

THE INSTITUTE FOR ADVANCED STUDY

Founded by Louis Bamberger and Mrs. Felix Fuld

BULLETIN NO. 3

THE INSTITUTE FOR ADVANCED STUDY

20 Nassau Street
Princeton, New Jersey

February, 1934

*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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Newark, New Jersey

SAMUEL D. LEIDESDORF
New York, New York

WALTER W. STEWART
New York, New York

*Resigned, April 24, 1933

Term expires 1938

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By invitation—Mrs. FULD

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Director: ABRAHAM FLEXNER

SCHOOL OF MATHEMATICS

Professors

JAMES WADDELL ALEXANDER

ALBERT EINSTEIN

OSWALD VEBLEN

JOHN VON NEUMANN

HERMANN WEYL

Visiting Professor (1934-1935)

P. A. M. DIRAC

Associate

WALTHER MAYER

Assistants

NATHAN JACOBSON

CHARLES CHAPMAN TORRANCE

JOHN LIVEZEY VANDERSLICE

LEO ZIPPIN

CALENDAR

1934-1935

October 1: First term opens
December 19: First term closes
January 16: Second term opens
May 3: Second term closes

SCHOOL OF MATHEMATICS

WORKERS REGISTERED 1933-1934

- A. ADRIAN ALBERT, Ph.D., University of Chicago, 1928
Assistant Professor, University of Chicago
- WILLARD E. BLEICK, Ph.D., Johns Hopkins University, 1933
- LEONARD M. BLUMENTHAL, Ph.D., Johns Hopkins University, 1927
National Research Fellow
- ROBERT H. CAMERON, Ph.D., Cornell University, 1932
National Research Fellow
- ALFRED H. CLIFFORD, Ph.D., California Institute of Technology, 1933
- ROBERT L. ECHOLS, Ph.D., University of Virginia, 1930
Instructor, College of the City of New York
- KURT GOEDEL, Ph.D., University of Vienna, 1930
Privatdozent, University of Vienna
- G. A. HEDLUND, Ph.D., Harvard University, 1930
Associate, Bryn Mawr College
- RALPH HULL, Ph.D., University of Chicago, 1932
National Research Fellow
- BÖRGE C. JESSEN, Ph.D., University of Copenhagen, 1930
Dozent, The Royal Veterinary and Agricultural College, Copenhagen
Privatdozent, University of Copenhagen
Rockefeller Foundation Fellow
- D. H. LEHMER, Ph.D., Brown University, 1930
- ARNOLD N. LOWAN, Ph.D., Columbia University, 1933
- ROBERT S. MARTIN, Ph.D., California Institute of Technology, 1932
National Research Fellow

THURMAN S. PETERSON, Ph.D., Ohio State University, 1930
HAROLD S. RUSE, D.Sc., University of Edinburgh, 1932
Lecturer in Mathematics, University of Edinburgh
Rockefeller Foundation Fellow
MEYER SALKOVER, Ph.D., Yale University, 1925
Associate Professor, University of Cincinnati College of
Engineering
MABEL F. SCHMEISER, Ph.D., Ohio State University, 1931
I. J. SCHOENBERG, Ph.D., University of Jassy, Roumania,
1926
ANNA A. STAFFORD, Ph.D., University of Chicago, 1933
Teacher, St. John Baptist School, Mendham, N.J.
TRACY Y. THOMAS, Ph.D., Princeton University, 1923
Associate Professor, Princeton University
JOHN A. TODD, Ph.D., University of Cambridge, 1932
Rockefeller Foundation Fellow
EGBERTUS R. VAN KAMPEN, Ph.D., University of Leiden, 1929
Associate, Johns Hopkins University
RAYMOND L. WILDER, Ph.D., University of Texas, 1923
Associate Professor, University of Michigan

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, the capital of which was to be preserved intact.

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, which was opened in 1931. While the Institute and Princeton University are organically and administratively entirely distinct, the faculties and students of the two institutions coöperate 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 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 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, more important still is the opportunity for informal and frequent contact with other young investigators and the professorial group with whom they exchange ideas regarding the problems or fields in which they are interested. The workers 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 1933-1934 have pursued the same course of action. For example, the group contains workers, one of whom conducts a seminar in advanced algebra, and others conduct seminars in topology and algebraic logic.

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.

II

SCHOOL OF MATHEMATICS

<i>Professors:</i>	JAMES W. ALEXANDER, ALBERT EINSTEIN, OSWALD VEBLEN, JOHN VON NEUMANN, HERMANN WEYL
<i>Visiting Professor:</i>	P. A. M. DIRAC (1934-1935)
<i>Associate:</i>	WALTHER MAYER
<i>Assistants:</i>	NATHAN JACOBSON, CHARLES C. TORRANCE, J. L. VANDERSLICE, LEO ZIPPIN

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 because of their training are sufficiently advanced to carry on and to coöperate in independent research, 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.

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.

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.

In 1933-1934 Professor Alexander of the Institute and Professor Lefschetz of Princeton University conducted a seminar on topology, and particularly on group theoretical problems connected with it. This seminar will be continued in 1934-1935.

Professor Einstein will continue his investigations in field theory in relation to quantum theory.

In 1933-1934 Professors Veblen and von Neumann have been collaborating in a seminar on differential geometry and quantum theory. The chief subjects studied have been the theory of spinors and the Dirac equation, projective relativity, and conformal geometry. It is proposed to continue this seminar in 1934-1935 in the same field or one of its natural extensions.

Professor von Neumann will continue during 1934-1935 his lectures on the theory of functional operators. These lectures began in the academic year

1933-1934 and were scheduled to cover two years. The subjects treated in 1933-1934 have been theory of integration, general theory of Hilbert space, and bounded operators. In 1934-1935 the following subjects will be discussed: theory of unbounded operators, algebra and analysis of operators.

Professor Weyl started his activities in the Institute in January 1934 with a course of lectures on structure and representations of continuous groups. This is intended as the foundation for further lectures and a seminar on the same subject during 1934-1935. The three main trends of the theory—the general algebraic approach, the topological-integral standpoint, and Lie's infinitesimal methods—will be included. Part of the time will be given to a study of Cartan's more important papers on semi-simple groups and symmetric spaces. Other topics will probably be representations of semi-simple continuous groups and their characters, orthogonal functions in spaces with a transitive group of transformations. The close relations to other branches of mathematics, as for instance to hyper-complex number systems, topology and to the theory of almost periodic functions, will be stressed.

Professor Dirac will give a course of lectures or a seminar on a subject to be announced later.

The subject of Professor Mayer's lectures in 1934-1935 will be n -dimensional differential geometry.

Since 1911 Princeton University has published the *Annals of Mathematics* under the editorial direction of the Department of Mathematics. This year an agreement has been entered into in accordance with

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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.

Fee—The fee charged is \$100.00 per annum.

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

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