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THE INSTITUTE FOR ADVANCED STUDY
SCHOOL OF MATHEMATICS
PRINCETON, NEW JERSEY

For Dr. Aydelotte

April 19, 1945

THEORETICAL PHYSICISTS AND MATHEMATICIANS
who have been discussed informally by our group

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Theoretical Physicists

CONFIDENTIAL

Top rank

Niels Bohr, Director, Copenhagen University Institute for Theoretical Physics.
Age 59. Out of the question. Nobel Prize laureate.

Erwin Schrödinger, Professor of Theoretical Physics, Institute for Advanced Studies,
Dublin, Eire. Age 57. Created the "wave" form of quantum mechanics. (1926).
Nobel Prize laureate. Brilliant, but less steady than Pauli. Already in
1937, when we compared their relative merits we decided in favor of Pauli.

Werner Heisenberg, Professor in Leipzig until quite recently, but if I am not mis-
taken now Director of the Kaiser Wilhelm Institute for Theoretical Physics in
Berlin. Age 44. Nobel Prize laureate. Heisenberg is to be credited with
the basic idea of the new quantum mechanics, in which observables are repre-
sented by matrices in a space of infinitely many dimensions. Although Schrö-
dinger's work is based on an entirely different idea, Heisenberg's fundamental
paper was known to him when he started his work. Dirac's work would have
been impossible without Heisenberg and Schrödinger.

Heisenberg considered it his duty to stay in Germany, and on the whole
took a courageous stand against much of the nonsense the Nazis did in phys-
ical science. But his political attitude was never too clear to his friends
outside Germany, and the impression prevails that his fate is tied up with
that of Germany.

Paul Adrien Maurice Dirac, Lucasian Professor of Mathematics, Cambridge, since 1932;
Fellow of St. John's College, Cambridge; now at Cavendish Laboratory, Cam-
bridge, England. Age 42. Outstanding achievement: relativistic quantum
equation for the electron. More speculative than Pauli. Concentrates on
the most fundamental questions of quantum physics. Nobel Prize laureate.

Enrico Fermi, Professor of Physics, Columbia University, since 1939. Age 43.
Early work in theoretical physics rates almost as high as Pauli's. He de-
veloped that sort of statistics for particles ("Fermi statistics") which cor-
responds to Pauli's exclusion principle. In his last years in Italy, and
since he came to this country, he has developed more toward the experimental
side. (transformation of elements by bombardment with neutrons, nuclear physics),
and now definitely needs and wants a laboratory. Nobel Prize laureate.

Second rank

George Gamow, Professor of Physics, George Washington University, since 1934.
Age 44, Russian origin. Main achievement: quantum theory of radioactive de-
composition, which he developed simultaneously with E.U. Condon and R.W. Gurney.

April 19, 1945

Hans Albrecht Bethe, Professor of Physics, Cornell, since 1937. Age 38, German origin. Very versatile theoretical physicist. Outstanding work in quantum theory of crystals, astrophysics; also nuclear physics.

Eugene Paul Wigner, Jones Professor of Theoretical Physics at Princeton University since 1938; now doing research work at University of Chicago. Age 42, Hungarian origin. Stronger on the mathematical side than most theoretical physicists. Main achievement: group-theoretical aspect of quantum mechanics.

W. Heitler, Professor of Theoretical Physics, Dublin Institute for Advanced Studies. Age probably a little over 40; German origin. Main achievement: showed the importance of the quantum mechanical exchange energy for chemical bindings (jointly with F. London); recent work in meson theory.

These four men are of the same rank as Oppenheimer, all several steps lower than Pauli; but Oppenheimer is the most inspiring for younger physicists. In my opinion Bethe is the strongest and Heitler the weakest in this group of 4; but that is purely subjective.

Mathematicians

André Weil, now at the University of São Paulo, Brazil. Age 39, French origin. A mathematician of the same type as Siegel, and among all those mentioned here the one who probably comes nearest to him in rank. (Might be a somewhat difficult colleague.) *Algebra*

Kurt Gödel. Age 39, Austrian origin. Extraordinary in the particular field of mathematical logic; but that is a somewhat limited field.

Emil Artin, Professor of Mathematics, Indiana University; ^{since 1939} was Professor at University of Hamburg before he came here. Age 47; Austrian origin. Very brilliant as a young man, in particular in algebra and number theory. Ten years ago I should have rated Artin as high as Siegel. Since then Artin has fallen off, while Siegel has been on the ascent.

Oscar Zariski, Professor of Mathematics, Johns Hopkins, since 1937. Age 46, Polish origin. Had his mathematical training mainly in Italy. Excellent work in algebraic geometry, where he combines the great Italian tradition with the more modern and abstract algebraic methods.

~~Hassler Whitney, Associate Professor, Harvard, and Witold Hurewicz, Assistant Professor, University of North Carolina. Whitney, age 38; Hurewicz, age 41, of Polish origin. The two outstanding younger topologists: Lefschetz rates Whitney, Alexander rates Hurewicz, the higher.~~

~~Garrett Birkhoff, Associate Professor, Harvard. Age 34. Outstanding work in algebra of the more abstract type.~~

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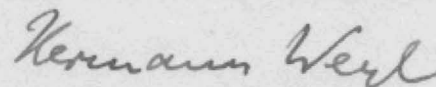
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Garrett Birkhoff, Associate Professor, Harvard, since 1941. Age 34. Outstanding work in algebra of the more abstract type; but much weaker than, for instance, André Weil.

Norbert Wiener, Professor, M.I.T., since 1932. Age 50. Probably the strongest man America now has in analysis, ^{outside our institute} but abroad the Finn Rolf Nevanlinna is at least of the same rank, and Harald Bohr comes pretty close. His strength is impressive, but Siegel in his fields is even more original and strong. He is certainly very far from Siegel's perfection. His enthusiasm makes him an inspiring teacher, but his uncritical and extremely egocentric attitude warps his judgments. Not easy to get along with.

There is no doubt that if we cannot get Siegel, we should have to come down several steps for an appointment in mathematics.



Hermann Weyl

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March 16, 1945

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H.A. Bethe, age 38, Cornell University. Quantum theory of crystals, nuclear
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