

# IAS

Institute for Advanced Study

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*It seemed to me that the time was ripe for the creation in America of an institute in the field of general scholarship and science . . . not a graduate school, training men in the known and to some extent in the methods of research, but an institute where everyone—Faculty and Members—took for granted what was known and published, and in their individual ways endeavored to advance the frontiers of knowledge.*

**Abraham Flexner** Founding Director 1930–39  
Memorandum to the Board of Trustees, September 26, 1931

HEVELII  
ASTRONOMIAE  
ET  
FIRMAMENTUM  
SOBIESCIANUM

HEVELII  
ASTRO-  
NOMIA

HEVELIUS: EPISTOLA DE COMETA — 1672

HEVEL  
MACHINA  
DEI

HEVELII  
SELENI  
GRAPHIA

VOYAGE  
DE  
HUMBOLDT  
ET  
BONPLAN

JULIANI  
IMPERATORIS OPERA

PHYSIQUE  
GENERALE  
ET  
RELATION  
HISTORIQUE  
DU VOYAGE

ROBERT  
PHILOSOPHICAL  
EXPERIMENTS

NEWTONI  
PRINCIPIA  
MATHEMATICORUM

# Introduction

*The work of scientists and scholars is a continuing conversation that spans the ages and the globe. Their efforts have produced a body of knowledge of the physical world and of humanity. In many instances, fundamental work at the frontiers of knowledge has led to discoveries that have prompted technological and cultural advances in science and society.*

**W**hile practical benefits often result from pure academic research at the most fundamental level, such benefits are not guaranteed and cannot be predicted; nor need they be seen as the ultimate goal. Ventures into unknown territory inevitably involve an element of risk, and scientists and scholars are rarely motivated by the thought of an end product. Rather, they are moved by a creative curiosity that is the hallmark of academic inquiry.

The Institute for Advanced Study is one of the few institutions in the world where the pursuit of knowledge for its own sake is the ultimate *raison d'être*. Speculative research, the kind that is fundamental to the advancement of human understanding of the world of nature and of humanity, is not a product that can be made to order. Rather, like artistic creativity, it benefits from a special environment. This was the belief to which Abraham Flexner, the founding Director of the Institute, held passionately, and which continues to inspire the Institute today.

The cultivation of ideas in a deliberately contemplative, quiet mode of reflection and intense personal interaction is the Institute's proven strength. While the image of the scholar working in quiet solitude serves to capture the individual effort and concentrated focus involved in the pursuit of knowledge, this image falls short in representing the Institute's intellectual community, that special environment created when young researchers and

*A poem, a symphony, a painting, a mathematical truth, a new scientific fact, all bear in themselves all the justification that universities, colleges, and institutes of research need or require . . .*

**Abraham Flexner** Founding Director 1930–39

**Opposite** Rare books from the Lessing J. Rosenwald Room

# Curiosity

In his provocatively titled essay “The Usefulness of Useless Knowledge,” published in *Harper’s Magazine* in October 1939, Abraham Flexner argued the case for spiritual and intellectual freedom. Citing numerous instances from the history of science, he presented the benefits of self-directed, curiosity-driven “theoretic” or seemingly useless research. Observing that most of the great discoveries beneficial to humanity were made by men and women “driven not by the desire to be useful but merely the desire to satisfy their curiosity,” he argued that “institutions of learning should be devoted to the cultivation of curiosity and the less they are deflected by considerations of immediacy of application, the more likely they are to contribute not only to human welfare but to the equally important satisfaction of intellectual interest which may indeed be said to have become the ruling passion of intellectual life in modern times.”

In presenting his argument Flexner cited, among other examples, the abstract mathematics of non-Euclidean geometry without which the theory of relativity would have been impossible. He concluded that “curiosity, which may or may not eventuate in something useful, is probably the outstanding characteristic of modern thinking. It is not new. It goes back to Galileo, Bacon, and to Sir Isaac Newton, and it must be absolutely unhampered.”



Institute for Advanced Study grounds

seasoned scholars are brought together with leaders in their fields, the Institute’s permanent Faculty and Faculty Emeriti. Scholars, who come to the Institute from all over the world, join a community of the best and brightest in the fields of Historical Studies, Mathematics, Natural Sciences, and Social Science. As graduate education in universities becomes more narrowly focused and specialized, the Institute serves an increasingly important function as a place where scholars across the disciplines can come together to share each other’s insights.

The Institute’s mission is to encourage and support curiosity-driven research in the sciences and humanities and the fundamental, innovative thinking that advances individual fields of inquiry. In providing opportunities to scholars in various stages of their academic development, this mission is constantly reaffirmed, and is never taken for granted, for such opportunities are increasingly rare in today’s product-driven society. The Institute makes a substantial contribution to the world of higher learning by providing intellectual and material support to visiting Members, whose development and growth constitute one of its principal purposes.

With its devotion to the continuing examination of new and centrally important questions as they arise at the frontiers of knowledge, the Institute can be likened to both a

university and to a research institute, although it differs in significant ways from both. It is unlike a university, for instance, in its small size and in the fact that it grants no degrees, has no formal curriculum, no scheduled courses of instruction, and no commitment that all branches of learning be represented by 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 according to individual intellectual imperatives rather than the collective aims of research teams or the private interests of potential donors.

Founded in 1930, the Institute for Advanced Study developed against the backdrop of the Great Depression and the rise of Fascism. Then, the Institute stood as a beacon of academic excellence and as a haven for scholars fleeing Nazi Germany. Today, the Institute's role as an independent institution free from corporate and government agenda and private or partisan interest is arguably just as important.

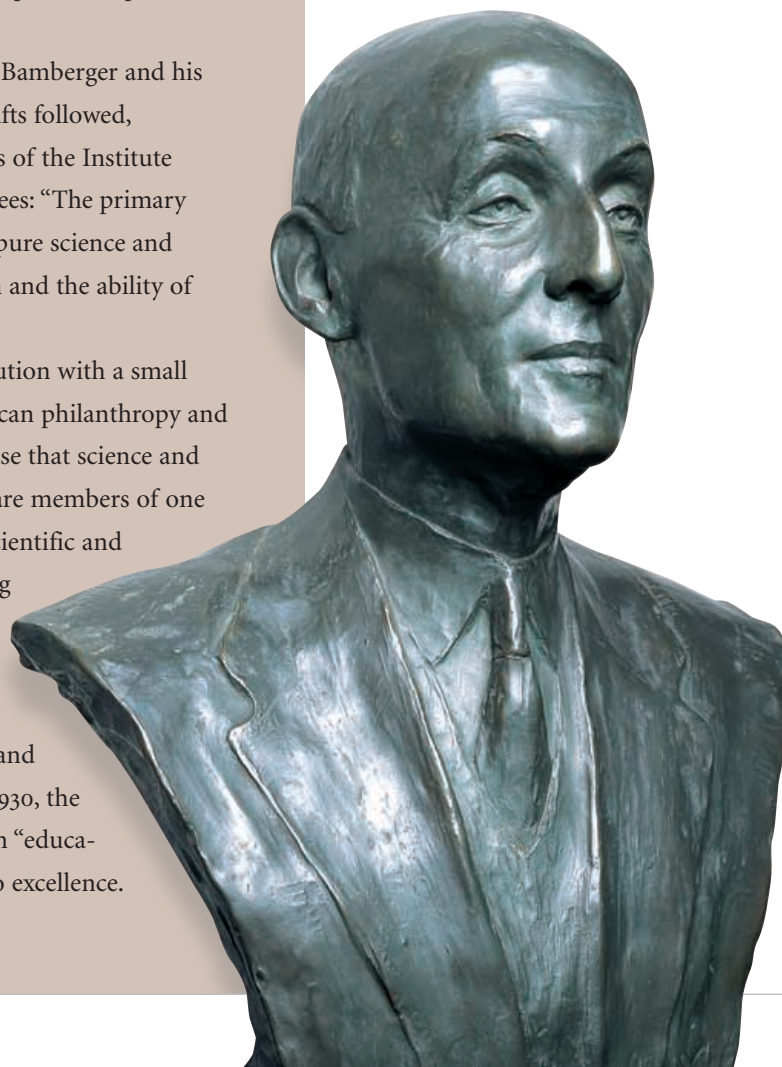
The Institute was first endowed by a gift of \$5 million from Louis Bamberger and his sister Caroline Bamberger Fuld, from whom a sequence of subsequent gifts followed, amounting to a total of over \$200 million in today's value. The objectives of the Institute were described as follows in the Founders' 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."

From the beginning, the Institute has been an international institution with a small permanent Faculty of exceptional merit. Although the product of American philanthropy and located in the United States, the Institute has ever operated 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 began their scientific and scholarly careers outside the United States, and many more of the visiting Members come from abroad.

The extraordinary drive and dedication to higher learning of the Institute's founding Director, Abraham Flexner, combined with the generosity and idealism of New Jersey philanthropists Louis Bamberger and Caroline Bamberger Fuld to create the Institute for Advanced Study. In 1930, the Institute was formed out of the happy amalgam of Flexner's vision for an "educational Utopia" and Bamberger and Fuld's philanthropy and dedication to excellence.

*The atmosphere at IAS focuses on the present where every twist and hairpin bend changes our view. What do we know? What do we yet need to understand? How should we try to comprehend it? Curiosity-driven research at the Institute furthers our grasp of a world of diverse facts, structures, ideas, and cultures. We share the conviction of our founders that such unrestricted deep thinking will change this world, but where and how is always a surprise.*

**Robbert Dijkgraaf** Director and Leon Levy Professor 2012–



**Right** Abraham Flexner portrayed by Russian sculptor Sergei Konenkov (1874–1971) in 1927



Felix Fuld (left) and Louis Bamberger

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

**Letter addressed by the Founders to their Trustees** June 4, 1930

## The Founders

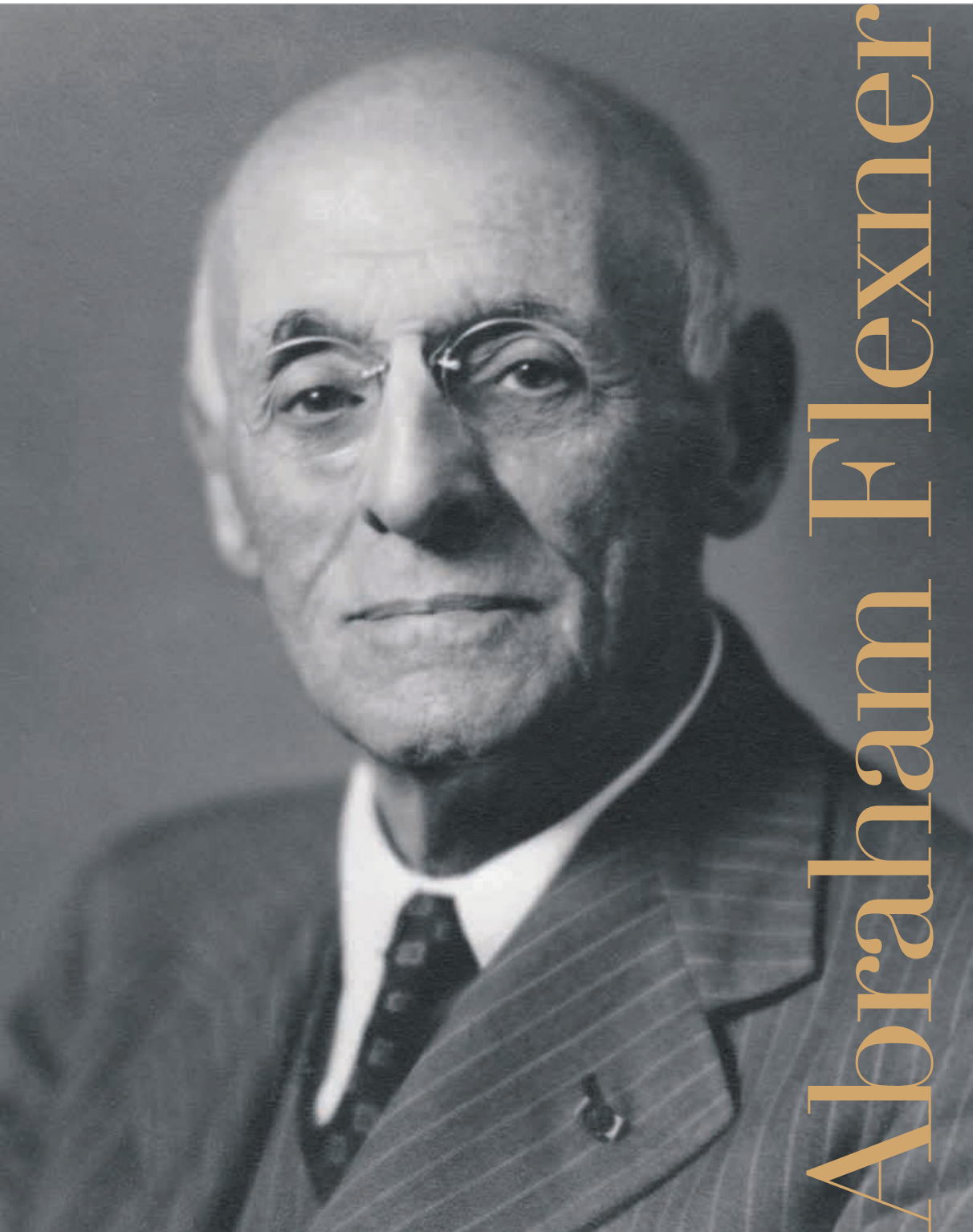
*Have you ever dreamed a dream?*

**M**ore than any other individual, it was Abraham Flexner who conceived and developed the idea that found expression as the Institute for Advanced Study. Following his careful analysis of such institutions as All Souls College, Oxford, the Collège de France, and the late-nineteenth-century German universities, Flexner recognized the need for an advanced research institution in the United States.

In 1908, Flexner had written *The American College*, a critical examination of the deficiencies of American higher education. Then, at the invitation of Henry Smith Pritchett, President of the new Carnegie Foundation for the Advancement of Teaching, he produced a report on *Medical Education in the United States and Canada*. Of the 155 medical schools in the United States and Canada that Flexner visited, his report recommended closing 120. Known widely as “The Flexner Report of 1910,” it established Flexner’s reputation and shaped the future of medical education.

Flexner was then asked to produce a report for John D. Rockefeller Jr. on the suppression and regulation of prostitution in Europe. His work and reputation for thoroughness led to his appointment, in 1913, to the General Education Board of the Rockefeller Foundation. Flexner worked for the Board until 1928, when he retired from his very influential post as Head of the Division of Studies after losing an internal power struggle prompted by changes within the organization. Then, at the age of sixty-two, he accepted an invitation to deliver the 1928 Rhodes Memorial Lectures in Oxford, England, for which he had been recommended by his friend Frank Aydelotte, the President of Swarthmore College. Years earlier, Flexner had helped Aydelotte win a Rhodes scholarship to Oxford by coaching him in classical Latin and Greek. Aydelotte subsequently became American Secretary to the Rhodes Trustees (1918–53), and the two men worked together in a variety of ways to improve higher education in the United States.





## **Abraham Flexner** 1866–1959

Founding Director 1930–39

**B**orn into a closely knit family of German Jewish immigrants in Louisville, Kentucky, Abraham Flexner was the sixth of nine children. His father, Moritz Flexner, was a tradesman and hat merchant, and his mother, Esther Abraham, was a seamstress. The Flexners valued education highly, but their losses in the financial panic of 1873 ended their hopes of providing a college education for their sons.

With the help of his oldest brother Jacob, Abraham attended Johns Hopkins University. In his turn, Abraham helped send his brother Simon to Johns Hopkins. Simon became a noted pathologist and bacteriologist, and Director of the Rockefeller Institute (later Rockefeller University). Abraham spent two years at Johns Hopkins and earned a B.A. in Classics in 1886. Johns Hopkins stressed postgraduate education, then very rare in the United States. Flexner hoped to continue his studies, but the fellowship he sought eluded him. He returned to Louisville to teach Latin and Greek at the Louisville Male High School. In 1890, he founded his own experimental school, which had no formal curriculum, exams, or grades but was very successful in preparing students for prestigious colleges.

In 1898, Flexner married playwright Anne Crawford, a former pupil in his school and a graduate of Vassar. Anne's financial success on Broadway enabled Flexner to pursue a master's degree in psychology from Harvard and spend a year at the Universities of Berlin and Heidelberg. Throughout his life, Flexner manifested a profound reverence for scholarship. In 1951, at age eighty-five, he was pictured in the *New York Times* with fellow students at Columbia University. The photo caption read: "The man who raised and spent \$600,000,000 through the Rockefeller General Education Board and headed the Institute for Advanced Study at Princeton sparks his 'retirement' with courses at Columbia, currently in European history and Soviet public administration."

## Louis Bamberger 1855–1944

**L**ouis Bamberger was born in Baltimore, Maryland, the son of Elkan Bamberger and Theresa Hutzler, owners of E. Bamberger & Sons, wholesalers of small goods. Louis left school at fourteen, worked hard, and accumulated capital.



In 1892, he purchased the stock of a bankrupt firm in Newark and opened L. Bamberger & Co. in partnership with his brother-in-law Louis M. Frank and fellow businessman Felix Fuld.

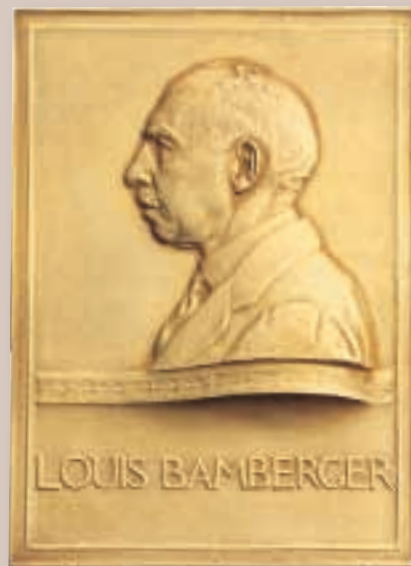
By 1912, L. Bamberger & Co. occupied an entire city block. The store ran on innovative lines, with money-back guarantees, price tags, and trained salespeople who treated customers with great respect and who earned commission on sales in addition to a regular salary. In 1924, the store employed 2,800 “coworkers,” as Bamberger, who cut a jaunty figure with his gold-tipped walking stick, referred to his employees. By the late 1920s, “Bams” boasted an in-store extension of Rutgers University, a library, health and social service departments, and a cafeteria. It pioneered radio broadcasting with a rooftop station, WOR. Sales for 1928 totaled \$38 million, ranking the department store fourth in the nation. When it was sold, Bamberger distributed \$1 million to 236 of his coworkers for long and faithful service. He remained as President of the store until his death at age eighty-eight in March 1944, and the store retained the Bamberger name into the 1980s.

Although born and raised in Baltimore, it was in Newark that Bamberger and Fuld had made their fortune and to which they felt loyalty and affection. The affection was returned. When Louis Bamberger died, the flags of the city were flown at half-mast for three days and the city hall was decked in mourning.

In late 1929, when Flexner was expanding these lectures into a book, *Universities: American, English, German*, he was approached by two visitors for advice concerning the philanthropic use of a large sum of money. Later, he recorded the event in *Abraham Flexner: An Autobiography*.

*I was working quietly one day when the telephone rang and I was asked to see two gentlemen who wished to discuss with me the possible uses to which a considerable sum of money might be placed. At our interview I informed them that my competency was limited to the education field and that in this field it seemed to me that the time was ripe for the creation in America of an institute in the field of general scholarship and science, resembling the Rockefeller Institute in the field of medicine—developed by my brother Simon—not a graduate school, training men in the known and to some extent in methods of research, but an institute where everyone—Faculty and Members—took for granted what was known and published, and in their individual ways endeavored to advance the frontiers of knowledge.*

The two gentlemen were Samuel Leidesdorf and Herbert Maass, representatives of two elderly clients from Newark, New Jersey: Louis Bamberger and his sister Caroline Bamberger Fuld, the recent widow of Louis’s partner and friend Felix Fuld.



With the death of Felix Fuld in January 1929, Louis Bamberger had become the sole head of one of the country’s leading department stores, the Newark-based L. Bamberger & Co., a business that had begun almost forty years earlier. Louis Bamberger and Caroline Fuld sold the store to R. H. Macy and Company of New York just weeks before the stock market crash in October 1929 for some \$25 million.

The Fuld and Louis Bamberger were deeply committed to community service. They contributed to charities, particularly those serving the

Medal of Louis Bamberger, circa 1925

Jewish community: to hospitals, youth clubs, museums, the Jewish Theological Seminary, and to Newark's Beth Israel Hospital. In 1923–24, Louis Bamberger donated \$650,000 to construct a building for the Newark Museum. Immediately after the sale of L. Bamberger & Co., Bamberger and Fuld began searching for a use for their considerable fortune. Feeling that they had benefited greatly from the state of New Jersey, and from the people of Newark in particular, Bamberger and Fuld thought of establishing a medical school either in Newark or on the Fuld estate in South Orange. They hoped to do something to counter the prejudice against Jews that they perceived as prevalent in the medical profession and in medical education. They therefore proposed to establish a medical school in Newark with preference for Jewish students.

To find out whether their project was feasible, they enlisted the help of their friend of many years, Samuel Leidesdorf, an accountant and their business adviser, who in turn solicited the help of his friend Herbert Maass, senior partner in the New York law firm of Maass and Davidson, the firm that had acted for Macy's when it acquired L. Bamberger & Co. From their inquiries, Leidesdorf and Maass were led to the most influential figure in the field of medical education, Abraham Flexner.

In bringing their request to Flexner, Maass and Leidesdorf had found the right man, but his advice was not what was expected. Flexner poured cold water on their clients' plan. He argued that a first-rate medical school required an outstanding teaching hospital and that it needed to be associated with a leading university, neither of which existed in Newark; nor did he think that the way to counter anti-Semitism would be to set up institutions favoring Jews. Instead he asked his visitors, "Have you ever dreamed a dream?" and proceeded to tell them his: the establishment in America of a purely graduate university, devoted to learning and researching rather than undergraduate teaching.

Maass and Leidesdorf (both of whom would later play significant roles on the Board of the Institute) returned to their clients with a copy of a memorandum conveying Flexner's conception of a modern university as a true society of scholars. Such was Flexner's charisma and reputation that on their subsequent meeting Louis Bamberger and Caroline Fuld were quickly captivated by his vision.

It was an idea whose time had come.



In 1939, Lavinia Bamberger presented this bronze relief of her sister Caroline to the Institute, together with one of her brother Louis and one of Caroline's husband Felix Fuld. The plaques are the work of Sergei Konenkov.

### **Caroline Bamberger Fuld 1864–1944**

**A**t the beginning of the twenty-first century, the names of Rockefeller and Carnegie, self-made men from the turn of the twentieth century, remain in the public eye through their many great philanthropic enterprises. Names of others who gave anonymously are less recognized. Such is the case with Louis Bamberger and Caroline Bamberger Fuld, who were modest in temperament and shunned publicity.

It is for Caroline (Carrie) Fuld's second husband Felix that the Institute's first building, Fuld Hall, is named. Caroline and her first husband, Louis Frank, ran a successful business in Philadelphia before moving to Newark to join Louis Bamberger and Felix Fuld in setting up L. Bamberger & Co. The four friends formed a close circle. Frank died in 1910 and Caroline married Fuld in 1913, becoming Caroline Bamberger Frank Fuld and embodying the entire partnership in her name. Louis lived with Caroline and Felix in the Fuld Estate on thirty acres of land in South and East Orange. Caroline Fuld was elected President of the National Council of Jewish Women in 1931.

*I am not unaware of the fact that I have sketched an educational Utopia. I have deliberately hitched the Institute to a star; it would be wrong to begin with any other ambition or aspiration.*

**Abraham Flexner** Founding Director 1930–39

## Founding Vision

*... the time was ripe.*

**F**lexner's idea of a research institution where scholars would have free rein captured the interest of Louis Bamberger and Caroline Fuld. They invited Flexner, by all accounts a man of great energy and high ideals, to dine with them at the Madison Hotel in New York City. They were soon to share Flexner's dream. Following a series of discussions and correspondence, they abandoned the idea of a medical school and embraced Flexner's plan for an Institute for Advanced Study, insisting that Flexner should be its first Director.

The Institute for Advanced Study was undertaken as a great experiment, born of high ideals and faith in intellect. Events moved speedily. A certificate of incorporation for the "Institute for Advanced Study—Louis Bamberger and Mrs. Felix Fuld Foundation" was filed on May 20, 1930, with the State of New Jersey. In June, the Founders wrote to the first Trustees stipulating that the Institute for Advanced Study should be situated in the state of New Jersey, that the endowment should not be depleted in order to construct buildings, and that no gifts should ever be accepted from outside sources that would change the fundamental aims of the Institute, an important precept to which the Institute has rigorously adhered. The *New York Times* announced the creation of an Institute for Advanced Study, to be located in or near Newark, with a gift of \$5 million from Louis Bamberger and his sister Mrs. Felix Fuld.

Bamberger and Fuld ultimately relinquished their desire that the Institute should be in Newark, persuaded by the need for proximity to a great library and the wider intellectual community of a great university. Given the constraint of New Jersey, this pointed to the town of Princeton. The time was ripe but Flexner's idea had yet to be fully articulated, resourced, and realized. To Louis Bamberger and Caroline Fuld he conveyed his idea that the Institute:

*“ . . . should be small, that its staff and students or scholars should be few, that administration should be inconspicuous, inexpensive, subordinate, that members of the teaching staff, while freed from the waste of time involved in administrative work, should freely participate in decisions involving the character, quality, and direction of its activities, that living conditions should represent a marked improvement over contemporary academic conditions in America, that its subjects should be fundamental in character, and that it should develop gradually.”*

At the first meeting of the Trustees on October 10, 1930, he spoke of his plans for “a free society of scholars and students devoted to the higher training of men and to the advance of knowledge.” It was first and foremost to be a quiet retreat, a fortress of learning. At its heart was the Faculty, who needed only “simple surroundings,” protection from interference, generous professional remuneration, little supervision, and freedom from any obligation “to entice or compel students to work.” “I shall seek a few first-rate men,” he said, and “give them ample salaries on condition they hold up their end of the job.”



The Institute's first Board of Trustees. Front row from left: Alanson Houghton, Caroline Fuld, Louis Bamberger, Florence Sabin, Abraham Flexner. Back row from left: Edgar Bamberger, Herbert Maass, Samuel Leidesdorf, Lewis Weed, John Hardin, Percy Straus, Julius Friedenwald, Frank Aydelotte, Alexis Carrel



# Truth & Beauty

## The Institute Seal

**T**he official Institute for Advanced Study seal was created by French artist M. Pierre Turin in 1932. “The notes that I would like struck,” Abraham Flexner directed, “are Truth and Beauty.” Turin’s design included a third element of a fruit-bearing tree to symbolize knowledge. Flexner wrote, in July 1931: “Every college seal that I have seen is a fake coat of arms. That is all very well in Oxford and Cambridge and Paris, but we ought to plant our feet firmly upon the here and now and utilize our freedom to devise new forms of beauty which shall be expressive of our efforts.” The original die, from which medals and bookplates were made, is in Paris with the Administration des Monnaies et Médailles.

Envisioning “an educational Utopia” is one thing. Bringing that vision into being is another. Louis Bamberger and Caroline Bamberger Fuld had delivered over \$5 million to bring Flexner’s dream into being. Flexner now had to deliver an Institute for Advanced Study. He began traveling and consulting with leading American and European scholars. In September 1931, he set out his plans in more detail to the Trustees:



The Newark Evening News, June 7, 1930

*“The Institute for Advanced Study will be neither a current university, struggling with diverse tasks and many students, nor a research institute, devoted solely to the solution of problems. It may be pictured as a wedge inserted between the two . . . I should think of a circle, called the Institute for Advanced Study. Within this, I should, one by one, as men and funds are available—and only then—create a series of schools or groups—a school of mathematics, a school of economics, a school of history, a school of philosophy, etc. The ‘schools’ may change from time to time; in any event, the designations are so broad that they may readily cover one group of activities today, quite another group, as time goes on. . . . Each school should conduct its affairs in its own way; for neither the subjects nor the scholars will all fit into one mould.”*

Flexner also suggested that the Institute should start with the discipline of mathematics, which he regarded as the “severest” of all disciplines and one that was antecedent to all others. It was also a discipline in which, as he pointed out, there was agreement as to its leaders. He intended to add economics and then subjects in the humanities to the principal areas of scholarship as funds and scholars became available.

Since Flexner had done extensive research on the East Coast and in Europe, his brother Simon urged him to visit the West Coast, particularly the California Institute of Technology in Pasadena. Flexner headed for California in February 1932. His visit there coincided with that of Albert Einstein, who was finding respite in California from the declining situation for Jewish intellectuals in Germany. Einstein responded with enthusiasm to both Flexner and his plans. The educational reformer and the world’s most famous scientist agreed to continue their conversation in Oxford that summer.

## The Great Experiment

Along with Flexner, others had argued the need to establish an international research institute in the United States where academics would be free to pursue their chosen work. The economist Thorstein Veblen, author of *The Higher Learning in America, A Memorandum on the Conduct of Universities by Business Men* (1916), was notable among them.

The economist's nephew Oswald Veblen, a professor of mathematics at Princeton University, had also been pushing for the establishment of a high-level research institute. In 1924, Oswald Veblen had written to Flexner's older brother Simon, then Director of the Rockefeller Institute for Medical Research (later Rockefeller University), seeking support for an "Institute for Mathematical Research." He envisaged a research institute in mathematics that would require no undergraduate teaching duties of its faculty and corresponded with Abraham Flexner about the topic. When Veblen saw the announcement in the *New York Times* in June of 1930, he wrote immediately to congratulate Flexner, expressing the wish that the new Institute would be located in the borough or township of Princeton "so that you could use some of the facilities of the University and we could have the benefit of your presence."

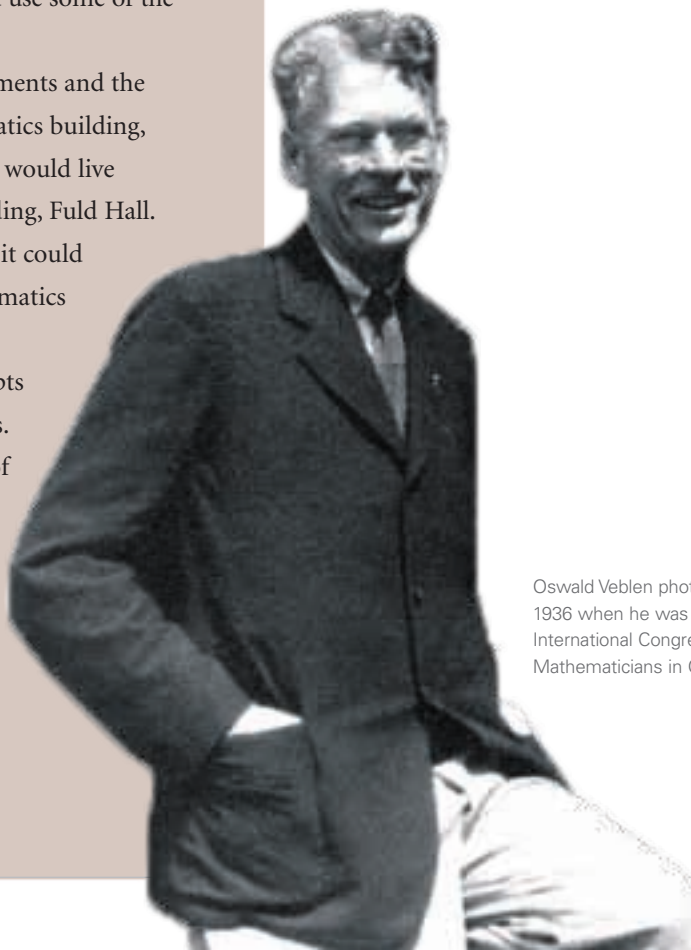
Veblen would become one of the new Institute's first Faculty appointments and the Institute would find accommodation in Princeton University's new mathematics building, Fine Hall. The Institute and Princeton University's mathematics department would live together for six years (1933–39) before the Institute constructed its own building, Fuld Hall. It was a tremendous advantage for the fledgling School of Mathematics that it could function within the framework of Princeton University's outstanding mathematics department and make full use of the facilities in Fine Hall.

As the Institute developed from an idea into a vital institution, attempts were made to create policies and protocols that would realize Flexner's ideals. Given the Director's view that informality, absence of rules, and autonomy of the Schools were the principles necessary to distinguish a living, growing institution from one that would otherwise "harden and grow old," the task of maintaining flexibility has been and continues to be a formidable challenge of the Institute for Advanced Study's Board of Trustees and Faculty. Flexner sought to make flexibility an enduring part of the Institute from its beginnings.

## Oswald Veblen 1880–1960

Institute for Advanced Study 1933–60

A faculty member of Princeton University's Department of Mathematics for twenty-seven years before being appointed as one of the first Faculty of the Institute for Advanced Study, Oswald Veblen was committed to improving research conditions in mathematics in the United States. He built Princeton University's mathematics department into one of eminence in the United States and subsequently had enormous influence on the development of the Institute's School of Mathematics. He was a pioneer in the mathematical field of topology.



Oswald Veblen photographed in 1936 when he was attending the International Congress of Mathematicians in Oslo

*Pure research is indispensable to the more familiar applied research that almost everybody understands as necessary for the development and well-being of the nation. Consider, for example, the need to understand air flow past an airplane wing in order to deal with the problem of turbulence. Underlying such a study is basic research, in this case, differential equations known as Navier-Stokes equations, which describe the flow of any type of fluid. These equations, in turn, depend on Sir Isaac Newton's greatest fundamental discovery, the calculus, which occurred centuries before the work of Navier and Stokes.*

**Phillip Griffiths** Institute Director 1991–2003

## First Faculty and First Schools

### *Ich bin Feuer und Flamme dafür*

**I**n the autumn of 1932, just eight months after his visit to the California Institute of Technology, Abraham Flexner announced publicly the creation of the Institute for Advanced Study's first School, the School of Mathematics. The first Faculty appointments were Oswald Veblen and Albert Einstein. Flexner had hoped to announce the appointment of Hermann Weyl, the mathematician who had succeeded David Hilbert to the world's most prestigious chair in mathematics at the University of Göttingen, but Weyl was wracked with indecision and had not yet made a commitment. The School would begin activities in fall 1933. Having as yet no building of its own, it would be housed temporarily in rented space in Fine Hall, Princeton University's new mathematics building.

On two occasions following their fateful first meeting in California, Flexner had spoken with Einstein of his plans for the Institute for Advanced Study. Einstein is recorded as responding with the words: *Ich bin Feuer und Flamme dafür* (I am fire and flame for this). Einstein pulled others into his orbit. With Einstein on the Faculty and with the help of Veblen and Luther Eisenhart, then Dean of the Faculty at Princeton University, Flexner began to assemble an outstanding Faculty. As word spread throughout the academic community, the Institute quickly became known as one of the world's great research centers.

In 1933, Flexner recruited John von Neumann, a young but already renowned mathematician who was then a visiting professor at Princeton University. Von Neumann's work would profoundly influence fields ranging from game theory to climatology to computer science. The basic architecture of virtually all computers today derives from his design for a machine built at the Institute in the 1940s. He would remain on the Institute's Faculty until his death in 1957.





Albert Einstein and logician Kurt Gödel often walked together to the Institute, conversing in German.

It is a sad irony that Flexner's recruiting efforts were helped by the rise of Nazism in Germany, the country from which he had drawn so much inspiration for his ideas on higher education. After Adolf Hitler became Chancellor in January 1933, Hermann Weyl put aside his misgivings about leaving Germany and decided to cross the Atlantic to join the Institute. The anti-Semitic policies of the Nazi regime that made the Institute for Advanced Study attractive to Einstein, Weyl, and von Neumann forced a generation of promising Jewish mathematicians to seek refuge as well. The Institute for Advanced Study became a lifeline in the migration of European scholars to the United States. Veblen, Einstein, and Weyl played a prominent role in helping European scholars obtain Memberships at the Institute or financial aid from the Rockefeller Foundation. Kurt Gödel, one of history's major logicians, and Carl Ludwig Siegel, who became one of the twentieth century's great number theorists, were given permanent Member appointments and eventually were invited to join the Faculty.

### **Kurt Gödel** 1906–78

Institute for Advanced Study 1933–78

**K**urt Gödel was among the first Members to come to the Institute for Advanced Study. The Austrian logician was appointed Professor in the School of Mathematics in 1953 and Professor Emeritus in 1976. His famous Incompleteness Theorem is recognized as a landmark of twentieth-century formal logic, and his *Consistency of the Axiom of Choice and of the Generalized Continuum Hypothesis with the Axioms of Set Theory* (1940) is a classic of modern mathematics. In 1974, Gödel was awarded the National Medal of Science. The medal is now held in the Institute's Shelby White and Leon Levy Archives Center.



With the opening of the Institute for Advanced Study, Princeton replaced Göttingen as *the* world center for mathematics, and by providing exceptional conditions and opportunities to Faculty and visiting scholars, the Institute set an example for universities throughout the United States.

Although founded as the School of Mathematics, the Institute's first School included physicists as well as mathematicians. Einstein was a physicist. Weyl and von Neumann were

mathematicians who had made major contributions to physics. At this time, there was no separation between mathematics and theoretical physics, and there would be no separate School of Natural Sciences until 1966.

By the start of the academic year 1933–34, the Institute for Advanced Study had a Faculty of five leading mathematicians and theoretical physicists: James Alexander, Einstein, von Neumann, Veblen, and Weyl, as well as over twenty visitors. In 1934 and 1935, respectively, this group was joined by Paul Dirac and Wolfgang Pauli.

Besides sharing space with the mathematicians at Princeton University, there was much collaboration between professors at the Institute and Princeton, resulting in an impressive set of lectures, courses, and seminars. Alexander and his Princeton University

colleague Solomon Lefschetz embarked on a two-year joint seminar on topology. Veblen and von Neumann led joint seminars on topics in quantum theory and geometry. Weyl presented a course and a seminar on continuous groups and then a course on invariant theory. In 1934, Dirac lectured on quantum electrodynamics. In 1935, Weyl began leading a seminar on current literature in mathematics.

Institute lectures began at 3 p.m. and were followed by tea at 4 p.m., after which the Members would meet again at 4:30 p.m. to talk and argue. Among this first group of Members,



Physicists Albert Einstein (Nobel Laureate, 1921), Hideki Yukawa (Nobel Laureate, 1949), John Wheeler, and Homi Bhabha conversing about physics during a visit to the Institute

## Albert Einstein 1879–1955

Institute for Advanced Study 1933–55

**M**athematical physicist Albert Einstein was born in Ulm, Germany, where, auspiciously, the city's motto is *Ulmenses sunt mathematici* (the people of Ulm are mathematicians). At the age of sixteen, he had wondered what the world would look like to someone traveling on a beam of light. In 1905, his *annus mirabilis*, he formulated the special theory of relativity, which defined the speed of light as an absolute or invariant property of the physical world. In the same year, he published seminal papers on Brownian motion and the photoelectric effect. In 1915, he introduced the general theory of relativity.

Einstein gained worldwide prominence in 1919, when British astronomers verified predictions of his general theory of relativity through measurements taken during a total eclipse. His theories expanded upon universal laws formulated by Newton in the late seventeenth century.

At the Institute for Advanced Study, Einstein pursued the goal of a unified field theory, and did so at a time when the goal of unifying the four fundamental forces of nature—gravity, electromagnetism, the strong nuclear force, and the weak nuclear force—had been set aside by the majority of working physicists. In recent years, this has again become a central aim of physicists, and string theory has become the favored candidate to provide a framework for a unified understanding of the basic laws of the physical universe. Some of the foremost string theorists in the world are Institute Faculty, and in that regard and others, Einstein's legacy is strongly felt at the Institute.

or “workers” as they were called until 1936, were two women: algebraist Emmy Noether and topologist Anna Stafford. This was highly unusual in Princeton, for women students were not accepted at Princeton University or at other leading graduate schools in the early thirties. The Institute for Advanced Study had no such prohibition.

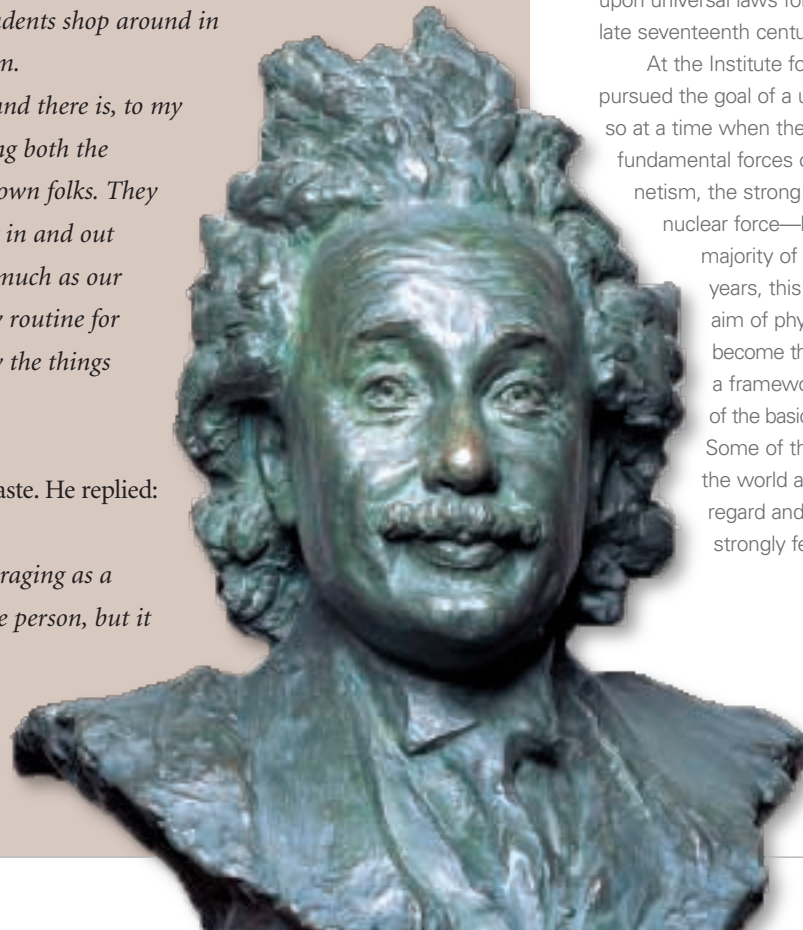
With the activities in Fine Hall, Abraham Flexner saw his vision of a “paradise for scholars” take on substance. In December 1933, he wrote excitedly to Trustee Felix Frankfurter:

*“What has happened is not exactly what I planned but is much better than I planned. I have frequently used the phrase ‘paradise for scholars’ without any very distinct notion of just how a paradise would be created. What has happened is the following: we have five mathematicians of great eminence, each with his own work to do. We have admitted to the Institute about twenty persons who have shown capacity for independent work—persons who have already attained the rank of assistant professor or associate professor in American universities or abroad. They have been turned loose in Fine Hall without any regulations whatsoever. The professors know of course what they want to do and are doing it. The students shop around in order to find the man who can be most helpful to them.*

*“... Every afternoon tea is served informally and there is, to my astonishment, an attendance of about sixty, comprising both the advanced workers and the staff of Princeton and our own folks. They talk mathematics but not only mathematics and drift in and out without explanation or ascertainable reason. . . . Inasmuch as our workers have all been teachers working under a heavy routine for some years, they are as happy as birds, doing precisely the things which they have wanted to do.”*

Frankfurter did not find Flexner's exuberance to his taste. He replied:

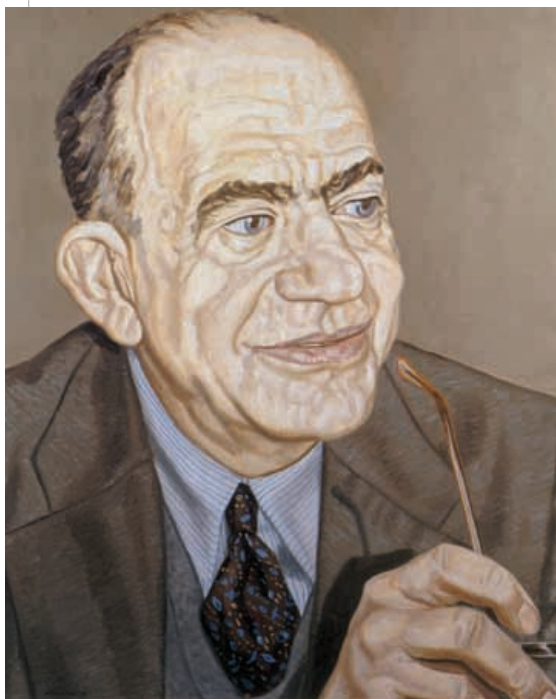
*“... the natural history of paradise is none too encouraging as a precedent. Apparently it was an excellent place for one person, but it was fatal even for two—or at least for two when the snake entered, and the snake seems to be an early and congenial companion of man. Really, figures of*



Albert Einstein by Sergei Konenkov, 1935

*I feel extremely privileged to have met and interacted with wonderful scholars, both Faculty members and Members in the School. The meetings enabled me to learn about a vast and exciting range of ideas from Greek medicine to medieval music to Chinese women revolutionaries.*

**Member** School of Historical Studies



This portrait of Erwin Panofsky by Philip Pearlstein was commissioned in 1995 for the centennial celebration of Panofsky's birth. It hangs in the Institute's Historical Studies–Social Science Library.

*speech are among the most fertile sources of intellectual confusion. Let's try to aim at something human, for we are dealing with humans and not with angels."*

Frankfurter's note of skepticism notwithstanding, it is remarkable to observe that the Institute today bears a striking resemblance to the Institute of these early years. With the success of the Institute's School of Mathematics, Flexner began thinking about other subjects and other matters—the Institute needed to begin work in additional fields and also find a permanent location and a building of its own.

In choosing mathematics as the first area of study for the new Institute, Flexner had found consensus among mathematicians in the United States and Europe as to the top scholars in the fields of mathematics and mathematical physics. When it came to the Institute's second School, the School of Economics and Politics, which Flexner hoped would examine economic theory and take an objective view of political theory of government, he found no such agreement as to leading individuals, areas of study, or methodologies.

Where mathematicians and mathematical physicists formed an international community within the academic world, in which existing lines of inquiry were being pursued in collaboration, such was not the case in economics or in politics. The first appointment, David Mitrany, was an expert in international relations, a journalist, and a political scientist who envisioned the new School being put into the hands of eminent social scientists. He was joined by military historian Edward Earle and economist Winfield Riefler and later by economists Walter Stewart and Robert Warren.

These were men with very different conceptions of the field of economics. The harmony among Institute Faculty that so delighted Flexner early one morning when he discovered the two Nobel Prize winners Einstein and Erwin Schrödinger conferring over a formulae-covered chalkboard in Einstein's sun-drenched office was not to be replicated in the School of Economics and Politics. As Felix Frankfurter had been quick to point out, Flexner, in his hopes for "paradise," had anticipated neither the serpent nor the Fall.

For a School of Humanistic Studies, the situation was more promising. As Veblen at Princeton University had been instrumental in choosing permanent Faculty for the Institute's School of Mathematics, so Flexner turned again to those he knew at the University for advice on building a School of Humanistic Studies. Art historian Charles Rufus Morey of Princeton's Department of Art and Archaeology was known to Flexner from his days at the General

Education Board, when Flexner had channeled funding to the department for archaeological expeditions in the Agora, in Athens. These excavations, for which Flexner had earned the eternal gratitude of the American School of Classical Studies, had been underway for some two years when Morey was consulted about the new Institute.

The first Professor appointed to the Faculty of the new School of Humanistic Studies was Benjamin Meritt, a classical scholar at Johns Hopkins University specializing in Greek history, epigraphy, and archaeology. The second appointment was the renowned German art historian Erwin Panofsky. Panofsky had been head of the art history department at the University of Hamburg and was a visiting Professor at New York University in 1933 when he learned of his dismissal from his position as a result of the Nazi expulsion of Jews from government offices. Considered one of the most important art historians of the twentieth century, Panofsky played a key role in professionalizing art history in the United States and authored key texts for generations of art historians, his *Studies in Iconology* (1939) foremost among them. In 1936, Latin paleographer Elias Lowe, Near Eastern archaeologist and historian Ernst Herzfeld, and Hetty Goldman, one of a small number of pioneering American women archaeologists of the period, joined the School. Within eighteen months, the Director had staffed the School of Humanistic Studies.

While the mathematicians had found offices in Fine Hall on the Princeton University campus, quarters for Faculty of the two new Schools were not so easily available. There were none to be had on the University campus for the economists or the humanists, save Herzfeld and Panofsky. The Institute bought a house at 69 Alexander Street and remodeled it as offices for Professors Meritt, Goldman, Mitrany, Earle, and Riefler. Visiting scholars had to compete for rented rooms in town. The disconnectedness of these makeshift arrangements made obvious the Institute's need for a site and for a building of its own.

By the mid-1930s, the Institute had established scholars in mathematics, economics, politics, and the humanities in three Schools—Mathematics, Economics and Politics, and Humanistic Studies. The Institute included, as one former Director has written, the study of the cosmos of culture as well as the study of the cosmos of nature. Rapid expansion during the Institute's first decade resulted in tight quarters for all. If this was the case in the years leading up to World War II, it became doubly so with the onset of war.



### Hetty Goldman 1881–1972

Institute for Advanced Study 1936–72

**A**rchaeologist Hetty Goldman was the first woman to be appointed to the Institute's permanent Faculty. A graduate of Bryn Mawr and the first woman to be awarded the Charles Eliot Norton Fellowship, she attended the American School of Classical Studies at Athens and was a pioneer in the investigation of pre-Greek and earliest Greek peoples. Goldman received the Gold Medal of the American Institute of Archaeology for Distinguished Archaeological Achievement in 1966.



This flask from Athens dates to about 450 B.C. Bequest of Ernst Kantorowicz, former Professor in the School of Historical Studies.

## Development and Growth

# 1939-1949



Fine Hall (now Jones Hall), Princeton University

**Opposite** Paul Dirac (center) with Abraham Pais (center right) and other Institute Members lunching in the Institute's dining room, located on the fourth floor of Fuld Hall until the mid-sixties

**I**n 1939, the Institute for Advanced Study celebrated the completion of its own building on its own grounds. Fuld Hall was built on wooded lands in Princeton Township. The property included Olden Manor, which became the residence of the Institute's Directors. In addition to offices and a library, Fuld Hall boasted a room dedicated to meetings of the Board of Trustees, a dining room, and the Common Room, where a radio operated on Saturday nights for occasional dances attended by the younger Members. In the meadow in front of Fuld Hall, there was a recreational bowling green and, following the tradition established in Fine Hall, tea was served every afternoon.

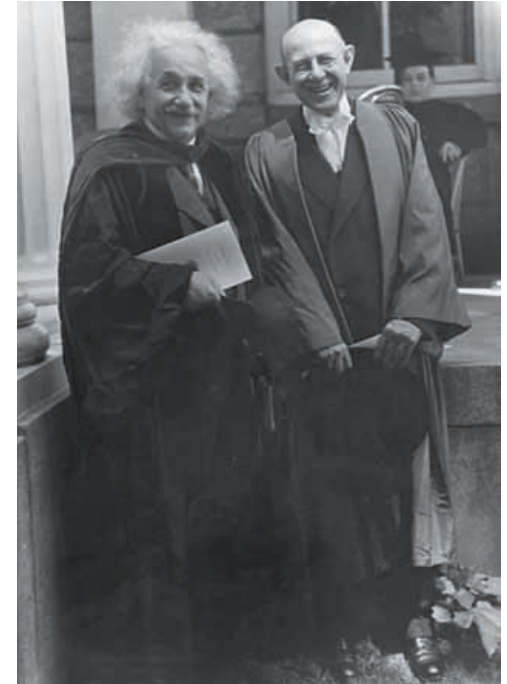
In addition to its new location, the Institute had a new Director. Frank Aydelotte succeeded his friend Abraham Flexner as Director of the Institute for Advanced Study in 1939 and guided the Institute through the war years until 1947. Flexner had known Aydelotte, a graduate of Indiana and Harvard, since they were both teachers at Louisville Male High School in Kentucky, where Aydelotte had taught English and football. When the Institute moved to Fuld Hall, Frank Aydelotte moved into Olden Manor.

In preparation for the move, the School of Mathematics had begun to build up a library so that it would not have to rely on the library at Princeton University. This would be a much-used resource since, with the approach of World War II, restrictions imposed on the movements of "enemy alien" scholars at the Institute forbade their access to the University campus.

With so many Faculty and Members from Europe or with ties to Europe, World War II would have a major impact on the Institute for Advanced Study. Almost from the beginning, the new building proved inadequate for all of the Institute's needs. With the start of the war, accommodations were even more strained. In an act of good will, the Institute offered to

provide a home for a department of the displaced League of Nations Secretariat. With Aydelotte's help, a small, international group of economists and statisticians and their families arrived in Princeton. The dining room in Fuld Hall was given over to the League while Faculty members were asked to share offices and secretaries to work in corridors.

In August 1939, the Institute's most prominent figure, Albert Einstein, prompted by fellow physicists Leo Szilard and Eugene Wigner, wrote to President Roosevelt warning of the dangers of Nazi Germany developing an atomic bomb. During the war, many members of the Institute's Faculty became involved in the war effort. Several served as consultants to the military. Panofsky, for example, worked to reduce the damage of American and British bombs on cultural monuments in Germany and Italy. He assisted the Commission for the Preservation of Cultural Monuments with maps and tables of information and reviewed all German targets. Von Neumann was a member of the Scientific Advisory Committee at the Ballistic Research Laboratories at the Aberdeen Proving Ground in Maryland from 1940. He was a consultant to the Los Alamos Scientific Laboratory from 1943 to 1955 and participated in the development of the hydrogen bomb.



Albert Einstein with Frank Aydelotte (right)

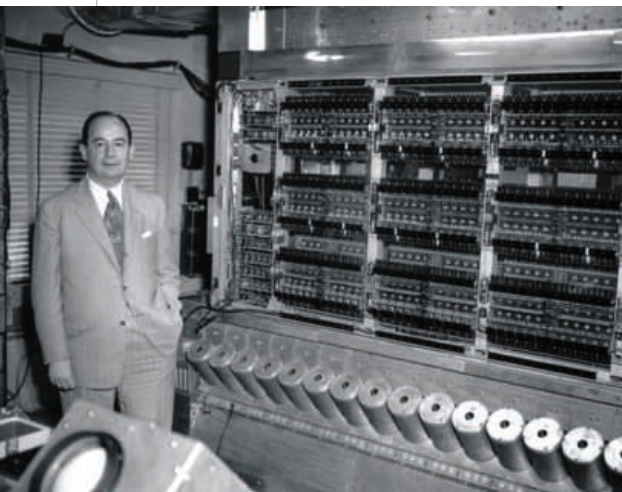
### **Frank Aydelotte** 1880–1956

Institute Director 1939–47

**F**rank Aydelotte succeeded Abraham Flexner as Director. A native of Indiana and a Quaker, Aydelotte attended Indiana University from 1896 to 1900, earning a B.A. in English literature. A varsity footballer, he taught English and coached football at Vincennes University and at Louisville Male High School in Kentucky before winning one of the first Rhodes Scholarships for study at Brasenose College, Oxford. On his return from England, Aydelotte joined the faculty at Indiana University and later at the Massachusetts Institute of Technology. In 1921, he became President of Swarthmore College, where he established an innovative honors program inspired by that which he had seen at Oxford. President of Swarthmore College until 1940, he is credited with making it into one of the most outstanding small, private liberal arts colleges in the country.

**John von Neumann 1903–57**  
Institute for Advanced Study 1933–57

**J**ohn von Neumann's scintillating intellect illuminated the fields of pure and applied mathematics, computer science, quantum mechanics, economics, and strategic thinking. He pioneered the modern computer, game theory, and the theory of nuclear deterrence. Born in Budapest, Hungary, the son of a successful lawyer, Max Neumann, von Neumann was an intellectually precocious child with a remarkable facility for mental arithmetic. After receiving his doctorate, von Neumann was appointed to the Universities of Berlin and Hamburg. A Rockefeller fellowship enabled him to undertake postdoctoral studies at the University of Göttingen, where he studied under David Hilbert in the academic year 1926–27. Taking up an invitation from Oswald Veblen to lecture on quantum theory at Princeton University, he arrived in the United States in 1930, one of many Hungarian and Jewish intellectuals to flee the turmoil of Europe. At age thirty, he was the youngest of the Institute's first Faculty and was frequently mistaken for a graduate student.



Von Neumann at the IAS machine's formal dedication ceremony, June 10, 1952

Von Neumann's intellect ranged over hydrodynamics, ballistics, meteorology, game theory, and statistics, applying mathematical rigor to practical problems in these fields. His wide-ranging perspective allowed him to envision applications for computers beyond that of computational instruments. In the spring of 1945, von Neumann had drafted a document that used a biological analogy to describe the logical structure of a desired high-speed automatic digital computing system powerful enough to solve nonlinear partial differential equations of two or three independent variables and similar complex mathematical problems. The analogy freed the concepts of the nascent computer from the considerable constraints posed by the technology of the era and, ultimately, stimulated the growth of that technology. Von Neumann identified the “organs” required as those relating to arithmetic, memory, control, and input and output devices. Subsequently known as “von Neumann architecture,” this logical schema serves as the basis for the modern computer, and these “organs” are now so familiar as to seem natural and immutable.

In late 1945, persuaded by von Neumann, Veblen, and Aydelotte, the Institute for Advanced Study embarked on a project that departed from the realm of the purely theoretical. With its focus on fundamental scholarship and its lack of laboratories, the Institute was not, at first sight, a suitable place for von Neumann's Electronic Computer Project. But these were extraordinary times and the project found a home, first in the basement of Fuld Hall and later in a building of its own that now houses Crossroads Nursery School. The IAS machine was among the first computers to make full use of a high-speed random-access storage matrix.

### **The IAS Machine and the Beginning of Modern Meteorology**

The early work on the Institute's computer carried out as the Electronic Computer Project serves as a model of intellectual collaboration and demonstrates the value of open publication of scholarly findings. A constant stream of progress reports dealing with the technical problems solved by the team of mathematicians and engineers building the IAS machine informed the academic scientific community. Because of these open reports, copies of the IAS machine spread nationally and internationally.

Because they benefited from pioneering troubleshooting with the Institute's prototype, some copies—for example, Argonne's Version of the Institute's Digital Automatic Computer (AVIDAC) and the Mathematical Analyzer, Numerical Integrator, and Computer (MANIAC) at Los Alamos—were completed before the IAS machine. The IAS machine was used



continuously and productively until 1958. It was given to the Smithsonian National Museum of American History's Computer History Collection in 1960.

Scholarly contributions to the continuing conversation require that scholars organize, record, and synthesize their findings into publications so that the work enters the public domain and is available for others to use. Von Neumann endorsed this point when he made sure that reports about the IAS machine were sent out to other groups.

Also in 1946, a project in meteorological studies was established by contracts with the Office of Naval Research. The IAS machine was a powerful research tool in the investigation of fundamental problems in dynamical meteorology, and it made possible for the first time a systematic treatment of problems of weather prediction by numerical solution of complex equations governing the motions of the atmosphere. The success of a series of numerical experiments led to the development of a model in 1953 by which the generation of storms could be predicted. The work that took place at the Institute, using the IAS computer to forecast the weather, stemmed directly from von Neumann's interest in weather prediction and climate control.

The theoretical meteorologists that von Neumann brought here, Jule Charney, Joseph Smagorinsky, Norman Phillips, and others, worked on climate modeling and numerical weather prediction. The Institute provided a unique intellectual meeting place for people from various disciplines—logic, mathematics, engineering, fluid dynamics, and meteorology—who came together to think about weather and climate in a new way. With the death of von Neumann in 1957, those working on meteorology dispersed: Charney moved to MIT and Smagorinsky went to the Geophysical Fluid Dynamics Laboratory of Princeton University.

In 2003, Phillips and Smagorinsky each received the Franklin Medal in Earth Sciences for work that was carried out at the Institute in the early fifties. Phillips was the first to show, with a simple general circulation model, that weather prediction with numerical models was feasible. The advent of numerical weather predictions in the 1950s signaled the transformation of weather forecasting from a highly individualistic effort to one in which teams of experts developed complex computer programs, eventually for high-speed computers.



The Electronic Computer Project (ECP) and the Meteorology Project employed a large staff of engineers, programmers, machinists, draftsmen, secretaries, and data-entry clerks. In 1978, ECP Chief Engineer (1946–51) Julian Bigelow recalled: “A long chain of improbable chance events led to our involvement. People ordinarily of modest aspirations, we all worked so hard and selflessly because we believed—we knew—it was happening here and at a few other places right then, and we were lucky to be in on it. We were sure because von Neumann cleared the cobwebs from our minds as nobody else could have done. A tidal wave of computational power was about to break and inundate everything in science and much elsewhere, and things would never be the same.” Among those pictured above are Bigelow, Hewitt Crane, Gerry Estrin, Frank Fell, Herman Goldstine, Richard Melville, Peter Panagos, and James Pomerene.



*...there has been no other place in the world from which, scholar for scholar and square foot for square foot, more and finer scholarship has emerged over these past forty years than from these surrounding walls.*

**George Kennan** (1904–2005) Professor, School of Historical Studies

## Postwar Years

**A**s World War II came to a close, the Institute's second Director, Frank Aydelotte, approached his retirement. Bamberger and Fuld had died in 1944 and Flexner, although still a Trustee, was playing a minor role. In a very short period, the Institute had grown from one School to three, with increased demands on resources, manpower, and space within the now cramped quarters of Fuld Hall.

Aydelotte had wrestled to balance the needs of the two new Schools, Economics and Politics and Humanistic Studies, with the needs of the more established School of Mathematics. He had also increasingly sought the advice of Faculty in the running of the Institute, and when it was time for the Board to appoint the Institute's third Director, the Faculty was asked for nominations. This procedure was very different from the time of Aydelotte's own appointment, when Flexner had handed the baton to an old friend whom he had tapped for the post from an active role on the Board of Trustees. Nominations for the Institute's third Director ranged from the worlds of business to the military.

J. Robert Oppenheimer, a theoretical physicist with a sound training in the classics and a profound appreciation for the humanities, was the unanimous choice of the Faculty and found favor with the Board. He was appointed as both Director and a member of the Faculty in the School of Mathematics. To date, Oppenheimer is the longest-serving Director of the Institute (1947–66).

Oppenheimer's appointment was electrifying. A charismatic leader, he attracted the cream of the postwar crop of theoretical physicists working in the new area of particle physics and ushered in what has been described as a "golden age for physics." The Institute became the world's center for the development of high-energy physics and field theory. As Copenhagen had been in the twenties and thirties, the Institute became the new mecca for theoretical physicists. Among those who visited the Institute were established figures such as Pauli, Dirac, and Hideki Yukawa, and younger scholars such as Murray Gell-Mann, Geoffrey Chew, Francis Low, Yoichiro Nambu, and Cécile Morette (now DeWitt).

Oppenheimer appointed young physicists in their mid-twenties to the Faculty: Abraham Pais, Freeman Dyson, Tsung-Dao Lee, and Chen Ning Yang. For their work in showing that parity conservation did not hold, Yang and Lee were awarded jointly the Nobel Prize in Physics in 1957. At the time they won the prize, Yang had been a Professor at the Institute

*When humanist studies flourish, life is richer and more gracious. When they decay, in the dark ages of history, . . . life becomes brutal, poor, and mean.*

**Frank Aydelotte** Institute Director 1939–47



J. Robert Oppenheimer in his office in Fuld Hall

**Opposite** Albert Einstein walking from his office at the Institute for Advanced Study to his home nearby on Mercer Street

## J. Robert Oppenheimer 1904–67

Institute Director 1947–66

**J**ulius Robert Oppenheimer was born in New York City, where his father, a German immigrant, worked in the family textile importing business. He grew up in a Manhattan apartment with paintings by van Gogh, Cézanne, and Gauguin on the walls.

After graduating *summa cum laude* from Harvard University, where he studied mathematics, science, philosophy, Eastern religion, French, and English literature, Oppenheimer worked for a year as a research assistant to J. J. Thomson in the Cavendish Laboratory at Cambridge University in England. He received his doctorate from the University of Göttingen, Germany, in 1927, and in 1929, he accepted offers to teach at both the California Institute of Technology and the University of California, Berkeley.

In 1942, Oppenheimer was appointed Technical Director of the Los Alamos Laboratory of the Manhattan Project. After the war, as Chairman of the General Advisory Committee of the Atomic Energy Commission, his opposition to the hydrogen bomb was controversial. As a result of anti-Communist fears fueled by the conservative U.S. Senator Joseph McCarthy, Oppenheimer was denied security clearance and lost his position with the AEC in 1953.

In April 1963, President John F. Kennedy awarded Oppenheimer the Fermi Award, the AEC's highest honor.

**Above** Oppenheimer commissioned architect Wallace Harrison to design the Institute's Historical Studies–Social Science Library. The building was completed in 1965.



for two years and Lee was a visiting Member. Increasingly, the physicists and the mathematicians were operating independently from one another, and when the number of physicists in the School of Mathematics reached a critical mass in the late fifties and early sixties, a separate School of Natural Sciences was founded in 1966.

But it was not only in physics that stellar appointments were made under Oppenheimer. Mathematicians Armand Borel, Deane Montgomery, Atle Selberg, André Weil, and Hassler Whitney joined the School of Mathematics, and George Kennan came to the School of Historical Studies. Kennan's was an unusual appointment and not without its opposition among the Faculty.

Nonetheless, it was a brilliant one, and Kennan was active for a further five decades as Professor and Professor Emeritus until his death at age 101 in 2005.

The first Faculty appointment that Oppenheimer made was in the School of Humanistic Studies. He appointed Harold Cherniss, a specialist in Greek philosophy, in 1948, shortly before merging the School of Humanistic Studies with the School of Economics and Politics to form the School of Historical Studies. The School would establish a pattern of moving into new fields, while continuing to explore those disciplines that had been associated with historical research at the Institute from its earliest years: Greek and Roman civilization, international relations and diplomatic history, modern history, and history of art. Further fields of inquiry were added with the appointment in 1951 of Ernst Kantorowicz in medieval history, followed by Felix Gilbert, a historian of the Renaissance and nineteenth-century Germany, in 1962.

Having consolidated two Schools into one, Oppenheimer turned to the problem of facilities and embarked on a modest building expansion, adding two neo-colonial brick buildings in 1948, and a third in 1953. To tackle the problem of Member housing, which still consisted of spartan war-surplus barracks heated by coal stoves that required constant stoking during the long New Jersey winters, Oppenheimer hired the noted architect Marcel Breuer to design a complex of Member Housing in 1957. Subsequently, Oppenheimer commissioned Wallace K. Harrison to construct a new library that was completed in 1965.

## A Period of Transition

**W**hen Oppenheimer, who died of throat cancer in 1967, stepped down in ill health, Carl Kaysen was appointed as the Institute's fourth Director in 1966. Kaysen was a Harvard-trained political economist with an established career in public service. He had served as President Kennedy's Deputy Special Assistant for National Security Affairs from 1961 to 1963 and would be Institute Director until 1976.

This was to be a period of transition for the Institute. Faculty assembled under Oppenheimer in physics had begun to disperse in the 1960s. Only two Professors—Freeman Dyson and Tullio Regge—remained from the earlier period. Between 1967 and 1971, Kaysen appointed four new Professors—Marshall Rosenbluth in plasma physics, Stephen Adler and Roger Dashen in high-energy physics, and John Bahcall in astrophysics. When the School of Natural Sciences was created in 1966, six Professors remained in the School of Mathematics: Armand Borel, Kurt Gödel, Harish-Chandra, Deane Montgomery, Atle Selberg, and Hassler Whitney. In 1969, Michael Atiyah joined the Faculty, followed by John Milnor in 1970 and Robert Langlands in 1972.

The School of Historical Studies developed into a center for the humanities in the broadest sense. In 1970, Morton White became the first Faculty member to concentrate simultaneously on the history of American thought and on systematic philosophy. The year 1973 saw three new Faculty appointments: art historian Irving Lavin, who succeeded Millard Meiss; Christian Habicht, who would continue the tradition of scholarship in Greek history that had been a part of the Institute's focus since 1935; and John Elliott, whose interests related to early modern history and especially to the history of Spain and the Spanish Empire. Lines of scholarly inquiry that had been established in the early years of the School continued to evolve with successive generations of the permanent Faculty. Glen Bowersock's appointment in 1980 reinforced a traditionally strong area, history of the Roman Empire, in a new way with Bowersock's interests in cultural history, the Roman Empire's relations with the Near East, and late antiquity. The appointment of Giles Constable in 1985, in succession to Kenneth Setton, brought a new emphasis in monasticism to the field of medieval history. The area of military history was revived after a long hiatus with the 1986 appointment of Peter Paret, who added a new dimension to the field through his study of painting and sculpture as historical documents.

*The commitment of the Faculty of the Institute for Advanced Study to the life of the mind is a statement that society matters, people matter, the future matters, youth matters, education matters. Their work clarifies what has been accomplished, what needs yet to be done, and how intricate the human mind and aspirations are. The Institute is an antidote to a consumer society in which people live to work, to buy, to eat, to die.*

**Vartan Gregorian** Institute Trustee Emeritus

Transition



Marilyn and James Simons Hall  
(Architects: Geddes, Brecher, Qualls, Cunningham)

A broad spectrum of disciplines, including those in the social sciences, had been a part of Flexner's conception of the Institute since its beginnings. Flexner had hoped to provide a haven for scholars to examine economic theory and the political theory of government, protected from the vagaries and pressures of the world in a place where they would be free to study contentious social problems.

In 1970, the Institute embarked on an experimental program in the social sciences, the Program in Social Change. With a view to creating a School of Social Science, Kaysen appointed anthropologist Clifford Geertz, a specialist in Indonesia, to take the lead in establishing the new School. Conceiving the social sciences as human sciences, Geertz's vision stressed the interplay of culture and structures for an understanding of social change. His approach gave rise to the field of "interpretive social science," which would become associated with the Institute's School of Social Science.

In 1972, the attempt by Kaysen and Geertz to make a second appointment in social science led to a serious internal dispute. The nomination of Robert Bellah, a sociologist of religion, was voted down by the majority of the Faculty. In spite of this, Kaysen, who felt he had the backing of the Board of Trustees, decided to proceed. The uproar that followed prompted a field day in the national press. In spring 1973, Bellah withdrew, but Kaysen remained as Director for another three years before stepping down. The Program in Social Change became the School of Social Science, and the next appointment in 1974 brought development economist Albert Hirschman to the Institute.

During his tenure, Kaysen had commissioned architect Robert Geddes to build the Institute's Dining Hall and West Building in 1969. The Dining Hall (named Marilyn and James Simons Hall in 2011) was a much-needed replacement for the lunchroom on the fourth floor of Fuld Hall, where the need to eat quickly so as to free one's seat for a colleague gave little opportunity for lingering chat.

Following Kaysen, historian of science Harry Woolf became Institute Director from 1976 to 1987, a period during which the Institute

saw much significant development. Notable changes included the introduction of computer technology and the establishment of an archives, the Association of Members of the Institute for Advanced Study, and the Friends of the Institute for Advanced Study. When the Institute celebrated the centennial of the birth of Einstein (March 14, 1879), Woolf directed a symposium that brought scientists, humanists, and friends to the Institute and edited a volume of the proceedings. In 1980, when the Institute celebrated the fiftieth anniversary of its founding, the occasion was marked by the publication of *A Community of Scholars: The Institute for Advanced Study 1930-1980*, an update of a bibliography published under Oppenheimer and an invaluable record of the Institute's Faculty and Members during its first fifty years.

By this time, the Institute had grown from one School to four, each with its own distinct culture. Under physicist Marvin Goldberger, who served as Institute Director from 1987 to 1991, the popularity of the public lectures given by Faculty prompted plans to construct what would become Wolfensohn Hall, the Institute's auditorium. Plans to construct Simonyi Hall, the home of the School of Mathematics, were also conceived. Yet the fundamental mission of the Institute remained unchanged. As Goldberger observed, "On balance, a modern day Flexner, provided he or she were smart enough, wouldn't go too far wrong to reinvent the Institute largely unchanged in overall form. . . . A truly civilized society should be prepared to support the highest form of pure intellectual endeavor without regard for immediate practical applications."

Under mathematician Phillip Griffiths, who served as Director from 1991 to 2003, the Institute began several major initiatives in the areas of Asian studies, theoretical computer science, theoretical biology, and economics. New academic outreach and mentoring programs included the IAS/Park City Mathematics Institute, the Program for Women in Mathematics, and the Science Initiative Group. The Institute also saw the successful completion of a long-term project to permanently preserve 589 acres of the Institute Woods and Farmlands, and it began an Artist-in-Residence program, introducing a musical presence within the Institute community.

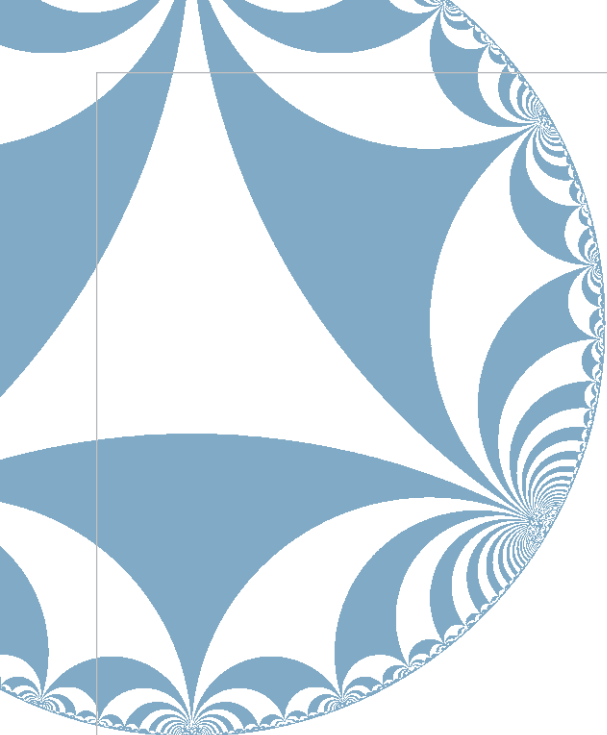
Nearing the close of the twentieth century, the Institute for Advanced Study had tested the vision of its Founders. It had survived the birth of three new Schools. It had survived periods of dissent among the Faculty, between Faculty and Director, and between Faculty and Trustees, and weathered the many squabbles that occur in most institutions made of human beings rather than angels, to paraphrase Felix Frankfurter. That it has done so, and remained true to its core mission, is a testament to the value of the Institute's mission. Academic freedom, the pursuit of fundamental knowledge and scholarship—unfettered and not prejudiced by private interest or short-term agenda, trends, or fashions—has weathered the test of time.



### Peter Goddard

Institute Director 2004–12

**W**hen Peter Goddard, a mathematical physicist, stepped down as Institute Director in June 2012, he joined the Faculty in the School of Natural Sciences, where he had been a Member in 1974 (additionally, he had been a Member in the School of Mathematics in 1988). Goddard unified the Institute's many parts through organization and design, articulated the importance of the Institute's founding principles and the relevance of its present research throughout the world, and nurtured the Institute as a true community of scholars that extends beyond its residential academic village to the more than seven thousand scholars and scientists affiliated with the Institute since its founding. Goddard deftly managed the impact of the worldwide financial crisis that began in 2008 on the Institute's resources and operations and he oversaw two campaigns to fortify the Institute's resources. A total of \$293 million in both operating and endowment funds was raised during his tenure. Additionally, Goddard administered the appointments of fourteen Faculty across the four Schools and guided the creation of the Shelby White and Leon Levy Archives Center; the completion of a Cesar Pelli-designed extension to Bloomberg Hall in 2007, which houses the Simons Center for Systems Biology; and plans for much needed housing for Faculty on campus.



*My life was fashioned by the Institute. There is no question that my whole career would have been completely different if I had not had the remarkable opportunity of participating in a place that is so single-mindedly determined to let your own imagination flourish.*

**Raoul Bott** (1923–2005) Member, School of Mathematics, 1949–51, 1955–57, 1971–72

**Above** Illustration of the action of a modular group. Modular groups, modular forms, and their relations to number theory have been studied at the Institute since its founding.

## School of Mathematics

**T**he School of Mathematics today addresses a broad range of mathematical sciences, including fields in pure mathematics, applied mathematics, theoretical computer science, and mathematical physics. Because the most profound discoveries often involve the combination of ingredients from different mathematical fields, the School chooses Faculty members with broad interests and diverse specialties, and it maintains research on many different areas of mathematics at the same time. For both Faculty and Members, it favors mathematical fields where deep and fundamental research is possible, and where significant new advances can be expected.

The School's activity in areas of algebra/number theory, representation theory, and geometry/topology continues a tradition of strength dating from the earliest days of the Institute. Over the years, mathematical discoveries made at the Institute in these areas have changed the course of the subject. Some recent examples include Vladimir Voevodsky's use of methods from algebraic topology to prove the Milnor conjecture, a fundamental result in algebra. The results of Robert Langlands's combining geometry and analysis to study number theory, building on the work of two earlier generations of School Faculty members, play an essential role in many of the most striking recent developments in number theory, from the proof of Fermat's last theorem, which was achieved by long-term Member Andrew Wiles, to the resolution of the fundamental lemma by Bao Châu Ngô, another long-term Member. These areas of mathematics also form the basis of interaction with the School of Natural Sciences. Ideas from physics, such as gauge fields and strings, have been key in solving problems in topology, while in the opposite direction, ideas from algebraic and differential geometry are important ingredients in theoretical physics.

The areas of analysis, partial differential equations, and mathematical physics arrived at the School of Mathematics in the 1980s (although there were earlier precursors). These fields





Simonyi Hall common room

have many applications ranging from the study of fluids and properties of materials to differential and symplectic geometry as well as to combinatorics. All of these have been subjects of special programs in the School of Mathematics.

In the 1990s, the School added discrete mathematics and theoretical computer science, reviving an earlier theme of von Neumann and Gödel. The integration of theoretical computer science with traditional mathematics has established the Institute as a world center in the field, attracting senior mathematicians as well as the most promising young scientists to postdoctoral positions.

The School of Mathematics has two objectives—creating new mathematical knowledge and furthering the careers of mathematicians. In pursuit of the second objective, every year the School selects about sixty talented mathematicians and computer scientists who come as



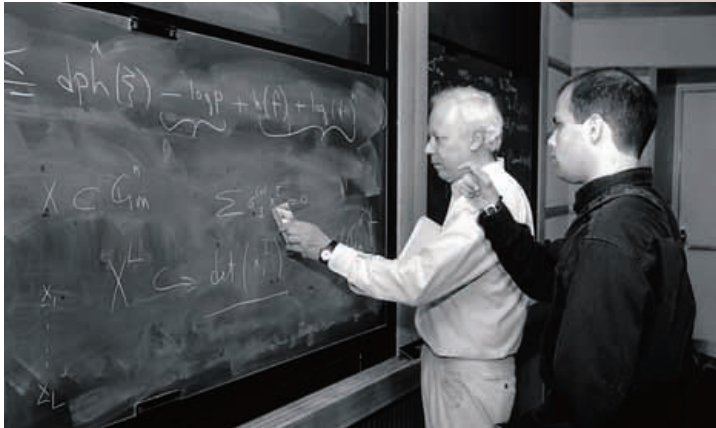
**Simonyi Hall and Wolfensohn Hall, 1993**

Designed by architects Cesar Pelli & Associates in cooperation with the Faculty of the School of Mathematics, the new mathematics building was intended to create an ideal physical environment for research. Next to the mathematics building is the 220-seat Wolfensohn Hall, used for lectures, concerts, and films. A courtyard, designed by Diana Balmori, connects the two buildings to the rest of the campus and features an outdoor blackboard, a copper-clad fountain sculpture, and benches.

visiting Members. They come from all over the world, bringing many different points of view. They represent all stages of mathematical careers, a mix designed to foster productive interactions. Promising young mathematicians work in close collaboration with well-established senior mathematicians. Members with diverse mathematical specialties are chosen to encourage cross-fertilization of ideas, in keeping with the School's belief in the unity of mathematics. Each year, there is a special focus in one, occasionally more, aspect of mathe-

matics. These special programs are led by one or two of the world's leading figures in the discipline together with a member of the permanent Faculty of the School. These special programs attract a group of visiting Members, who may compose up to a third of the total Membership in the School. They serve to increase the School's mathematical coverage, and to attract a wide variety of Members.

The environment for Members within the School is designed to offer a minimum of distractions, a maximum of opportunities for mathematical stimulation, and time for intensive concentration on research. Members are given a unique opportunity to discover new mathematical results and broaden their mathematical horizons through seminars, interaction with the Faculty, and interaction with each other. A large fraction of the world's best mathematicians have benefited from a Membership at the Institute.



Professor Enrico Bombieri (left) with visitor Bjorn Poonen

*Spending a year at the Institute has been a very important and special time in my career as a mathematician. In particular, it provided a smooth transition from being a graduate student to becoming an independent scholar.*

**Member** School of Mathematics

**Member Karen Uhlenbeck**, whose areas of expertise include aspects of theoretical physics, was already a leading mathematician when she first came to the Institute as the Albert Einstein Fellow in the School of Mathematics in 1979–80. She returned for visiting terms in 1995 and 2012, and was the School's Distinguished Visiting Professor in 1997–98. A successful woman in a field dominated by men, Uhlenbeck has demonstrated a long-term commitment to encouraging younger women to pursue careers in mathematics. In 1993, with colleague Chuu-Lian Terng, Uhlenbeck organized a mentoring program for women mathematicians to run in conjunction with the IAS/Park City Mathematics Institute (of which she was also a founder in 1991). The Program for Women and Mathematics has been held annually at the Institute for Advanced Study since 1994, and is now a joint program of the Institute's School of Mathematics and Princeton University. Uhlenbeck's abilities and accomplishments have been recognized with awards that include, among others, a MacArthur Prize Fellowship (1983) and the National Medal of Science (2002).

# School of Historical Studies

**T**he School of Historical Studies supports scholarship in all fields for which historical methods are appropriate, embracing research throughout the humanistic disciplines, from socioeconomic developments and political theory to the history of art, music, and literature. Without a formal curriculum, the School bears no resemblance to a traditional academic department of history. Faculty and Members practice a range of methods of inquiry and scholarly styles, both traditional and innovative.

Classics, modern history, and medieval history have been part of the School since its founding, but in recent decades these have evolved with new emphases and approaches, reflecting the areas of interest of contemporary Faculty. Jonathan Israel, appointed in 2001, studies the impact of radical thought on the Enlightenment and the emergence of modern ideas of democracy. Medieval historian Caroline Walker Bynum, who was instrumental in introducing the concept of gender into the study of medieval Christianity, was succeeded in 2012 by Patrick Geary, whose current research into European migration patterns examines evidence from ancient DNA to illuminate the medieval past. Angelos Chaniotis, who in 2008 succeeded Glen Bowersock, uses epigraphic evidence and hagiography to study emotions and identity in the ancient world. The field of art history, established by Erwin Panofsky, and long associated with medieval, Renaissance, and early modern art, took a new direction in 2002 when Kirk Varnedoe, a specialist in contemporary art and a museum curator, joined the Faculty. Following Varnedoe's untimely death, Yve-Alain Bois has continued this tradition since 2005.

*The very concept of history implies the scholar and the reader. Without a generation of civilized people to study history, to preserve its records, to absorb its lessons and relate them to its own problems, history, too, would lose its meaning.*

**George Kennan** (1904–2005) Professor, School of Historical Studies, on receiving the Gold Medal for History from the American Academy and Institute of Arts and Letters in 1984



Members Ittai Weinryb and Ortal-Paz Saar (center) during a seminar on medieval history

A male antelope, flanked by predators, grazes peacefully on this cup from Athens that was mended in antiquity and dates to 550–525 B.C. Bequest of Ernst Kantorowicz, former Professor in the School of Historical Studies



*The months at IAS have given me the chance to engage in the sort of broad and comprehensive reading that is necessary to start a new project . . . the sort of activity that is not easily compatible with a normal teaching schedule. . . . Especially beneficial in directing my readings has been the exchange of ideas with other Members.*

**Member** School of Historical Studies

The School expanded its focus to include Islamic history starting with Oleg Grabar in Islamic art and culture in 1990, followed in 1997 by Patricia Crone, whose research focuses on the Near East from late antiquity to the coming of the Mongols. In 2003, East Asian history became a permanent area of research with the appointment of Nicola Di Cosmo as the first Luce Foundation Professor in East Asian Studies. The George F. Kennan Professorship ensures that the history of modern international relations will continue within the School. Avishai Margalit, whose work focuses on the contemporary human condition, moral issues, and current problems facing Western societies, served as Kennan Professor from 2006–2011. In 2011, the School welcomed Visiting Professor Michael van Walt van Praag, an international lawyer specializing in intra-state conflict resolution. In 2001, a Membership in music studies was established by a grant from the Edward T. Cone Foundation.

In an age of increasing globalization, an understanding of human history across time and place takes on new importance. The Institute's School of Historical Studies is uniquely positioned to foster the work of Visitors and Members that crosses conventional departmental and professional boundaries and actively promotes interdisciplinary research.

**Michal Biran spent the academic year** 2001–02 as a Member in the School of Historical Studies, one year after she had completed her Ph.D. at the Hebrew University in Jerusalem. During her year at the Institute, she consulted closely with Professor Patricia Crone, beginning a long association that has enhanced the work of them both. While at the Institute, Biran also consulted with Joshua Fogel, then Mellon Visiting Professor, whom she mentioned with appreciation, along with Professor Crone and the nurturing atmosphere of the Institute, in her acknowledgments for her book *The Empire of the Qara Khitai in Eurasian History*, published in 2005. According to Biran, the time she spent at the Institute had an impact on her work that also ultimately led to the publication of her 2007 book on Chinggis Khan. Michal Biran is now Max and Sophie Mydans Foundation Professor in the Humanities and Director of the Louis Frieberg Center for East Asian Studies at the Institute of Asian and African Studies of the Hebrew University of Jerusalem. Her transcultural historical research of the Mongol Empire has enabled her to bridge the gap between Sinologists, Mongolists, and Islamic studies scholars, and her publications have become standard reference works on the Mongol and pre-Mongol periods. She is presiding over a five-year research project, "Mobility Empire and Cross-Cultural Contacts in Mongol Eurasia," funded by the European Research Council.

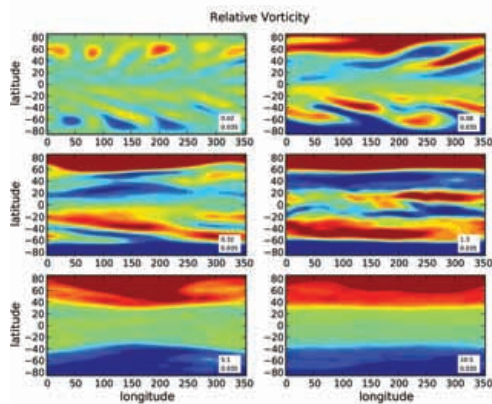


The School of Historical Studies–Social Science Library, designed by architect Wallace Harrison, was completed in 1965.

# School of Natural Sciences

*There really isn't anywhere like the Institute. Because of its very strong postdoctoral programs in astrophysics, physics, mathematics, and other disciplines, it has been a kind of funnel through which a large fraction of all of the most productive researchers in many of the physical sciences have passed.*

**Scott Tremaine** Richard Black Professor



This image, created on the Institute's Aurora computer cluster by a Member in the School of Natural Sciences, is part of a project that seeks to identify the transition to superrotation in planetary atmospheres.

**I**n the School of Natural Sciences today, the areas of interest in theoretical physics include elementary particle physics, string theory, quantum theory and quantum gravity and their relationship to geometry, theoretical and observational astrophysics, and cosmology.

In 1985, Edward Witten, who subsequently joined the Faculty in the School of Natural Sciences in 1987, was invited to the Institute by the School of Mathematics to give several lectures on string theory aimed at mathematicians. Interest in the lectures was such that a program in string theory was organized for the academic year 1987–88. While the program originated in the School of Mathematics, the School of Natural Sciences became increasingly involved, and as had been the case in earlier years, the borderline between the two Schools became somewhat blurred. The program established the increased contact between mathematicians and physicists that continues today.

Current activity in the School's astrophysics group encompasses astronomical systems from nearby planets to distant galaxies, from black holes to the dark matter and dark energy that dominate the evolution of the universe. The growing cross-fertilization between astrophysics and elementary particle physics is exemplified by the appointments of Nima Arkani-Hamed and Matias Zaldarriaga, whose work crosses the boundary between these two disciplines.

An addition to the School's scope of work is the Simons Center for Systems Biology, which conducts research at the interface of molecular biology and the physical sciences. The Simons Center, which was established in the School of Natural Sciences in July 2004, fosters original theoretical research in fundamental biology, most commonly utilizing genetic and molecular approaches, and in some cases focusing on understanding disease processes. In 2003, Arnold Levine, a leader in cancer research, was appointed as the first biologist on the permanent Faculty. Stanislas Leibler, who began his research career in physics and now works

in biology, was appointed to the Faculty in 2009 while retaining his professorship at Rockefeller University and continuing to head his laboratory there.

Each year the School has about sixty Members, the majority of them postdoctoral fellows, who are typically appointed for three years, although longer-term (five-year) Memberships are available. These Members work together in Bloomberg Hall, which provides a unified home for the School, encouraging collaboration in its many scientific areas—from molecular biology to mathematical physics—and facilitating the possibility for any number of scientific innovations.

From its earliest days, the Institute has been a leading center for fundamental physics, contributing substantially to many of its central themes, which now interrelate with astrophysics and biology. Members in the astrophysics research group employ an array of tools from theoretical physics, large-scale computer simulations, and ground- and space-based observational studies to investigate the origin and composition of the universe, and to use the universe as a laboratory to study fundamental physics. At the Simons Center, the tools of modern physics and mathematics are being applied to biological investigation. This collaborative and pioneering approach to the sciences, which extends to the Institute's School of Mathematics, Princeton University, and the larger scientific community, has transformed research in these fields and presents opportunities for powerful and important discoveries.

**Raúl Rabadán arrived at the Institute** in October 2003 as a Member in theoretical physics, after spending two years as a fellow at CERN, the European Organization for Nuclear Research, in Geneva, Switzerland. In 2006, he transitioned to biology after attending lectures by Professor Arnold Levine and becoming fascinated with viruses. Rabadán, now Assistant Professor at Columbia University, and his collaborators recently proposed using techniques developed for algebraic topology to uncover evolutionary relationships beyond the single figure—a phylogenetic tree that has become the accepted model for depicting evolution—contained in Charles Darwin's *On the Origin of Species*. Such a tree fails to capture evolutionary relationships if there has been any horizontal (from one species to a different species) exchange of genetic material among the ancestors of organisms. Rabadán, in collaboration with Levine, Professor Robert MacPherson in the School of Mathematics, and Member Nils Baas, is applying and extending persistent homology to diverse biological problems, such as the evolution of influenza viruses, to explore the structure of biological information and demonstrate how novel biological processes can lead to new structural representations of evolution.



Professor Juan Maldacena (left), in discussion with Herbert Neuberger, Member in the School of Natural Sciences

*The environment at the Institute has been extremely conducive to my research. In particular I benefited very much from the opportunity to interact with the other postdoctoral Members, several of whom became my collaborators. Equally importantly I benefited from the very strong external speakers who come to the Institute to give seminars; my current research project was inspired by hearing two such talks.*

**Member** School of Natural Sciences

*Clifford Geertz's vision for the School of Social Science stressed diversity. He sought a wide range of approaches and problematics, not an orthodoxy. In that sense, he didn't want a "school," but a place where debate would flourish and there would be cross fertilizations from which new ways of thinking would emerge, (in his words) "a critical place where people could think their own thoughts and resist the heavily institutionalized aspects of big research in big social science departments."*

**Joan Wallach Scott** Harold F. Linder Professor



West Building, where Members and Faculty of the School of Social Science have their offices, was designed by architect Robert Geddes.

## School of Social Science

**T**he School of Social Science, the Institute's youngest School, was founded by the anthropologist Clifford Geertz, who was soon joined by the economist Albert Hirschman. In 1980, the political theorist and moral philosopher Michael Walzer became the third Faculty member. Like his two colleagues, he combined interest in theoretical issues with attention to political activity, exploring topics such as just war and social justice.

Five years later, Joan Wallach Scott was appointed to the Faculty. Scott works on questions of gender and has become a leading figure in the emerging field of critical history, which examines the premises of conventional historical practice, including the nature of historical evidence and historical experience and the role of narrative in the writing of history. Scott succeeded Geertz as Harold F. Linder Professor in 2000.

In 2007, Danielle Allen became the UPS Foundation Professor, a position Walzer had held since 1986. As a democratic theorist and historian of political thought, Allen investigates core values, such as equality, non-domination or freedom, and trustworthiness. As a political sociologist, she analyzes relations among legal structures, political values, and power dynamics.

In 2009, Didier Fassin was appointed as the first James D. Wolfensohn Professor. As a physician and sociologist, Fassin has conducted research on global health, current epidemics, the embodiment of social inequalities, and the disparities in the value of life. His recent body of work in the emerging field of political and moral anthropology deals with contemporary issues around humanitarianism, asylum, and immigration, as well as police, justice, and prison.

In 2013, Dani Rodrik succeeded Eric Maskin, who won the Nobel Prize in Economics in 2007, as Albert O. Hirschman Professor. Rodrik is a political economist whose work bridges the realms of theory and public policy across the field of economics—from the consequences





Professor Didier Fassin (center) leads a seminar as part of the “Morals and Moralities” theme year in the School of Social Science.

of globalization to the role of national institutions, the challenges of inequality, and the tensions between the market and the state.

While each Faculty member is rooted in his or her own discipline, all do work that transcends disciplinary boundaries. Each year, the School brings together scholars with various perspectives to examine historical and current problems. Professors in the School have participated actively in contemporary debates about the meaning of the “interpretive turn” in anthropology, history, and political theory; about the centrality of culture, language, ritual, and moral understandings in the study of society; about the character and direction of social change; and about the policies and practices in development.

While the School develops a theoretical analysis of contemporary societies and their transformation, the Faculty have been engaged in a reflection that is critical to approaching major issues of our time. Walzer’s study of conflicts offers general criteria for thinking about legitimate grounds for military intervention. Scott’s research on gender and secularism enlightens current discussions worldwide regarding the regulation of religious symbols. Allen’s program on education provides conceptual and empirical elements necessary to fostering more justice and equity in the school system. The ethnography of the state conducted by Fassin contributes to

*Not only in terms of the concrete outputs one can trace directly back to the year of the fellowship, but also in terms of less tangible, but equally important, insights into new ways of thinking through my material and designing the next phase of my research, the Institute has provided a timely intervention into my efforts—the impact of which I expect to see for some years to come.*

**Member** School of Social Science



Members in the School of Social Science, Duana Fullwiley and Bruce Grant

public debates and policies on the reduction of inequalities and the treatment of disadvantaged groups. The political economy of development proposed by Rodrik has concrete consequences on the way institutions can be reformed and governments rendered more efficient.

The reputation of the School's Faculty, the appeal of high-level interdisciplinary dialogue, and the unique environment that the Institute provides attract scholars in a wide range of fields, including political science, economics, law, psychology, sociology, anthropology, history, philosophy, and literary criticism. Devoted to a multidisciplinary, comparative, and international approach to social research, the School creates a sense of community for its scholars by designating a theme for each year, which is neither exclusive nor excluding. It publishes *Occasional Papers*, drawn from Members' presentations each year, as well as a series of *Economic Working Papers*.

**When Quentin Skinner** first came to the Institute for Advanced Study as a Member in the School of Historical Studies for the 1974–75 academic year, he was at a stage of his career when the demands of teaching and lecturing allowed him little prospect of finishing the book he was attempting to write on the development of the theory of the state. Subsequently invited as a long-term Member in the School of Social Science from 1976–79, Skinner was able to use these years to complete his book, which was published in two volumes in 1979. It was awarded the prestigious Wolfson Prize for History, and was listed by the *Times Literary Supplement* as one of the hundred most influential books of the past fifty years. Since then, Skinner has gone on to publish numerous works on contemporary political philosophy, the history of political theory, and the discussion of interpretation and hermeneutics across the humanities and social sciences. He remembers his years at the Institute with deep affection as one of the most productive periods of his academic life. The School has appointed several long-term Members in addition to Skinner: social historian and historical sociologist William Sewell Jr. in 1975; sociologist of literature Wolf Lepenies in 1982; and, in 1999, Adam Ashforth, a political scientist working on South Africa.

*It is the vibrancy created by various serendipitous encounters at lunch or teatime and other fortuitous moments during the day, combined with the more organized intellectual life—seminars, discussion groups, lectures—that gives the Institute its unique quality.*

**Peter Goddard** Institute Director 2004–12



Fuld Hall Common Room

*The Institute for Advanced Study has achieved a position that is unrivaled in the world of science and scholarship. In all fields where it has been engaged, its contributions have set the standards against which other contributions may be measured.*

**Björn Wittrock** Principal, Swedish Collegium for Advanced Study



Visiting scientists in the School of Natural Sciences, Alison Farmer, Erik Reese, Joop Schaye, and Gilbert Holder

## The Institute for Advanced Study Today

**T**he Institute for Advanced Study has remained small, but its influence has been wide and profound through the achievements of its Faculty and Members, the impact it has on their academic development, and through the new institutions, ever growing in number, that have been modeled on or inspired by Flexner's vision as realized by the Institute.

The primary aim of each of the Institute's four Schools is to offer talented scholars from around the world the time and resources to pursue their studies while applying the highest standards of scholarship. Applicants to the Schools are primarily motivated by their need for free time in which to carry on research and writing. Members benefit from the many opportunities to encounter and test new points of view in seminars and other scholarly gatherings, as well as in informal conversation. Those who join the Institute's international community of scholars often find unexpected conjunctions of interest across fields.

In recent years, the Institute has broadened its scope by moving selectively into new fields, including computer science and biology, where advances increasingly depend on insights from mathematics and physics, core disciplines in which the Institute has long been preeminent. In the humanities, a Faculty appointment has been made in East Asian studies, an area previously not studied at the Institute. These new commitments are all in areas that offer major promise, and in which the Institute can hope to make a significant contribution.

The Program in Interdisciplinary Studies, directed by Professor Piet Hut, explores different ways of viewing the world, spanning a range of disciplines from computational astrophysics, geology, and paleontology to artificial intelligence, cognitive psychology, and philosophy. Hut's own research focuses on computational astrophysics, in particular multiscale multiphysics simulations of dense solar systems. He is actively involved in



Hélène Esnault, Member in the School of Mathematics, in the Mathematics–Natural Sciences Library in Fuld Hall



### Robert Dijkgraaf

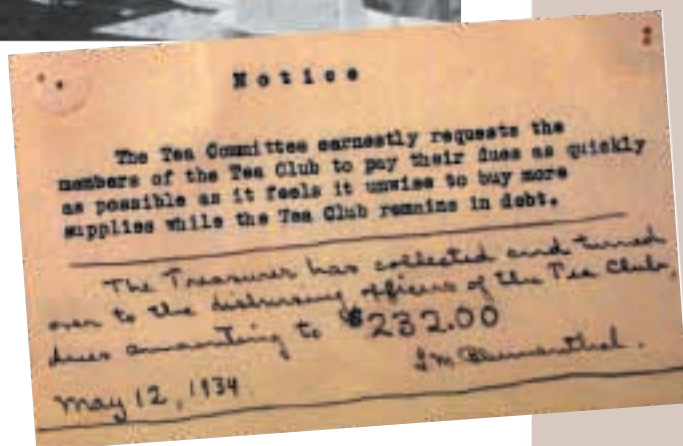
Director and Leon Levy Professor 2012–

**R**obert Dijkgraaf, Director of the Institute for Advanced Study and Leon Levy Professor since July 2012, is a mathematical physicist who has made significant contributions to string theory and the advancement of science education. His research focuses on the interface between mathematics and particle physics. In addition to finding surprising and deep connections between matrix models, topological string theory, and supersymmetric quantum field theory, Dijkgraaf has developed precise formulas for the counting of bound states that explain the entropy of certain black holes. For his contributions to science, Dijkgraaf was awarded the Spinoza Prize, the highest scientific award in the Netherlands, in 2003, and was named a Knight of the Order of the Netherlands Lion in 2012.

Past President (2008–12) of the Royal Netherlands Academy of Arts and Sciences and Co-Chair of the InterAcademy Council (since 2009), Dijkgraaf is a distinguished public policy adviser and passionate advocate for science and the arts. Many of his activities—which have included frequent appearances on Dutch television, a monthly newspaper column in *NRC Handelsblad*, several books for general audiences, and the launch of the science education website *Proefjes.nl*—are at the interface between science and society.

## The Tradition of Tea

Each weekday at 3 p.m., the Common Room of Fuld Hall fills with noise and bustle as Faculty, visiting scholars, and staff gather for tea and fresh-baked cookies, a tradition that dates back to the Institute's beginnings. Elizabeth Veblen (seen below), the wife of Oswald Veblen, then Professor in the School of Mathematics, introduced afternoon tea to the Institute community when the Institute was housed in Fine Hall on the campus of Princeton University. When the Institute moved to Fuld Hall in 1939, the custom continued, as it does today.



In the early days of the Institute, tea was organized by collective contributions to a "kitty."

interdisciplinary explorations in the areas of cognitive science and philosophy of science centered around questions involving the nature of knowledge.

Director's Visitors, who work in a variety of fields, including areas not represented in the Schools, contribute much to the vitality of the Institute. Their time at the Institute has been dedicated to international relations, art, writing, photography, biochemistry, and energy studies, among other areas.

Although the Institute's resident academic community has been kept intentionally small, its commitment to learning has produced results out of all proportion to its size. Some thirty-three Nobel laureates and thirty-eight out of fifty-two Fields Medalists have been associated with the Institute. Many more Institute Professors and Members have been winners of the Wolf or MacArthur prizes. The influence of the Institute and its Members also can be seen in the proliferation of institutes for advanced study around the world. The great growth in the number of institutions modeled on the Institute, and on Flexner's view that the research that has the most profound impact on knowledge and understanding is driven by curiosity rather than the prospect of immediate application, is a powerful testimony to their perceived value. These institutes for advanced study allow time for intense and prolonged concentration on challenging research problems amid trends in society that have led to greater demands for specified milestones and predetermined objectives. Understandable as these requirements are, they are, to a large extent, inimical to fundamental research. If

researchers know precisely what they are going to do before they do it, and how and when they will get their results, it is unlikely that they are doing truly fundamental research. The really important ideas, the ones that change the way we think and the way that we live our lives, are likely to be found by researchers following their curiosity into the unknown, rather than by objective-driven research.

## A Community of Scholars

Providing exceptional opportunities for the intellectual development and growth of visiting scientists and scholars is one of the Institute's principal purposes. What began with twenty-three Members invited to the School of Mathematics in 1933 has grown such that the Institute is now able to award approximately 190 Memberships annually to scholars from universities and research institutions throughout the world. The major consideration in choosing a visiting Member is the expectation, based on

past performance, that his or her term at the Institute will result in work of significance and high quality. Over half the Members come from outside the United States, and some, particularly in the School of Natural Sciences, are in residence for two or three years. In the course of a typical year, Members are joined by some four hundred associated scholars who for a week or more participate in the many seminars, conferences, and other gatherings sponsored by the Institute. Some Members use their time to complete books or conduct library research. Others explore scholarly interests with one or more of the Institute's Faculty members, or take part in topical programs and workshops sponsored by the four Schools. In recent years, research at the Institute has involved using genetic data to potentially revolutionize our understanding of migration history; developing a new branch of mathematics called homotopy type theory and the related univalent foundations of mathematics, which can be used to verify individual mathematical proofs and facilitate the large-scale formalization of mathematics; trying to understand how mind emerges from brain just as we understand how tornadoes emerge from molecules; and developing a critical anthropology of morals that extends from immigration policies and minorities issues to the administration of asylum and the deployment of humanitarianism.

Though Members are not students in the narrow sense of being degree candidates, intellectual growth is still ahead, and learning opportunities are abundant at the Institute. The Faculty places great emphasis on mentoring, which is viewed as a serious obligation. For scholars still in the formative phase of their careers, when independent work is of the highest importance to their intellectual development, a stay at the Institute can set the course of research for years to come. For more established scholars, the Institute offers time and space for completion of major projects or for reflection that can take their research in productive new directions. These temporary Members then return to or join the faculties of universities all over the world and share what they have learned as a result of their stay at the Institute. This might be termed the invisible work of the Institute; its visible work is contained in the publications of the Faculty and Members. Both serve to reinforce in highly significant ways the quality of scholarship, teaching, and research throughout the world.



The outdoor blackboard in use by Members in the School of Mathematics

Faculty and Members share interests and knowledge outside their own fields of specialization. The fact that Members live together in Institute housing, eat in the same dining hall, share the same common room and libraries, and carry out their work in an institutional setting where human scale has been carefully maintained is conducive to common interest, mutual understanding, and friendship.

### **IAS and Beyond**

Faculty and Members are also a part of the larger community of Princeton, New Jersey, with its University and its numerous institutions of research and learning, including nearby Rutgers, the State University of New Jersey. Although the Institute has no administrative or organic connection with Princeton University, there has always been very close collaboration between the two institutions. The proximity to a major university with excellent library facilities was a major consideration in placing the Institute in the town of Princeton. In 1945, the Institute made a substantial financial contribution toward the creation of the Firestone Library at Princeton University—as a result, Institute Faculty and visiting scholars have faculty privileges at the library.

The Institute also engages in outreach beyond its local community. Since 1994, the IAS/Park City Mathematics Institute has integrated mathematics educators, researchers, and students through innovative programs. The Program for Women and Mathematics, sponsored jointly with Princeton University, provides substantive mathematics content as well as practical encouragement for women to pursue careers in the field of mathematics. The School of Natural Sciences sponsors Prospects in Theoretical Physics, a two-week residential summer program held at the Institute for exceptionally promising graduate students and postdoctoral scholars. In 1999, the Institute created the Science Initiative Group, an international team of scientific leaders and supporters dedicated to fostering science in developing countries.

Throughout each academic year, the Institute offers lectures and special events that are open to the public. Additionally, the Institute values the opportunity to share with the larger community the Edward T. Cone Concert Series and talks organized by the Institute's Artist-in-Residence. The Artist-in-Residence Program was established in 1994 to create a musical presence within the Institute community, and to have in residence a person whose work could be experienced and appreciated by scholars from all disciplines. Artists-in-Residence have included Robert Taub, Jon Magnussen, Paul Moravec, Derek Bermel, and, as of 2013,



The Institute is a true academic village. It provides many opportunities for Members, who live together in housing adjacent to the Institute campus, to interact with one another through a series of concerts, lectures, programs, forums, and activities.





### The Legacy of Albert Einstein

**A**fter Einstein died, photographs of his office at the Institute for Advanced Study (left) were widely distributed in the press. The myth spread that the office remained locked and untouched. It did not. The office continues to be used by a member of the Institute's Faculty.

Einstein's home on Mercer Street (above) passed to the Institute in 1986 following the death of Einstein's stepdaughter Margot, who had lived there. It was requested at that time that the home not be used in any manner as a memorial to Einstein. The residence remains private and is owned by the Institute.

The home was one of the first planned gifts to the Institute for Advanced Study, and it prompted the creation, in 1996, of the Einstein Legacy Society in honor of those who name the Institute in their will and those who make a planned gift.

In 2003, in the spirit of Einstein's generosity, the Institute for Advanced Study donated items from Einstein's home in Princeton to the Einstein House in Berne, Switzerland, as well as sixty-five of his possessions to the Historical Society of Princeton. The sixty-five items include Einstein's treasured Biedermeier-style grandfather clock, his favorite armchair, his wooden music stand, and his pipe.

Sebastian Currier. Information about lectures and concerts open to the public are provided on the Institute's website at [www.ias.edu](http://www.ias.edu).

The abundant natural beauty of the Institute's eight-hundred-acre site, including the Institute Woods, fields, and wetlands, forms a key link in a network of green spaces in central New Jersey. The majority of these lands have been permanently conserved. The Institute Woods and Farmlands are open to the public and are enjoyed by bird watchers, walkers, runners, and cross-country skiers.

### Supporting the Institute

Underlying the Institute's ability to generate new knowledge of lasting value is its financial independence. That the Institute has remained true to its original mission is a tribute to the



Children by the Institute Pond

importance and continuing relevance of that mission, to the magnificence of the founding gift made by Bamberger and Fuld, and to the generosity of those benefactors who support the Institute today. To provide a haven where distinguished scholars and scientists can pursue curiosity-driven research into fundamental questions meets a need at least as pressing now as in 1930. The ability of the Institute to pursue this aim depends entirely on the continuing strength of its resources, especially its endowment. The Institute constantly reaffirms both the importance and relevance of its mission and its commitment to maintaining the strength of the endowment, initially provided by the Founders, which makes the work of the Institute possible.

Like any research institution, the Institute depends on, and is grateful to, foundations and agencies for funding some of its programs. Institute revenues are also derived from contributions by individuals and corporations, and from ongoing support by the Friends of the Institute for Advanced Study and the Association of Members of the Institute for Advanced Study (AMIAS).

The Friends of the Institute for Advanced Study are partners with the Institute in the advancement of research and scholarship at the highest level. Friends make annual unrestricted contributions to the Institute and participate in its intellectual and cultural life through forums, lectures, concerts, films, and other gatherings. The Friends' generosity demonstrates the leadership necessary to maintain the Institute's extraordinary influence on science and scholarship.

The central purpose of AMIAS is to support the mission of the Institute and to continue for future generations the opportunities for independent, undistracted scholarship that AMIAS members themselves have experienced. Founded in 1974, AMIAS now has some five thousand members in more than fifty countries.

These sources of support are vitally necessary additions to endowment income in the absence of tuition and other fees as well as of general-purpose income provided by the large-scale alumni giving characteristic of most private educational institutions. Its carefully managed endowment gives the Institute freedom and flexibility when it comes to choosing which lines of research to pursue, an independence that is becoming increasingly rare.

Abraham Flexner invited the world's greatest minds to the Institute for Advanced Study with a promise not of "duties" but of "opportunities." Today, the Institute continues to attract exceptionally talented scholars and scientists whose intellectual explorations are extending further than Flexner could have dreamed. Supporting this extraordinary enterprise of learning is a meaningful opportunity to enable advances in knowledge that change the way we understand the world. ■