THE INSTITUTE FOR ADVANCED STUDY

Founded by Louis Bamberger and Mrs. Felix Fuld

BULLETIN NO. 4

THE INSTITUTE FOR ADVANCED STUDY
20 Nassau Street
Princeton, New Jersey
February, 1935

Extract from the letter addressed by the Founders to their Trustees, dated Newark, New Jersey, June 6, 1930

"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."

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Term expires 1937

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Term expires 1938

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Director: ABRAHAM FLEXNER

SCHOOL OF MATHEMATICS

Professors

JAMES WADDELL ALEXANDER
ALBERT EINSTEIN
MARSTON MORSE*
OSWALD VEBLEN
JOHN VON NEUMANN
HERMANN WEYL

Visiting Professor (1934-1935)

P. A. M. DIRAC

Associate

WALTHER MAYER

Assistants

RICHARD BRAUER
ROBERT S. MARTIN
ARTHUR E. PITCHER*
JOHN L. VANDERSLICE
LEO ZIPPIN

SCHOOL OF ECONOMICS AND POLITICS

*Professors**

EDWARD MEAD EARLE
DAVID MITRANY
WINFIELD W. RIEFLER

* Beginning October 1935

CALENDAR

1935-1936

October 1: First term opens.
December 14: First term closes.
January 14: Second term opens.
May 1: Second term closes.

SCHOOL OF MATHEMATICS

Workers Registered 1934-1935

Georg Aumann, Ph.D., University of Munich, 1931
Privatdozent, University of Munich-Technische Hochschule
Rockefeller Foundation Fellow

Sherburne F. Barber, Ph.D., University of Illinois, 1933
National Research Council Fellow

Robert H. Cameron, Ph.D., Cornell University, 1932
National Research Council Fellow

John F. Carlson, Ph.D., University of California, 1932

Alonzo Church, Ph.D., Princeton University, 1927
Assistant Professor, Princeton University

James A. Clarkson, Ph.D., Brown University, 1934

Alfred H. Clifford, Ph.D., California Institute of Technology, 1933

Jesse Douglas, Ph.D., Columbia University, 1920
Associate Professor, Massachusetts Institute of Technology

Patrick Du Val, Ph.D., Trinity College, Cambridge, England, 1930

*Robert L. Echols, Ph.D., University of Virginia, 1930

Carl Eckart, Ph.D., Princeton University, 1925
Associate Professor, University of Chicago

*Ralph Hull, Ph.D., University of Chicago, 1932
National Research Council Fellow

**Georges Lemaître, D.Sc., University of Louvain, 1920
Ph.D., Massachusetts Institute of Technology, 1927
Professor, University of Louvain

Daniel C. Lewis, Jr., Ph.D., Harvard University, 1932

* First term
** Second term

WILHELM MAGNUS, Ph.D., University of Frankfurt, 1929
Privatdozent, University of Frankfurt
Rockefeller Foundation Fellow
ALFRED J. MARIA, Ph.D., Rice Institute, 1925
Professor, University of Illinois
WILLIAM T. MARTIN, Ph.D., University of Illinois, 1934
National Research Council Fellow
DEANE MONTGOMERY, Ph.D., University of Iowa, 1933
National Research Council Fellow
CHARLES N. MOORE, Ph.D., Harvard University, 1908
Professor, University of Cincinnati
FRANCIS J. MURRAY, Ph.D., Columbia University, 1935
National Research Council Fellow
SUMNER B. MYERS, Ph.D., Harvard University, 1932
Instructor, Harvard University
DAVID S. NATHAN, Ph.D., University of Cincinnati, 1933
National Research Council Fellow
BORIS PODOLSKY, Ph.D., California Institute of Technology, 1928
NATHAN ROSEN, D.Sc., Massachusetts Institute of Technology, 1932
OSWALD K. SAGEN, Ph.D., University of Chicago, 1934
*I. J. SCHOENBERG, Ph.D., University of Jassy, Roumania, 1926
CONRAD L. B. SHUDEMAN, Ph.D., Harvard University, 1908
**CARL L. SIEGEL, Ph.D., University of Göttingen, 1920
Professor, University of Frankfurt
**MARY EMILY SINCLAIR, Ph.D., University of Chicago, 1908
Professor, Oberlin College
ANNA A. STAFFORD, Ph.D., University of Chicago, 1933
Teacher, St. John Baptist School, Mendham, N.J.
MARTIN H. STOBBE, Ph.D., University of Göttingen, 1930
JOSEPH L. WALSH, Ph.D., Harvard University, 1920
Associate Professor, Harvard University
MORGAN WARD, Ph.D., California Institute of Technology, 1928
Assistant Professor, California Institute of Technology
OSCAR ZARISKI, Dr.Math., University of Rome, Italy, 1923
Associate Professor, Johns Hopkins University
*CLARENCE ZENER, Ph.D., Harvard University, 1929

I

HISTORY AND ORGANIZATION

AMERICAN universities now offer abundant facilities for study in the liberal arts and sciences leading to the Ph.D. degree. Some universities have made excellent arrangements also for work beyond the Ph.D. degree, especially in recent years since the organization of advanced fellowships such as the fellowships offered by the National Research Council, the Rockefeller Foundation, and the Commonwealth Fund. But, with the exception of medicine and a few other branches, the country has not hitherto possessed an institution whose essential purpose it is to provide young men and women with opportunities to continue their independent training beyond the Ph.D. degree without pressure of numbers or routine. To provide such opportunities Mr. Louis Bamberger and his sister, Mrs. Felix Fuld, established in 1930 the Institute for Advanced Study with an initial gift of $5,000,000. In April 1934 an anonymous gift of $1,000,000 was made to facilitate the organization of a school of economics and politics.

In order that the ideals of the Founders might be realized, the organization and administration of the Institute have been kept simple and unostentatious, and the several schools will in their internal conduct

be as nearly autonomous as possible. The Board of Trustees is composed of laymen, scholars, and scientists. It is hoped that in this way perfect accord may be established between the administrative officers and the scholars who really constitute an institution of learning. The scale of salaries and retiring allowances is such that the teaching staff is freed from all financial concern and feels under the strongest obligation to refrain from activities that bring a financial return without really being of high scientific or scholarly character—in other words, that the members of the staff may live up to the standard that has been created in the full-time departments of certain medical schools organized within recent years.

The Institute for Advanced Study is located at Princeton, New Jersey. Work began in the field of mathematics October 2, 1933. The authorities of Princeton University have been most helpful and coöperative. They offered the Institute space in the new mathematics building, Fine Hall, opened in 1931. While the Institute and Princeton University are organically and administratively entirely distinct, the faculties and students of the two institutions cooperate in any direction that promises more favorable results than either institution could obtain alone, the students availing themselves of the courses, seminars, and opportunities for conference and direction of work in both institutions without payment of an additional fee. Advanced workers, such as National Research Council Fellows and Rockefeller Foundation Fellows, who have come to Princeton to study with a

member of one group, have in many instances found it in their interest to confer with one or more members of the other group. The Foundations concerned therefore accredit their Fellows to both institutions.

The initial group forming the School of Economics and Politics will assemble in Princeton in the autumn of 1935.

During the past year the Institute has also made a tentative beginning looking forward ultimately to the establishment of a school devoted to humanistic studies. Two young scholars have been engaged in studying the resources of Princeton and of adjacent centers in preparation of further steps when the time is ripe.

II

SCHOOL OF MATHEMATICS

Professors:	JAMES W. ALEXANDER, ALBERT EINSTEIN, MARSTON MORSE, OSWALD VEBLEN, JOHN VON NEUMANN, HERMANN WEYL
Visiting Professor: (1934-1935)	P. A. M. DIRAC
Associate:	WALTHER MAYER
Assistants:	RICHARD BRAUER, ROBERT S. MARTIN, ARTHUR E. PITCHER, JOHN L. VANDERSLICE, LEO ZIPPIN

THE School of Mathematics is an informal institution. Instruction is given by individual contact with students, by seminars, by courses of lectures, and by other methods, each professor being free to follow the methods he prefers and to vary them from year to year.

It will be noticed that the staff consists only of professors and their assistants and one associate, in this respect differing from the faculty of a university which has varied teaching responsibilities.

Inasmuch as only those students have been admitted who have already obtained the Ph.D. degree

or who have given evidence of ability in independent research at least comparable with that expected for the degree of Doctor of Philosophy, the number of students is relatively small and is expected to remain small. The workers are for the most part persons who received their doctor's degree some years ago, have engaged in university and college teaching, and have, while carrying on their routine, published papers indicative of promise. The staff aids students in deciding the general methods and purposes of their work and, as occasion offers, in the details.

Among the workers during the present year are a number of advanced scholars on leave of absence from universities. They have acted in close coöperation with the regular staff of the Institute to the mutual advantage of both groups. While the persons who are thus advanced may profit by seminars or lecture courses which bring them in touch with the latest advances in the various branches of their science, equally important is the opportunity for informal and frequent contact with other investigators with whom they exchange ideas regarding the problems or fields in which they are interested. The workers may seek the professors whether on the staff of the Institute or on the faculty of Princeton University, whose interests coincide with their own. They make their own individual arrangements from time to time. No two persons during the year 1934-1935 have pursued the same course of action. For example, the group contains workers, several of whom conduct seminars or meet in conference on various subjects.

It is difficult to overestimate the importance of a year spent in free research and study to those who for a number of years previously have been carrying the burden of routine college and university teaching and have had to carry on their original work in such bits of time as could be snatched from their daily duties. Naturally, mature persons of this kind receive preference in the matter of admission.

Once a week the mathematical club, conducted by Princeton University and the School of Mathematics of the Institute, meets. A paper is presented, followed by informal discussion and questioning. Daily at 4:30 in the afternoon, tea is served for both the University and the Institute groups, and professors and workers thus assemble at their pleasure.

In 1935-1936 Professor Alexander will give a course of lectures on Analysis Situs. The lectures will be intended as an introduction to the subject, revised in the light of the developments of the last few years.

Professor Einstein will continue his investigations in the relativistic theory of electricity.

Professor Morse will conduct a seminar in the general field of Analysis in the Large. The seminar will discuss the topological analysis of functions and the extensions of this analysis to functionals, in particular to the Calculus of Variations. Other possible topics are abstract metrics, and the associated function space topologies.

In 1934-1935 Professors Veblen and von Neumann have been collaborating in a seminar in which the chief subjects studied have been the theory of spinors and conformal geometry. It is proposed to continue

this seminar in 1935-1936 in the same field or one of its natural extensions.

Professor von Neumann will lecture on the theory of rings of operators, and of applications of operator theory. These lectures may be considered as a continuation of those given in 1933-1934 and 1934-1935 on the theory of Hilbert space and its operators.

During the year 1934-1935 Professor Weyl treated, in lectures and in a seminar, of continuous and infinitesimal groups and their representations, stressing in particular their relation to certain problems in finite group theory. An independent course in some special field of group theory will be given by him in 1935-1936; moreover, he will conduct a seminar on Current Literature, where the participants are expected to report on their own research work and on important new mathematical papers.

In 1934-1935 Professor Dirac gave a course of lectures on quantum theory of electrodynamics.

Professor Emmy Noether of Bryn Mawr has conducted a seminar in Class Field Theory during 1934-1935.

In the spring term of 1935 Professor Siegel gave a course of lectures on the Analytic Theory of Quadratic Forms, under the joint auspices of the Institute and Princeton University.

Professor Mayer in 1934-1935 held a seminar on the foundations of the theory of continuous groups. In 1935-1936 he proposes to lecture on differential geometry or topology.

Since 1911 Princeton University has published the *Annals of Mathematics* under the editorial direction

of the Department of Mathematics. In 1933 an agreement was entered into in accordance with which Princeton University and the Institute for Advanced Study jointly publish the *Annals*. The editorial board consists of Professor S. Lefschetz of the University, Professor John von Neumann of the Institute, and ten associate editors from various institutions.

III

SCHOOL OF ECONOMICS AND POLITICS

Professors: Edward M. Earle, David Mitrany, Winfield W. Riefler

It is expected that the three initial professors in the School of Economics and Politics will meet in Princeton in the autumn of 1935. It is probable that they will devote the first year to discussion and conference with one another and with scholars and thinkers connected with Princeton and other universities and with practical affairs.

APPLICATIONS AND FEES

Applications for admission should be addressed to the Institute for Advanced Study, Princeton, New Jersey.

The fee charged is $100.00 per annum.

The Trustees have set aside a sum which can be used to make grants to persons of distinct ability and promise who require a limited amount of financial aid.