Excerpts and notes on Fifty Years of American
Mathematics by George D. Birkhoff, source: American
Mathematical Society Semicentennial Publications, Volume II:
Semicentennial Addresses.

Mathematical background in the United States: (p. 270):

George Washington was a scientifically-minded gentleman
farmer and a skilled surveyor, familiar with trigonometry.

Benjamin Franklin discovered experimentally the
electrical nature of the lightning discharge, theorized
concerning electricityas a fluid, and was interested enough
in mathematics to devise ingenious magic squares.

Thomas Jefferson regarded geometry and trigonometry
as "'most valuable to every man,'" algebra and logarithms as
"'often of value,'" while he classed "'conic sections, curves
of the higher orders, perhaps even spherical trigonometry,
algebraic operations beyond the 2d dimension, and fluxions'"
as a "'delicious luxury'"; in his later years Jefferson spent

much of his time in mathematical reading, and was ever a
true friend of mathematics.

However, until the middle of the last century, the
Americans interest in mathematics was "genteel and amateurish"
and the best of the mathematicians of those days looked
appreciatively toward Europe "without much thought of high
emulation." (p. 270)

Benjamin Peirce, Professor of Mathematics at Harvard
University College was the most eminent mathematician of
the period (published on algebra in the American Association
for the Advancement of Science in 1864, and was the father of
pure mathematics in our country. (pp. 271-272) The other
scientists who used applied mathematics were taken by the
astronomers and the physicists and the chemists. Peirce,
alone, started the trend toward abstract mathematics in pure
research.

Education in general: Birkhoff agrees with Flexner
in his book Universities, "the Johns Hopkins University was

the first American institution 'consciously devoted to the
pursuit of knowledge, the solution of problems, the critical
appreciation of achievement, and the training of men at a
really high level.'" (p. 273) This was, Birkhoff said,
despite the opening of Yale University, 1847, (Graduate
School) and Harvard University, 1872. The great English
algebraist, James Joseph Sylvester, opened the Department of
Mathematics at Johns Hopkins andxinitiated in 1878 and
initiated the American Journal of Mathematics. Baltimore
has continued to be a center of mathematical activity.

The founding of the American Mathematical Society (formerly
the New York Mathematical Society) in 1888 was the most
important/for the development of mathematics in this
country. French and German mathematical traditions were
particularly well established and of incomparable brilliancy
represented at that moment by Henri Poincaré, the young
David Hilbert, and a number of others of very high rank.
Italy and Scandanavian countries were flourishing. Yet the
European mathematicians had had no occasion to note the work
of their American colleagues except for Poincaré's notice of

Hill's Lunar Theory, but failed to note Peirce's algebraic
advances.

A number of young Americans studied abroad, came back
and initiated mathematical departments notably at Chicago
University. Chicago University originated in 1892. At
Chicago was Moore. At about the same time Osgood and Bôcher
inspired by their German sojourn and in particular by the great
Felix Klein of Göttingen, bent their every effort to
strengthen the tradition at Harvard.

Birkhoff's tribute to Henry Burchard Fine who had
studied under a famous German mathematician and his bringing
promising young men to Princeton, in particular Eisenhart,
Veblen, and Wedderburn: "From that day forth there has always
been an important mathematical group at Princeton." Further
impetus with the founding of the Institute for Advanced
Study with the first appointments of Einstein, Veblen and
Weyl in "ideal research posts." "The others at the Institute
have in general already obtained their doctor's degree and
come to enjoy a period of uninterrupted study and research

under favorable conditions. The Institute is fortunately able
not only to augment its staff through distinguished temporary
appointments, but also to give partial financial support to
many of those who come to study at the Institute."

Birkhoff's own biography: he came to Princeton in 1909
from the University of Chicago where he went in 1902 and
worked under Moore, a great mathematician who studied the
Germans and inspired those who worked with him; then to
Harvard to learn more analysis, particularly from Osgood and
Bocher; then back to Chicago for more work with Moore on
analysis, studying Hilbert and others. In 1907 he taught
at the University of Wisconsin, 1909 to Princeton. "The
presence of Veblen, nearly of my own age, with large ideas
for American mathematics in general and for the Princeton
Department in particular, meant much to me during my three
years there. Veblen was then completing his important
Projective Geometry, volume 1, written in collaboration with
J. W. Young, whom many will remember kindly. It was my
privilege to read the book in page proof, and to learn of
Veblen's geometric program and ideas directly from him in our
frequent walks and talks together."

Thus he has selected Chicago, Cambridge and Princeton
for special reference, though he concedes that American
mathematics reaches beyond what may be found in any three
or even ten centers.

There are now (1938) 30 institutions where advanced
students of mathematics may go with advantage to study for
the doctorate, while only 50 years ago he was forced to go
to Europe to secure adequate training. He lists the
universitites, among which is the California Institute of
Technology, Brown University, etc., Rice Institute, the
great eastern universities, some of the middle western,
the University of Toronto in Canada. "All that is required
in many cases is that mathematicians in a position of
influence take the proper steps. As instances in point, I
would cite what was done by Fine at Princeton and by Harris
Hancock at Cincinnati." (p. 276)

Then he goes statistical. In 1888 there were a mere
handful of competent mathematicians in the Unixar United States;
whereas, now there is a body of over 2,000 American members
of our Society, between one and two hundred of whom have

gone far beyond a doctoral dissertation to make important
additions to mathematical knowledge, and some forty and fifty
of them with established international reputations.

Cites those of leadership in the field: Moore, outstanding;
George Bruce Halsted, geometer who attracted two notable figures
L. E. Dickson and R. L. Moore. Also James Pierpont at Yale.
Also younger men besides those mentioned including Veblen:
 G. A. Bliss, G. C. Evans, Lefschetz, Marston Morse,
J. F. Ritt, M. H. Stone, and Norbert Wiener. (Burkoppy)

A second group are those who have come from Europe in
the last twenty years, largely on account of various adverse
conditions, A large influx which has benefited American
mathematics greatly, some of them the greatest mathematicians
of Europe; a partial list: Artin, Bochner, Courant, Gronwall,
Hille, van Kampen, Lefschetz, Levy, Menger, von Neumann,
Oystein, Ore, Rademacher, Radó , Shohat, Struik, Szasz,
Szegő, Tamarkin, Uspensky, Weyl, Whitehead, Wintner, Zariski.

There followed a caution that with the accession of these
Europeans, available opportunities for young American

mathematicians is certain to be lessened. "I believe we have reached a point of saturation, where we must definitely avoid this danger." (Of good young Americans being forced to take lower positions).

One of the factors encouraging American universities to strengthen their mathematical staffs is that no extraordinary laboratory or library expenses are incurred; furthermore, mathematics is in a state of continual creative growth, ever more important to engineer, scientist, and philosopher alike; and excellent mathematicians from here and abroad are within financial reach.

Statistics on education: In 1888 probably 200,000 students in our high schools and preparatory school, in 1938 there are between 2,000,000 and 3,000,000 due to the unquestioning belief in higher education in our country. Nearly 1,000 colleges, universities and advanced technical schools hxxm in the United States in 1938 serving half a million or more students with plant representing billions of dollars of endowment, but of them some 250 meet the exacting requirements

of appr oval by the Association of American Universities.

The American Mathematical Society has a membership of over 2,000 persons. The Mathematical Association of America, devoted primarily to the interests of collegiate mathematics, has nearly 2500 members. Between two and three thousand mathematical teaching positions in our higher institutions with an average salary which he estimates lies between two and three thousand dollars; therefore about six millions of dollars which goes each year to the support of higher mathematics.

Burdens of these positions: He learned in 1924 from Fields at Toronto that the American professor was the worst treated of all.

In 1938   of

Today Harvard had been able to reduce the amount/the teaching and tutorial routine of the regular mathematical staff to six hours a week, of which only three hours are devoted to more or less elementary mathematical instruction. This affords an opportunity for research. These conditions obtain in a few institutions. Twelve hours of instruction a

week, including at least one course of advanced grade is
about all that can be required if the best standards of
scholarship are to be expected. Hours of instruction should
be reduced to not more than nine, and if there are heavy
outside duties, there should be a compensating diminution
in teaching.

American periodicals are important to this. He lists
them (p. 278). There are seven affording excellent facilities
for the publication of original articles. There is only one
of them, the Journal of Mathematics and Physics, directed
toward applied mathematics. In book form the Colloquium
Publications and a similar new series in contemplation by
the Institute for Advanced Study afford an opportunity here.
The National Academy of Sciences publishes shorted articles,
so does the Rice Institute Pamphlets, but the American
commercial publishing business if is not concerned with
significant mathematical books as is the European. (p. 279)

Then there follows an analysis of significant mathematical
advances which have been made in America during the last 50 years,

an outline, including logic, algebra, analysis, geometry and
applied mathematics.   (p. 280 ff.) These are fairly
detailed accounts, and they give individual credit for
developments in the various fields. (pp. 280-313.)

He classes as applied mathematics that which seems to
be closely connected with physics or some other branch of
science. "Inasmuch as most of the so-called 'pure'
mathematics of the present day was at one time 'applied,'
the term is a very vague one. Nevertheless, the field of
applied mathematics always will remain of the first order of
importance inasmuch as it indicates those directions of
mathematical effort to which nature herself has given approval.

"Unfortunately, American mathematicians have shown in the
last fifty years a disregard for this most authentically
justified field of all. It was remarked at the outset that
the American tradition was at first of quite the opposite
character." He recalled only six Americans deeply concerned
with applied mathematics in the usual sense, of whom four were
brought up in the great British tradition: Bateman, Brown,
Murnaghan, Robertson, Synge, and Tolman. Brown was the

world's foremost lunar theorist; Tolman is to be regarded
as primarily as physical chemist. All six had an extremely
broad scientific outlook. The names of Bateman and Tolman
will always be mentioned among those who were closest in spirit
to the special theory of relativity at the time of itx its
discovery. Bateman has added to classical electromagnetic
theory. Tolman has contributed to the relativistic theory of
the expanding universe in which he has shown his daring
speculative spirit. Other comments as to the others are
included. (p. 313)

Excerpts and notes on <u>Fifty Years of American Mathematics</u>, etc.
(See page one of this memo for more detail) by George D.
Birkhoff.   From File I-12

1923-1924
1929-1931
1936

MATHEMATICS   Academic Activities

NATIONAL RESEARCH COUNCIL (GENERAL)   Foundations

 FLEXNER, SIMON   Biographical

VEBLEN, O.

     See correspondence between Oswald Veblen and
Simon Flexner in the file, V-4. The year of Veblen's
service in some administrative capacity in the National
Research Council must have been 1923-24, because of the
subjects upon which Flexner and Veblen correspond, and also
 Vernon Kellogg. The correspondence in 1929 and 1930 1931
appertains to the National Academy of Science.

File V-4

1923-1932

MATHEMATICS   Academic Activities

VEBLEN, O.   Biographical

FLEXNER, A.

    Veblen's early work to set up Research Fellowships in
Mathematics, etc. all were for research in applied mathematics
and as was practically all research in the United States
of that day.

    With Flexner came research in Pure Mathematics.

Veblen Interview, December 28, 1956, page 7

1923

GENERAL   (INTERNATIONAL EDUCATION BOARD) Foundations

MATHEMATICS   Academic Activities

FLEXNER, A.   Biographical

ROSE, WYCLIFFE

        See Fosdick's description (p. 151) of Rose's report
on world mathematics in every leading institution in the world
to his Board: "He was reporting on where man had arrived in
his mathematical thinking, and where the opportunities for
progress seemed brightest. His performance was characteristic
of the immense pains and thoroughgoing analysis with which he
scanned every recommendation he brought before his trustees.
Göttingen and Paris were preferred in his judgment because
of all the places in the world at that time they represented
the peaks in mathematical science."

The Story of the Rockefeller Foundation by Fosdick, p. 151
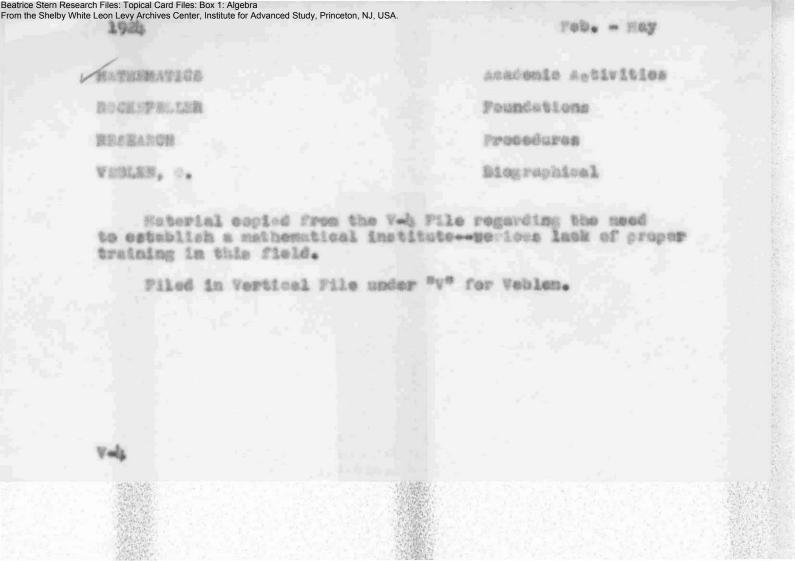
1923

GENERAL (SECONDARY SCHOOLS)   Educational Institutions

MATHEMATICS   Academic Activities

     See pages 113-121 regarding what of mathematics should
be taught in grammar and secondary schools. (Very little)

Flexner--A Modern College A Modern School, 1923

1924   Feb. - May

✓ MATHEMATICS   Academic Activities

  ROCKEFELLER   Foundations

  RESEARCH   Procedures

  VEBLEN, O.   Biographical

        Material copied from the V-4 File regarding the need
to establish a mathematical institute--serious lack of proper
training in this field.

        Filed in Vertical File under "V" for Veblen.

  V-4

MATHEMATICS   Academic Activities

VEBLEN, O.   Biographical

FLEXNER, A.

Flexner to Veblen, June 12, 1924.

"I have your interesting letter of June 10 regarding the
desirability of making some more satisfactory provision for
the Department of Mathematical Research in this Country. I
shall take the matter up with Dr. Rose and my colleagues, and
let you know if there is anything wxxxxnxdx which we are in
a position to do in reference to it. With xx much appreciation
of your extremely interesting letter, I am, Very sincerely yours,
Abraham Flexner."

V File, "Flexner Abraham"

1930

PRINCETON UNIVERSITY

PHYSICS

MATHEMATICS

SHENSTONE, ALLEN

VEBLEN, O.

EISENHART

RelationaxNEXIX Edu. Institutions

Academic Activities

Biographical

Interview with Professor Allen Shenstone, May 23, 1956.

Filed in Vertical file under Shenstone Interviews.

Interview with Professor Shenstone, 5/23/56

POLICIES   Administration

MATHEMATICS   Academic Activities

ECONOMICS

BIRKHOFF, GEORGE D.   Biographical

George D. Birkhoff to Flexner, November 5, 1931. Copy.

"Cambridge, Nov. 5, 1931

"Dear Doctor Flexner:

"It was a great privilege to see you and have such a
good talk with you while you were in Cambridge. I enjoyed
also your interesting lecture at the Old South Meeting House
and your responses to the numerous questions from the
audience. It was an audience of a kind I find appealing.

"Since I saw you I have been thinking more about your
admirable report to the Board of the Institute for Advanced
Study. Your report is a wonderful one which should be regarded

as a permanent statement of the ideals of the Institute.

"I will give you, however, my principal reactions for what they are worth

"(1) Subjects

"Your selection of mathematics as a first subject is a very wise one, not only because it stands for pure intellectual endeavor of the highest type and plays an ever increasing role in the sciences, but also because the whole field of human thought should undergo 'mathematical clarification'. George Boole, the Irish mathematician and inventor of symbolic logic says in his book on the Mathematical Laws of Thought that he looked in vain through the philosophic work of Spinoza, cast in almost geometric form, for a single syllogism! What are the various self-consistent points of view, the precise definitions, the underlying assumptions, and the purely logical consequences in various important social domains? I think it is important for the human race to find out. My forthcoming book on Aesthetic Measure will represent one investigation of this general type.

"In your second subject of economics I think you have
also made the best possible choice. Ha Shih the Chinese
philosopher has pointed out that the material success of the
West is really spiritual in many of its aspects. Perhaps
he did this to counteract a rather prevalent Chinese view
that Western civilization is merely materialistic. He is
clearly right to the extent that human welfare can be
immeasurably improved in the Far East and this would make
possible a development of the spirit not possible at present.
But we know so little of economic law from a fundamental,
impartial world point of view. Clearly the Institute can
be of great service in the economic field."

"(2) Persons

"The staff, especially the first staff, is fundamentally
important for the Institute. The Institute must therefore
secure men of the highest possible calibre, outstanding
figures of their day. By so doing there will be set up a high
and severe intellectual standard such as is obviously not
to be found today in American Universities. I regard the
setting of proper standards in this manner as extremely important in
this country.

"In order to get this initial staff it is obviously
necessary to set your maximum salaries at a rather high level.
I think much will depend upon the decision of the Institute
in this direction. Not that the question of compensation
is a fundamental one, once a certain satisfactory level has
been reached, but rather that America has become and is
likely to remain a country in which the status of the
scholar and of scholarship is deeply bound up with the reward
which is given him. At Harvard today the regular maximum
salary is $12,000 and is likely to go to $15,000 in a few
years. The University of Chicago has already gone beyond
this latter amount (at least in offers) in special cases.

"The working conditions at the Institute will of course
be ideal from the outset, and this fact will weigh very
heavily with the kind of man you want to get.

"(3) Locations

From our talk together I know that you are considering
Princeton and Washington as possible locations. I think that

Princeton is perhaps better, primarily because of the remarkable mathematical center there and the fact that Princeton is on the up-grade among American Universities. As a physical site and in geographical location, it would be hard to improve upon Princeton.

"Cambridge also has points to consider, as an intellectual center of first order, not too large for a reasonable quiet in living.

"However I come back finally to Princeton as the possible future location of the highest centers of learning and research, near to New York. The Princeton mathematical group will cooperate strongly with yours. That is also an important item.

"I am looking forward with much interest to seeing Professor Mitrany in a few days.

"With kindest remembrances,

Sincerely yours,
/s/ George D. Birkhoff

File I-12

1932-35

MATHEMATICS

WEYL, HERMANN

FLEXNER, A.

Academic Activities

Biographical

Correspondence official I. A. S. file.

A, 10/18/56

MATHEMATICS (ALGEBRA)   Academic Activities

WEDDEBURN   Biographical

        Veblen to Flexner.

        Weddeburn and Dickson best algebraists in U. S. and then
Albert.

IV-21

1932   11/12
                                                                 11/26

PRINCETON UNIVERSITY   Relations WOAI

✓MATHEMATICS   Academic Activities

EISENHART   Biographical

VEBLEN, O.

FLEXNER, A.

        See Flexner to Eisenhart, November 12 and Eisenhart to
Flexner regarding asking Princeton mathematicians to I. A. S.
Flexner offers to hold back on Princeton faculty. Eisenhart
says that would prejudice Princeton in recruiting in future.
He is taking matter up with Curriculum Committee--Board of
Trustees--Princeton.

II-17

1933-36

MATHEMATICS   Academic Activities

COURANT   Biograp hical

FLEXNER, A.

        Correspondence showing close friendship between the
mathematicians and Flexner. See Courant's note on Nazis and
Naturwisschenschaft Spring and Berliner--9/12/35, 9/17/35, 12/12/35.
Flexner helped Courant with Fosdick and Weaver in NYU   NYU
work 12/14/36.

A, 10/18/56, Institute file on Courant

GENERAL   Relations WOAY

PRINCETON UNIVERSITY

√MATHEMATICS   Academic Activities

>   Minutes, p. 7:

    "RESOLVED, That the Institute for Advanced Study become a sustaining member of
the American Mathematical Society for a period of five years by the payment of Two
Hundred Dollars ($200.00) annually during that period."

>   Minutes, p. 8:

    "RESOLVED, That the Institute for Advanced Study hereby appropriate Two thousand
Dollars ($2,000.00) annually over a five-year period towards the expense of publication
of the Annals of Mathematics to be issued under the joint editorship of the School of
Mathematics of the Institute and of the Mathematical Faculty of Princeton University."

Vol. I, No. 10

PONTRJAGIN, L. S.   Biography

FOREIGN   Academic Activities

✓MATHEMATICS

Lefschetz, S. to Pontrjagin (Moscow)

"Dear Lev Semenich:

"I take great pleasure in informing you that the Institute for Advanced Study
just opened in Princeton by Dr. A. Flexner, has made a grant of $1800 to you for the
year 1933-1934 with an additional sum not to exceed $1200 for travelling expenses to
enable you to spend the year here. We hope that the Mathematical Institute of the
University of Moscow will grant you the necessary leave of absence and we, on our side,
shall do our best to make your stay here no less agreeable than profitable. For the
present, I strongly advise that you continue to study English as earnestly as possible.

"I am enclosing an English translation of my letter of which I am also sending
a copy to Alexandroff, I am writing to Director Khintchine in regard to this matter.

"..."

File III-13