Theoretical Physics Seminar: "Towards an analytic demonstration of permanent linear confinement"
Guest Lecturer: T. Tomboulis, Princeton University

April 6

School of Mathematics

Algebraic Geometry: "Towards extending the scope of Hodge theory with the help of holonomic systems"
Guest Lecturer: J-L. Brylinski, Ecole Polytechnique, Palaiseau

April 8

School of Mathematics

Topology: "Complex bordism of $B(Z^p)^n$: a short proof of the Conner-Floyd conjecture"
Guest Lecturer: S. Mitchell, Massachusetts Institute of Technology

Partial Differential Equations: "Some thoughts on the meaning of integrability"
Guest Lecturer: M. Kruskal, Princeton University

School of Natural Sciences

Theoretical Physics Seminar: "Monte Carlo evidence for long-range chiral structure in QCD"
Guest Lecturer: Tony Duncan, University of Pittsburgh

School of Social Science

Seminar: "The possibility of reasoning about the human good"
Marc Stier, Harvard University; Assistant, School of Social Science, IAS

April 11-12
School of Historical Studies

Commemorative Colloquium: "Gianlorenzo Bernini (1598-1680)" (made possible by a grant from the National Endowment for the Humanities)
Sponsor: Irving Lavin, Professor, School of Historical Studies, IAS

April 13
School of Mathematics

Algebraic Varieties: "Hilbert modular varieties"
Guest Lecturer: E. Thomas, University of California at Berkeley

Diophantine Approximation: "Baker's method: the rational case" (continued)
Enrico Bombieri, Professor, School of Mathematics, IAS

April 15
School of Mathematics

Special Lecture: "Fractal aspects of the interation $z \rightarrow z^2 - \mu$"
Guest Lecturer: B. Mandelbrot, IBM, Yorktown Heights

Partial Differential Equations: "On the general theory of quantization: a survey"
Guest Lecturer: A. Unterberger, University of Reims

School of Social Science

Seminar: "Race, gender, and equality"
Philip Green, Smith College; Visiting Member, School of Social Science, IAS

April 16
School of Mathematics

Algebraic Geometry: "Riemann-Roch and error correcting codes, I"
Guest Lecturer: I. N. Patterson, Institute for Defense Analyses; and
"Riemann-Roch and error correcting codes, II"
Guest Lecturer: D. Lieberman, Institute for Defense Analyses

April 19
School of Natural Sciences

Theoretical Physics Seminar: "Progress at large N_c"
Herbert Neuberger, University of California at Berkeley; Visiting Member, School of Natural Sciences, IAS

April 19-20
School of Historical Studies
School of Social Science

Colloquium: "The identity of colonial elites" (made possible by a grant from The Andrew W. Mellon Foundation)

April 20	
School of Mathematics	Special Lecture: "Cohomology and L^2-cohomology" Guest Lecturer: W. Casselman, University of British Columbia
April 22	
School of Mathematics	Partial Differential Equations: "Non-uniqueness of the Cauchy problem" Guest Lecturer: S. Alinhac, Courant Institute
	Special Lecture: "Cohomology and L^2-cohomology" Guest Lecturer: W. Casselman, University of British Columbia
School of Social Science	Seminar: "Toward a liberal foreign policy" Marshall Cohen, City University of New York; Visiting Member, School of Social Science, IAS
April 23	
School of Mathematics	Quadratic Forms: "Finite groups of automorphisms of K3 surfaces" Guest Lecturer: David Morrison, Princeton University
School of Natural Sciences	Theoretical Physics: "QCD on a random lattice" Guest Lecturer: Norman Christ, Columbia University
April 24-26	
Colloquium	"French and American perceptions of the Maghreb" (sponsored by Princeton University, Department of Near Eastern Studies and CNRS)
April 27	
School of Mathematics	Partial Differential Equations: "Pseudo-differential calculus on manifolds with filtrations" Guest Lecturer: A. Melin, University of Lund and Purdue University
April 29	
School of Mathematics	Topology: "Survey of Bott periodicity in algebraic K-theory" Guest Lecturer: V. Snaith, University of Western Ontario
School of Social Science	Seminar: "Models of communication" Daniel A. Sperber, Paris, France; Visiting Member, School of Social Science, IAS
April 30	
School of Mathematics	K3 Surfaces and Quadratic Forms: "Good embeddings of $T_{p,q,r}$ lattices" Henry P. Miranda, University of Chicago; Visiting Member, School of Mathematics, IAS
May 3	
School of Natural Sciences	Theoretical Physics Seminar: "Analytical results for mixed action SU(2) lattice gauge theory"

Urs M. Heller, Rutgers University; Visiting Member, School of Natural Sciences, IAS

May 6
School of Social Science

Seminar: "Marx and Menger in the mountains: ritual and economic meanings in highlands Java"
Robert Hefner, University of Michigan; Assistant, School of Social Science, IAS

May 7
School of Natural Sciences

Theoretical Physics Seminar: "A quenched momentum prescription for large N theories"
Guest Lecturer: David Gross, Princeton University

May 11
School of Natural Sciences

Theoretical Physics Seminar: "The effect of noise on the quasi-periodicity transition"
Guest Lecturer: Mitch Feigenbaum, Los Alamos

May 12
School of Natural Sciences

Theoretical Physics Seminar: "Translation invariance and a reduced model for summing planar diagrams"
Guest Lecturer: Spenta Wadia, University of Chicago

May 13
School of Social Science

Seminar: "Making a living in a bankrupt bureaucracy"
Carter V. Findley, Ohio State University; Visiting Member, School of Historical Studies, IAS

May 17
School of Natural Sciences

Theoretical Physics Seminar: "Baryon asymmetry and the scale of supersymmetry breaking"
Guest Lecturer: Howard Haber, University of Pennsylvania

May 18
School of Natural Sciences

Theoretical Physics Seminar: "Finite particle number relativistic quantum mechanics"
Guest Lecturer: H. Pierre Noyes, Stanford Linear Accelerator Center

May 20
School of Social Science

Seminar: "Politics, language, and literary choice"
Steven N. Zwicker, Washington University; Visiting Member, School of Historical Studies, IAS

May 20-21

AMIAS (Association of Members of the Institute for Advanced Study) Annual Meeting

May 21
School of Mathematics

Topology: "Semifree actions on R^n"
Guest Lecturer: I. Hambleton, McMaster University

School of Natural Sciences

Theoretical Physics Seminar: "The order parameters of QCD"
Guest Lecturer: Michael Scadron, University of Arizona at Tucson

June 1

School of Natural Sciences — Theoretical Physics Seminar: "Baryon number violation in the presence of monopoles"
Guest Lecturer: Curt Callan, Princeton University

June 3-4

School of Natural Sciences — Conference on High Velocity Winds and Molecular Clouds
Guest Lecturers: B. Draine and J. Giuliani

June 4

School of Natural Sciences — Theoretical Physics Seminar: "Vacuum energy in bag models"
Guest Lecturer: Philip Candelas, University of Texas at Austin

June 7

School of Mathematics
School of Natural Sciences — Theoretical Physics Seminar: "The origin of galaxies in the inflationary universe"
Guest Lecturer: Stephen W. Hawking, University of Cambridge

June 11

School of Natural Sciences — Theoretical Physics Seminar: "CP(n) models in the semi-classical approximation"
Adrian Patrascioiu, University of Arizona; Visiting Member, School of Natural Sciences, IAS

June 14

School of Mathematics — Algebraic Geometry: "Picard groups of Zariski surfaces"
Piotr Blass, University of Pennsylvania; Visitor, School of Mathematics, IAS

School of Natural Sciences — Theoretical Physics Seminar: "Numerical study of a system with two degrees of freedom"
Alain Rouet, CNRS, Marseille, France; Visiting Member, School of Natural Sciences, IAS

June 17

School of Mathematics — Algebraic Geometry: "Picard groups of Zariski surfaces"
Piotr Blass, University of Pennsylvania; Visitor, School of Mathematics, IAS

June 20-26

School of Social Science — Conference: "Southeast Asian languages and literatures"
Conveners: Alton L. Becker, University of Michigan; Visiting Member, School of Social Science, IAS and Clifford Geertz, Professor, School of Social Science, IAS (made possible by a grant from the Social Science Research Council)

June 21

School of Natural Sciences — Theoretical Physics Seminar: "The inflationary universe—with gravity and without fine tuning"
Emil Mottola, Columbia University; Visiting Member, School of Natural Sciences, IAS

June 21-23
Conference

Alfred P. Sloan Foundation Workshop to establish a videotaped archive of the principal persons involved in the decisions connected with nuclear weaponry
Chairman: McGeorge Bundy, New York University

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

October 13
Lecture Series: "The Lords of Petra"
Glen W. Bowersock, Professor, School of Historical Studies, IAS

November 10
Lecture Series: "Elopement in Greek Mythology: Helen of Troy"
Guest Lecturer: Lily Kahil, University of Fribourg, and Fellow of the Humanities, Princeton University

December 8
Lecture Series: "The Rotunda of Arsinoë in Samothrace"
Guest Lecturer: James R. McCredie, Institute of Fine Arts, New York University

February 9
Lecture Series: "Highlights of Archaeology in Jordan"
Guest Lecturer: James A. Sauer, University of Pennsylvania

March 17
Lecture Series: "Secular Mosaic Decoration in Norman Sicily"
Ernst Kitzinger, Harvard University; Visiting Member, School of Historical Studies, IAS

April 13
Lecture Series: "New Excavations at the Athenian Agora"
Guest Lecturer: Professor T. Leslie Shear, Princeton University

Report of the Treasurer

The market value of the Institute's endowment totaled $88,149,776 on June 30, 1982.

During the fiscal year, total operating expenditures were $9,277,014. After applying $2,363,182 in operating fund gifts and grants against these expenditures, the Institute was required to provide $6,913,832 from endowment resources. This represents approximately 7.4 percent of the average of the endowment market values at June 30, 1982 and June 30, 1981, as compared to 7.0 percent of the comparable endowment totals for fiscal year 1981.

The performance of the Institute's portfolio is measured annually by Hamilton, Johnston & Co., Inc. Over the eight year period ending June 30, 1982, dividend and interest income and net realized and unrealized gains combined for a total average annual compound rate of return on Institute investments of 15.4 percent. Over the past five years, the average annual compound rate of return was 15.2 percent. For fiscal 1982, the annual rate of return was −3.1 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, 1982, follow this report.

Ralph E. Hansmann
Treasurer

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

Deloitte
Haskins + Sells

111 Madison Avenue
Post Office Box 2086
Morristown, New Jersey 07960
(201) 540-0940
TWX. 710-986-7462

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

September 29, 1982

Dear Sirs:

We have examined the financial statements of the Institute for Advanced Study - Louis Bamberger and Mrs. Felix Fuld Foundation as of June 30, 1982 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, 1982 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

Exhibit A

Balance Sheet, June 30, 1982

ASSETS	
Operating Funds:	
Cash	$ 449,499
Accounts and notes receivable	73,881
Government receivable	192,502
Specific purpose funds receivable	195,025
Marketable securities, at cost	45,807
Accrued income on investments	865,392
Deferred charges	123,483
Total operating funds	$ 1,945,589
Plant Funds:	
Cash	$ 17,133
Debt service fund deposits	426,864
Accrued income on investments	72,243
Marketable securities, at cost which approximates market	2,688,280
Unamortized debt expense	90,107
Land, buildings and improvements, equipment and library books (including rare book collection) at cost, less accumulated depreciation of $7,713,843 (Notes C and D)	13,498,795
Total plant funds	$16,793,422
Endowment and Similar Funds: (Note B)	
Cash	$ 623,291
Marketable securities, at cost (Note D)	95,441,866
Mortgages and notes receivable	1,239,985
Total endowment and similar funds	$97,305,142
LIABILITIES AND FUND BALANCES	
Operating Funds:	
Accounts payable, accrued expenses, etc.	$ 244,162
Deferred restricted revenue (Note G)	189,471
Fund balance (Exhibit B)—unrestricted	1,511,956
Total operating funds	$ 1,945,589
Plant Funds:	
Interest payable (Note D)	$ 326,864
Bonds payable (Note D)	9,167,431
Notes payable	62,756
Plant funds balance (Exhibit B)	7,236,371
Total plant funds	$16,793,422
Endowment and Similar Funds:	
Investment accounts payable	$ 747,095
Fund balances (Exhibit B):	
Endowment funds	23,831,886
Quasi-endowment funds	72,726,161
Total endowment and similar funds	$97,305,142

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

ouis Bamberger and Mrs. Felix Fuld Foundation

Exhibit B

atement of Support and Revenue, Expenses, Capital Additions, and hanges in Fund Balances for the Year Ended June 30, 1982

	Operating Funds			Plant	Endowment and	Total
	Unrestricted	*Restricted*	*Total*	*Funds*	*Similar Funds*	*All Funds*
ıpport and Revenue:						
Endowment income (net of management fees)	$6,558,048	$1,639,218	$ 8,197,266			$ 8,197,266
Contributions	379,490	1,641,256	2,020,746			2,020,746
Government contracts	107,668	234,768	342,436			342,436
Total support and revenue	7,045,206	3,515,242	10,560,448			10,560,448
penses:						
School of Mathematics	1,070,950	814,835	1,885,785	$127,264		2,013,049
School of Natural Sciences	955,673	598,086	1,553,759	78,101		1,631,860
School of Historical Studies	1,256,225	391,843	1,648,068	175,140		1,823,208
School of Social Science	52,807	850,866	903,673	53,002		956,675
Library	777,151	930	778,081	54,606		832,687
Director's Special Purpose Fund	11,561	81,465	93,026	2,605		95,631
Administration and General	1,565,761	26,268	1,592,029	87,163		1,679,192
Auxiliary Activity — tenants' housing expenses net of $57,228 of revenue	154,130	56,390	210,520	34,192		244,712
Total expenses	5,844,258	2,820,683	8,664,941	612,073		9,277,014
Excess (deficiency) of support and revenue over expenses before capital additions	1,200,948	694,559	1,895,507	(612,073)		1,283,434
ıpital Additions:						
Gifts	68,877		68,877	415,488	$2,119,108	2,603,473
Realized net gains on investments				6,200	5,848,555	5,854,755
Investment income				489,428		489,428
Total capital additions	68,877	-0-	68,877	911,116	7,967,663	8,947,656
Excess of support and revenue over expenses after capital additions	1,269,825	694,559	1,964,384	299,043	7,967,663	10,231,090
ınd Balances at Beginning of Year	756,506	-0-	756,506	5,778,478	88,540,300	95,075,284
ansfers:						
Proceeds from disposal of plant facilities	6,200		6,200	(6,200)		
Plant acquisitions and principal debt service payments	(1,165,050)		(1,165,050)	1,165,050		
Portion of quasi-endowment funds appropriated	644,475		644,475		(644,475)	
Transfers to endowment and similar funds		(694,559)	(694,559)		694,559	
ınd Balances at End of Year	$ 1,511,956	$ -0-	$ 1,511,956	$7,236,371	$96,558,047	$105,306,374

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

Louis Bamberger and Mrs. Felix Fuld Foundation

Exhibit C

Statement of Changes in Financial Position
for the Year Ended June 30, 1982

	Operating Funds	*Plant Funds*	*Endowment & Similar Funds*	*Total All Funds*
Resources Provided:				
Excess (deficiency) of support and revenue over expenses before capital additions	$ 1,895,507	$ (612,073)		$ 1,283,434
Capital additions:				
Gifts	68,877	415,488	$ 2,119,108	2,603,473
Realized net gains on investments		6,200	5,848,555	5,854,755
Investment income		489,428		489,428
Excess of support and revenue over expenses after capital additions	1,964,384	299,043	7,967,663	10,231,090
Items not using (providing) resources:				
Provision for depreciation		612,073		612,073
Decrease in unamortized debt service expense		1,185		1,185
(Gain) on disposition of investments - net			(5,848,555)	(5,848,555)
Proceeds from sale of investments			309,550,732	309,550,732
Decrease in marketable securities		116,526		116,526
Increase in notes payable		35,000		35,000
Decrease in receivables			1,083,596	1,083,596
Increase in payables	106,156		511,295	617,451
Increase in deferred restricted revenue	42,719			42,719
Total resources provided	2,113,259	1,063,827	313,264,731	316,441,817
Resources Used:				
Purchases of investments			312,904,996	312,904,996
Purchases of plant facilities and equipment		2,021,143		2,021,143
Increase in accrued income	187,104	72,243		259,347
Increase in deferred charges	21,812			21,812
Decrease in accounts payable		2,790		2,790
Increase in debt service fund deposits		2,210		2,210
Increase in marketable securities	45,807			45,807
Increase in receivables	258,469			258,469
Reduction of bond and note payables		143,046		143,046
Total resources used	513,192	2,241,432	312,904,996	315,659,620
Transfers:				
Proceeds from disposal of plant facilities	6,200	(6,200)		
Plant acquisitions and principal debt service payments	(1,165,050)	1,165,050		
Portion of quasi-endowment funds appropriated	644,475		(644,475)	
Transfers to endowment and similar funds	(694,559)		694,559	
Total transfers	(1,208,934)	1,158,850	50,084	
Increase (decrease) in cash	$ 391,133	$ (18,755)	$ 409,819	$ 782,197

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

Summary of Significant Accounting Policies
June 30, 1982

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.

Other Significant Accounting Policies

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

Notes to Financial Statements
June 30, 1982

A.

The accompanying financial statements are presented in accordance with certain recommendations contained in Statement of Position No. 78-10 of the American Institute of Certified Public Accountants titled, Accounting Principles and Reporting Practices for Certain Nonprofit Organizations.

B.

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

Assets of endowment and similar funds, except nonmarketable investments restricted for the School of Social Science having a carrying value of $2,500,000, are pooled with each individual fund subscribing to or disposing of units on the basis of the market value per unit on a quarterly basis.

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

	Pooled Assets		*Net*	*Market*
	Market Value	*Carrying Value*	*Increase (Decrease)*	*Value Per Unit*
July 1, 1981	$95,756,133	$86,040,327	$ 9,715,806	$4,214
June 30, 1982	82,852,603	92,941,866	(10,089,263)	3,609
Unrealized appreciation (depreciation) for the year ended June 30, 1982			(19,805,069)	
Realized net gain for the year ended June 30, 1982			5,848,555	
Net change for the year ended June 30, 1982			$(13,956,514)	

Earnings per unit, exclusive of realized gains and losses, amounted to $354 for the year ended June 30, 1982.

The pooled marketable securities at June 30, 1982 are comprised of the following:

	Carrying Value	*Market Value*
Cash equivalents	$ 2,779,103	$ 2,779,103
Equity securities	60,352,259	50,498,293
Debt securities	29,810,504	29,575,207
	$92,941,866	$82,852,603

In the opinion of management, there has been no permanent decline in the market value of these securities.

C.

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

A summary of plant assets follows:

Land	1,909,798
Buildings and improvements	16,412,617
Equipment	2,690,715
Library books	199,508
Total	21,212,638
Less accumulated depreciation	7,713,843
Net book value	$13,498,795

D.

A summary of bonds payable follows:

2.75%, 1956—Apartment Bonds	$ 597,000
7.804%, 1980—NJEFA Series A Revenue Bonds	8,680,000
Total	9,277,000
Less unamortized bond discount	109,569
Total bonds payable	$ 9,167,431

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

The bonds are dated July 1, 1980, bear interest at the net average annual rate of 7.804%, are subject to redemption at various prices, and 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 $100,000 matured on July 1, 1982 and bond principal in the amount of $105,000 (1983), $110,000 (1984), $115,000 (1985) and $120,000 (1986) 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, 7.875% due November 15, 1982, 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 $32,000 in 1982, 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, 1982 was $688,832.

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, 1982 amounted to $400,188.

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 $42,538 for the year ended June 30, 1982 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 accountant for the Estate, aggregated $860,327 as of June 30, 1982 and is not included in the accompanying financial statements.

G.

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

	Specific Purpose Funds	*Government Contracts*	*Total*
Balance at beginning of year	$ 107,974	$ 38,779	$ 146,753
Additions:			
Contributions	1,623,878	294,864	1,918,742
Net endowment income	1,639,218		1,639,218
Total additions	3,263,096	294,864	3,557,960
Deductions:			
Funds expended during year	2,585,915	234,768	2,820,683
Transfer to endowment and similar funds	694,559		694,559
Total deductions	3,280,474	234,768	3,515,242
Balance at end of year	$ 90,596	$ 98,875	$ 189,471

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 ($202,288 net of $197,083 in revenues) and Members' Housing ($525,143 net of $554,634 in revenues) have been allocated among the programs and supporting services benefited.

Donors

The Institute for Advanced Study gratefully acknowledges contributions of gifts, grants and pledges in the amount of $3,456,235.93 received between July 1, 1981 and June 30, 1982. 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
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