DR. KURT GÖDEL

Dr. Gödel was born in Brunn, Czechoslovakia, April 28, 1906. He has 1st U.S. naturalization papers. His nationality is Austrian. Dr. Gödel is married, and lives at 129 Linden Lane in Princeton, New Jersey. His permanent address is Himmelstr. 43, Vienna 19, Austria. He received his Ph.D in 1930 at the University of Vienna.

He entered the United States at New York City on October 15, 1938 under a Temporary Visitor's visa No. 69, issued at Vienna on August 24, 1938, expiring 9 months from October 15, 1938. He entered the United States again at San Francisco on March 4, 1940 under Non-quota Immigrant's visa No. 57 issued at Vienna on January 8, 1940.

Positions held: University of Vienna 1933-38 (Apr.) - Privatdozent, 1st term. Received Institute for Advanced Study stipends in 1933-34, plus travel; 1935-36 (resigned before expiration); 1938-39, 1st term; March 1940 to July 1, 1946. Permanent Member July 1, 1946 to present. Notre Dame University 1938-39, 2nd term. Dr. Gödel is a member of the American Mathematical Society.

PUBLICATIONS

Uber formal unentscheidbare Satze der Principia Mathematica und verwandter Systeme I, Monatshefte fur Mathematik und Physik XXXVIII, (1931), pp. 173-198.

Zur intuitionistischen Arithmetik und Zahlentheorie, Ergebnisse eines mathematischen Kolloquims, Heft IV (1932), pp. 34-38.

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Zum intuitionistischen Aussagenkalkul, Anzeiger der Akademie der Wissenschaften in Wien, 1932.

Die Vollstandigkeit der Axiome des logischen Funktionenkalkuls, Monatshefte fur Mathematik und Physik, XXXVII, No. 2, pp. 349-360 (1930).

Zum Entscheidungsproblem des logischen Funktionenkalkuls, Monatshefte fur Mathematik und Physik, Vol. 40, No. 2, pp. 433-443 (1933).

Also several short notes in Ergebnisse eines mathematischen Kolloquiums, Wien.

The consistency of the axiom of choice and of the generalized continuum-hypothesis, N.A.S. Proc. 24 (1938), 556-557.

Consistency-proof for the generalized continuum-hypothesis, N.A.S. Proc. 25, (1939), 220-224.

The consistency of the continuum hypothesis, 68 pp., Annals of Mathematics Studies, (1940).

Russell's mathematical logic, Library of Living Philosophers, Vol. 5 (1944?), 125-153.

What is Cantor's continuum problem?, Am. Math. Monthly 54 (1947), 515-525.

An example of a new type of cosmological solutions of Einstein's field equations of gravitation, Rev. Mod. Phys. 21, (1949), 447-450.

Room 5600
30 Rockefeller Plaza
New York 20, N. Y.

Einstein Award
G. Godel

April 2, 1951

Mrs. Katherine Russell
The Institute for Advanced Study
Office of the Director
Princeton, New Jersey

Dear Mrs. Russell:

I hope you will thank Mrs. Gödel for relinquishing her favorite photograph of Dr. Gödel. We are very grateful to have had it and trust Mrs. Godel will forgive the few scratches which it seems to have suffered in use.

Sincerely yours

Janet Molleson

Janet Molleson

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THE INSTITUTE FOR ADVANCED STUDY
OFFICE OF THE DIRECTOR
PRINCETON, NEW JERSEY

March 29, 1951

Dear Miss Molleson:

In connection with the Einstein Prize Award, I send to your attention a photograph of Dr. Gödel for the publicity releases, which I had obtained from Mrs. Gödel. This happens to be a favorite photograph of hers, and she has asked to have it returned. Would you be kind enough to see if you could get it back for me? It has probably been sent to Mr. Gardner; but I thought I would check with you. We would appreciate its return if that is possible.

Sincerely yours,

Katherine Russell,
Secretary to the Directo[r]

Miss Janet Molleson
Room 5600
30 Rockefeller Plaza
New York, N. Y.

From: Rcom 5600
30 Rockefeller Plaza
New York 20, New York

Telephone: CIrcle 7-3700, Ext. 89

FOR RELEASE IN MORNING PAPERS, MONDAY, MARCH 12, 1951

The first Albert Einstein Award for achievement in the natural sciences has been won by Professor Julian Schwinger of Harvard University, a mathematical physicist, and Professor Kurt Godel, member of the Institute for Advanced Study, Princeton, New Jersey, a mathematical logician.

The awards were made by a committee and announced today by Lewis L. Strauss, President of the Board of Trustees of the Institute for Advanced Study. Mr. Strauss established the award in memory of his parents, the late Lewis and Rosa Strauss, of Richmond, Virginia, who were interested in advancing the natural sciences.

Formal presentation of the award will take place at Princeton on Wednesday, March 14, on the occasion of Dr. Einstein's seventy-second birthday. Dr. Einstein and other noted scientists will be present.

The winners will divide the $15,000 prize and will receive a medal which has been designed by Gilroy Roberts, Philadelphia, sculptor and engraver, who has done much medallic work for the United States mint.

The award committee consisted of Dr. Einstein, Dr. Robert Oppenheimer, director of the Institute for Advanced Study; Dr. John von Neumann and Dr. Hermann Weyl, both of the Institute for Advanced Study.

The committee said it has been "persuaded of the superlative qualifications" of Professor Schwinger and Professor Godel and, under the circumstances, concluded the first Albert Einstein Award should be made to both candidates.

Professor Schwinger has done outstanding work in the field of atomic physics.

His most recent, and rated by many as his greatest, work has given science new understanding of the problem of interaction of light and matter and the properties of electrons and light. His calculations on the influence of self-energy on the hydrogen fine-structure and on the magnetic moment of the electron generally are regarded as a major advance in the understanding of quantum electro-dynamics.

He developed new methods for the treatment of electro-magnetic waves. This formed the basis for much of the practical work with micro waves and had great civil and military significance. He originated new mathematical tools for the analysis of collisions, on which scientists depend heavily for understanding relations between elementary particles.

During World War II, at the radiation laboratory of the Massachusetts Institute of Technology, Dr. Schwinger developed new methods for the treatment of electro-magnetic waves. These methods furnished the basis for the investigations by a substantial part of the laboratory's theoretical group.

Early in his career he contributed many important suggestions about the structure of atomic nuclei and about many decisive experimental studies of nuclear interaction.

Dr. Godel's work in mathematical logic is regarded as one of the greatest contributions to the sciences in recent times. He was able to prove the existence in a properly codified mathematical system of propositions inherently "undecidable."

Following a broad study of the logic of provable and disprovable propositions, he made further notable contributions to science by proving that two of the axioms generally used by mathematicians, although frequently doubted, namely the "axiom of choice" and the "cantor continuum hypothesis", are consistent with the other axioms of set theory if these axioms are consistent.

He has gone deeply into the history of logical and scientific ideas. Although he has not published much on the subject, he is an authority on Leibniz. It was part of Leibniz' program for science to work out a symbolic logic of the sort which is now being developed and of which Dr. Godel is a leading protagonist.

Dr. Schwinger was born in New York City, February 12, 1918 and received his AB and PhD at Columbia University. He has been a National Research Fellow at the University of California, instructor in physics at Purdue University and has lectured at the University of Michigan. He has been at Harvard since 1945 and Professor of Physics since 1947.

Dr. Godel was born in Brunn, Czechoslovakia, April 28, 1906. He received his PhD in 1930 at the University of Vienna and taught at the University of Vienna from 1933 to 1938, when he came to the United States. In this country, he has been connected with the Institute for Advanced Study, of which he has been a permanent member since 1946. He has taken out his first naturalization papers.

Statement in connection with the first presentation of the
Albert Einsteih Award to Dr. K. Godel, March 14, 1951

Kurt Gödel's achievement in modern logic is singular and monumental -- indeed it is more than a monument, it is a land mark which will remain visible far in space and time. Whether anything comparable to it has occurred in the subject of logic in modern times may be debated. In any case, the conceivable proxima are very, very few. The whole field of logic has certainly completely changed its nature and possibilities with Gödel's achievement.

Gödel's name is associated with many important achievements in detail, and with two absolutely decisive ones. The occasion is such that I think I should only talk about the two latter.

The nature of the first one is easy to indicate, although its exact technical character and execution escape an adequate characterization without the specialized and rather intricate techniques of formal logic.

Gödel was the first man to demonstrate that, for any precisely defined set of rules of reasoning, there exist mathematical theorems which can neither be proved nor disproved by means of these rules. In other words, he demonstrated that, no matter what rules of reasoning one may choose as the basis of mathematics, there exist mathematical propositions undecidable by these rules. He proved furthermore that a very important specific proposition belonged to this class of undecidable problems: The question, as to whether mathematics or, to be more exact, the set of rules of reasoning chosen, is free of inner contradictions. The result is remarkable in its quasi-paradoxical "self denial": With whatever set of rules of reasoning one may identify mathematics (provided, only, one identifies it with one precisely defined set), it will never be possible to acquire <u>with mathematical means</u> the certainty that mathematics does not contain contradictions. It must be emphasized that the important point is, that this is not a philosophical principle or a plausible intellectual attitude, but the result of a rigorous mathematical proof of an extremely sophisticated kind.

The formulation that I gave above is actually somewhat simplified: The accepted modes of reasoning in mathematical logic are such that anything can be rigorously inferred from an absurdity. It follows, therefore, that if the formal system of mathematics contained an actual contradiction, then just by virtue of this contradiction, every mathematical theorem would be demonstrable -- including the one about the absence of inner contradictions in mathematics (this would, however, be of little interest, since the opposite would be equally demonstrable). Gödel's result accordingly states that the absence of such contradictions is undecidable, provided there are actually no contradictions in mathematics or, to be more exact: In the formalized system identified with mathematics. In other words, he established not an absolute, but a relative undecidability of a most interesting and peculiar kind. The introduction of such conditional insights into the subject is, in itself, a feat of great significance.

From the mathematical point of view, it is also very interesting that he showed that the propositions involved in these investigations, in particular the one regarding the absence of inner contradictions, are equivalent to problems dealing with so-called Diophantine equations, which have been traditionally of great interest to mathematicians.

Gödel actually proved this theorem, not with respect to mathematics only, but for all systems or disciplines which permit a formalization, that is, a rigorous and exhaustive description, in terms of modern logic, and in which the logician has a freedom of action comparable to the one existing in mathematics. For no such system can the absence of inner contradictions be demonstrated with the means of the system itself. This theorem, too, is established in the relative sense described above.

These results of Gödel's are especially significant against the background of the period in which they were obtained. The dominant mathematical figure of the epoch, Hilbert, had formulated a program to establish the absence of inner contradictions in mathematics by a rigorous and explicitly constructive investigation of its logical methods. Gödel's results proved, to the great surprise of our entire generation, that this program, as conceived by Hilbert, could not be implemented. Thus, these results possessed in the highest degree two qualities which are not frequently found together: All the brilliancy of a great immediate surprise, and the static worth of a discovery which will leave its imprint on the subject for a long time to come.

Gödel's second decisive result can only be stated in the terminology of formal logic and of an important but rather abstruse modern mathematical discipline: Set theory. Two surmised theorems of set theory, or rather two principles, the so-called "Principle of Choice" and the so-called "Continuum Hypothesis" resisted for about 50 years all attempts of demonstration. Gödel proved that neither of the two can be disproved with mathematical means. For one of them we know, that it cannot be proved either, for the other the same seems likely on the basis of certain ideas that Gödel has developed in the course of the last decade, although it does not seem likely that a lesser man than Gödel will be able to prove this.

I will not attempt a detailed evaluation of these achievements, I will limit myself to repeat: In the history of modern logic, they are entirely singular. No indemonstrability within mathematics proper had ever been rigorously established before Gödel. The subject of logic will never again be the same.

John von Neumann

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The formulation that I gave above has coarsened the result and obliterated some of the fine points of its rigorous formulation, but if one is to state the theorem without having recourse to the difficult technical language of formal logic this is, I think, the best approximation that one can achieve.

Gödel actually proved this theorem, not with respect to mathematics only, but for all systems which permit a formalization, that is a rigorous and exhaustive description, in terms of modern logic: For no such system can its freedom from inner contradictions be demonstrated with the means of the system itself.

Gödel's second decisive result can only be stated in the terminology of formal logic and of an important but rather abstruse modern mathematical discipline; Set theory. Two surmised theorems of set theory, or rather two principles, the so-called "Principle of Choice" and the so-called "Continuum Hypothesis" resisted for about 50 years all attempts of demonstration. Gödel proved that neither of the two can be disproved with mathematical means. For one of them we know, that it can not be proved either, for the other the same seems likely, although it does not seem likely that a lesser man than Gödel will be able to prove this.

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March 2, 1951

THE INSTITUTE FOR ADVANCED STUDY
PRINCETON, NEW JERSEY

Copy: Dr. Oppenheimer

February 21, 1951

Rear Admiral Lewis L. Strauss
Room 5600
30 Rockefeller Plaza
New York 20, N. Y.

Dear Strauss:

Yesterday afternoon Oppenheimer asked me to write you a short note about Gödel's work which would give you some kind of a general notion of where it stands in the history of science. The plan is to have von Neumann give a more carefully thought-out statement in connection with the presentation of the prize, but I am glad to have this excuse to write you a few words and in the process to let you know how much I appreciate the sentiments of your letter of January 10.

Modern logic, which it has often seemed to me took up after a long hiatus where the Greeks left off, could be said to begin with the German Frege who devised a symbolism for writing propositions in a way sufficiently unambiguous to permit a study which could be called really logical, at least to the extent of being free from the colorations and ambiguities of the every-day language of mathematics. This happened more than a half century ago.

His work was followed by that of the Italian Peano who made up his own independent but equivalent symbolism and applied it rather broadly to the formulation of mathematical propositions. His method was elaborated further in the "Principia Mathematica" of Whitehead and Russell. The main ideas, as distinguished from the details, of the latter work seem to me to come from Russell. In particular, Russell is the author of "The Theory of Types" which, for the first time, seemed to provide a method of escape from the logical paradoxes which some of the Greek scientists had enunciated with seeming playfulness.

Gödel came on the scene toward the end of the 1920's when a number of very good mathematicians (including von Neumann) were working on the problem of simplifying and understanding the foundations of logic along the lines which the pioneers whom I have mentioned had indicated. His first great contribution was to realize that there are, in a properly codified mathematical system such as for example ordinary arithmetic, propositions which can neither be proved nor disproved. He was able to prove the existence of such "undecidable" propositions by a laborious but perfectly verifiable and elementary process. I think you can see that this up-set a very large number of preconceived notions which had previously been accepted without sufficient analysis. Since this initial achievement

Gödel has gone on with a very broad study of logic in all its aspects, and in particular has displayed great power in determining, so to speak, what can and what cannot be done. Perhaps the most notable of these achievements was the proof which he made something over ten years ago that two of the axioms which have been generally used by mathematicians although frequently doubted by the more sophisticated, namely the "axiom of choice" and the "Cantor continuum hypothesis" are consistent with the other axioms of set theory if these axioms are consistent.

He also has gone very deeply into the history of logical and scientific ideas. In particular he is, although he has not published much on the subject, probably our leading authority on Leibniz and he is very ready to emphasize a point that I have not mentioned above, namely that it was part of Leibniz' program for science to work out a symbolic logic of the sort which is now actually being developed and of which Gödel himself is the leading protagonist.

I doubt very much whether these remarks are of any real use to you except perhaps as they will indicate that Johnny really has a bit of a job on his hands.

Yours sincerely,

OVcdu

Oswald Veblen

This is a textual reproduction of the remarks that I made to Gödel at the presentation of the Albert Einstein Award at Princeton, March 1951. I hope they are sufficiently informative. JvN.

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Gödel's second decisive result can only be stated in the terminology of formal logic and of an important but rather abstruse modern mathematical discipline: Set theory. Two surmised theorems of set theory, or rather two principles, the so-called "Principle of Choice" and the so-called "Continuum Hypothesis" resisted for about 50 years all attempts of demonstration. Gödel proved that neither of the two can be disproved with mathematical means. For one of them we know, that it can not be proved either, for the other the same seems likely, although it does not seem likely that a lesser man than Gödel will be able to prove this.

I will not attempt a detailed evaluation of these achievements, I will limit myself to repeat: In the history of logic, they are entirely singular. No indemonstrability within mathematics proper had ever been rigorously established before Godel. The subject of logic will never again be the same.

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Remarks by Dr. John von Neumann, of the Institute for Advanced Study, at the presentation of the first Albert Einstein Award, at Princeton, March 14, 1951, to Dr. Kurt Godel, member of the Institute for Advanced Study.

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