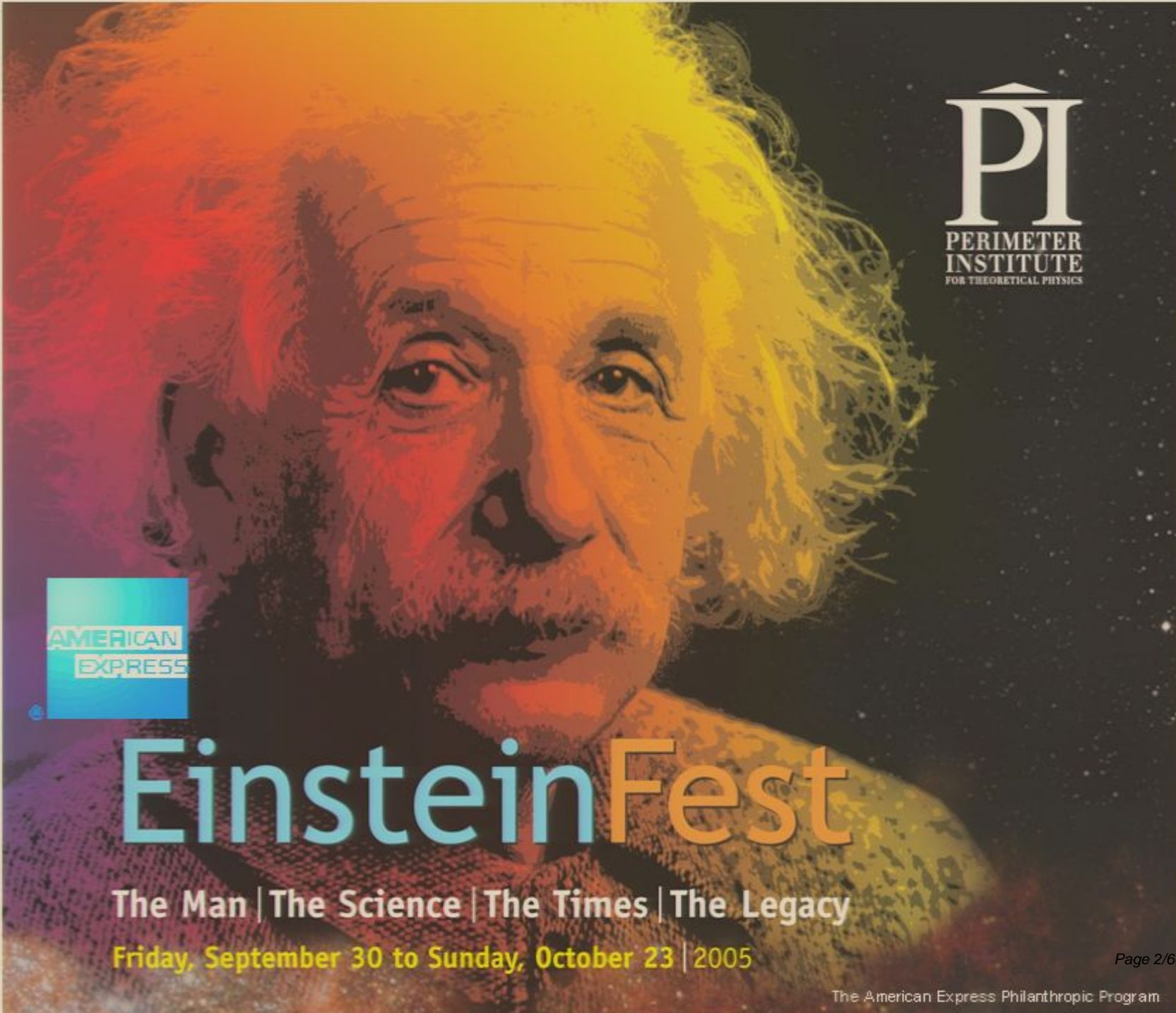


Title: Companion Stars: Einstein and Gödel at the Institute for Advanced Study

Date: Oct 16, 2005 12:00 PM

URL: <http://pirsa.org/05100028>

Abstract: Two of the greatest geniuses of the twentieth century, Albert Einstein and Kurt Gödel, were colleagues in Princeton during the years 1940-55. This talk will explore the contrasting personalities, revolutionary results, consonant world views, and confluent interests in the nature of time that underlay their bond of friendship. <kw>John W Dawson, Einstein, genius, Gödel, Institute for Advanced Study, friendship, </kw>



PI
PERIMETER
INSTITUTE
FOR THEORETICAL PHYSICS



EinsteinFest

The Man | The Science | The Times | The Legacy

Friday, September 30 to Sunday, October 23 | 2005

Companion Stars:

Albert Einstein and Kurt Gödel at the Institute for Advanced Study

John W. Dawson, Jr.

Penn State, York





Albert Einstein: Early Career

- Born Ulm, Germany, 14 March 1879
- 1895–1900 — Student at E.T.H., Zürich
- 1901 — Becomes Swiss citizen; is declared unfit for military service
- 1902— Begins work as patent examiner
- 1905 — *Annus mirabilis*: Obtains Ph.D. and publishes 6 fundamental papers, including two on special relativity
- 1908 — Becomes *Privatdozent* at Bern

Kurt Gödel: Early Career

- Born Brno, Austria-Hungary, 28 April 1906
- 1924 — Enters the University of Vienna
- 1929 — Becomes an Austrian citizen; in his dissertation, proves that first-order logic is semantically complete.
- September 1930 — At a conference in Königsberg, announces his discovery of formally undecidable statements in number theory
- 1933 — Becomes *Privatdozent* at Vienna

Gödel's completeness theorem

In his dissertation Gödel showed that in any first-order axiomatic theory, the statements that are provable coincide with those that are true in all interpretations that satisfy the axioms.

He thus demonstrated that the rules of inference formalized by earlier logicians are adequate for the task of deriving all the logical consequences of a set of axioms.

What the completeness theorem *doesn't* say

Axiom systems are set up to describe specific structures of mathematical interest.

But the completeness theorem does not say that all statements true in a *specific* structure are provable from the axioms, for there may be *other* structures that also satisfy the axioms.

In particular :

Gödel's *incompleteness* theorem

In 1931 Gödel established that all reasonable axiomatizations of arithmetic admit interpretations in which some statements true of the natural numbers are false.

Such statements are therefore **formally undecidable** (neither provable nor refutable from the axioms).

Revolutionary results

- Einstein's theory of special relativity showed that **Newtonian mechanics requires modification** for velocities approaching the speed of light: time runs slower, and measuring rods shrink.
- Gödel's incompleteness theorem showed that **the Euclidean paradigm** of proving theorems on the basis of a fixed set of axioms **is inadequate** for deriving all true statements of arithmetic.

Contrasting personalities

Einstein was

- Gregarious, genial
- A citizen of the world, famous and instantly recognized
- Politically active, especially in the causes of Zionism and peace

Contrasting personalities

Gödel was

- Reclusive, hypochondriacal and paranoid; averse to controversy
- Virtually unknown outside the mathematical community
- Otherworldly, publicly apolitical
- Not Jewish

Commonalities

- Neither Einstein nor Gödel believed in chance.

Einstein: “God doesn’t play dice.”

Gödel: “Every chaos is merely a wrong appearance”

Commonalities

- Both were left behind by their fields and were unwilling to accept some outgrowths of their own discoveries.

Einstein rejected relativistic quantum theory, because of its conflict with causality.

Gödel believed the human mind is capable of settling every mathematical question.

Further parallels

- Both needed caretakers to look after them
 - Einstein:** his cousin/second wife Elsa; his secretary, Helen Dukas.
 - Gödel:** his wife Adele; his colleagues, Oswald Veblen and Einstein; the economist, Oskar Morgenstern
- Both were geniuses who tackled big problems
- Both made discoveries concerning the cosmological structure of space-time

Health: parallels and contrast

Each was incapacitated for a year by stomach ulcers and had to observe a strict diet.

Both were nursed back to health by devoted wives.

Each was also incapacitated for a time by the stress of overwork.

But Gödel, unlike Einstein, was afflicted by recurrent bouts of mental illness.

The Institute for Advanced Study

- Founded in 1930 as a haven for scholars, unfettered by teaching obligations
- Funded by Louis Bamberger and his sister, Mrs. Felix Fuld, who had sold their New York department store to Macy's just before Black Friday
- Began operation in the fall of 1933, housed in Fine Hall at Princeton University. Both Einstein and Gödel were present that year, E. as the first professor, G. as a “worker” (visitor).

The Institute for Advanced Study

- Started out as a single School of Mathematics; later expanded to Schools of Economics and Politics (now Historical Studies), Natural Sciences (theoretical physics) and Social Science.
- Moved into its own building (Fuld Hall) in 1939
- Together with Black Mountain College (also founded in 1930), offered sanctuary to many intellectual refugees of the Holocaust.

Einstein's path to the I.A.S.

1909-12 — Rises from associate to full professor, first at U. Zürich, then Prague, then the E.T.H.

1913 — Becomes research professor in Berlin

1912-19 — Formulates general relativity theory

1920 — Becomes target of anti-Semites

1922 — Is awarded a Nobel Prize in Physics

1930-31 — Visits Cal Tech, which recruits him

1932 — Accepts split appointment (IAS/Berlin)

Einstein's emigration

10 December 1932 — Leaves Germany for third visit to the U.S.; never returns to Germany again

30 January 1933 — Nazis assume power

Spring 1933 — Returns briefly to Europe

9 September 1933 — Leaves Europe for the last time

17 October 1933 — Arrives in U.S. on visitor's
visa

Gödel's path to the I.A.S. (1)

1933 — Teaches first course at Vienna.

1933/34 — First visit to the IAS, where he lectures on his incompleteness results

1934/35 — Enters Austrian sanatorium for treatment of depression.

1935 — Teaches second course at Vienna.

Obtains first consistency results in set theory.

Returns briefly to the IAS that fall, but suffers relapse of depression.

The theory of sets

Set theory is regarded today as the basis for all of mathematics.

The theory was initiated in the 19th century by the German mathematician Georg Cantor, who found a way of comparing the sizes of infinite magnitudes. In particular, Cantor showed that there are more real numbers (those that can be expressed as decimals) than there are integers.

Axiomatic set theory

In the 1920s, set theory was axiomatized by the German mathematician Ernst Zermelo.

(A further axiom was later added by Abraham Fraenkel.)

Among Zermelo's axioms, one (the Axiom of Choice) instantly became controversial.

Gödel's path to the I.A.S. (2)

Spring 1937 — Teaches last course at Vienna.

Proves further consistency results in set theory.

Fall 1938 — Marries Adele Porkert, but leaves her in Vienna while he returns to the U.S. to lecture at the IAS on his consistency results.

Spring 1939 — As a visiting professor at Notre Dame, lectures again on his consistency results.

The Axiom of Choice and the Continuum Hypothesis

The **Axiom of Choice** asserts that given an arbitrary, infinite collection of non-empty sets, there is a set containing one element from each set in the collection.

The **Continuum Hypothesis** asserts that there is no infinite set whose size is intermediate between that of the integers and that of the real numbers.

Gödel's results in set theory

Gödel proved that both the Axiom of Choice and the Continuum Hypothesis are **consistent** with the other axioms of set theory: They can be adjoined to the other axioms without producing any contradiction.

Gödel's emigration

Summer 1939 — On his return to Europe, he is declared fit for Nazi military service. Begins quest to emigrate.

Late 1939 — With IAS assistance, he obtains exit permits and transit visas for him and Adele to leave Europe via the trans-Siberian railway.

January 1940 — After receiving U.S. immigrant's visas, the two begin the long rail and sea journey to America. They arrive March 4 .

Gödel's I.A.S. career

1940-46 — Is reappointed annually as IAS member. Works mainly in philosophy.

1946 — Becomes permanent IAS member.

1948 — Becomes U.S. citizen.

1949-50 — Finds unexpected solutions to Einstein's field equations of gravitation.

1951 — Nearly dies from bleeding ulcer. Shares first Einstein award.

1953 — Is elected to the U.S. National Academy of Sciences and made an IAS professor.

Development of a friendship

- Reportedly, Einstein and Gödel were introduced by Paul Oppenheim, an old friend of Gödel's from Vienna.
- In 1943, Gödel, Einstein, Bertrand Russell, and Wolfgang Pauli met several times in Einstein's home to discuss philosophy of science.
- Soon a firm friendship, based on mutual respect, developed between Einstein and Gödel.

Walking companions

Gödel and Einstein were often seen walking home together. What did they talk about on those occasions?

Shortly after Einstein's death, Gödel himself described their friendship:

Princeton, Sep. 7, 1955.

Sehr geehrter Herr Seelig:

In Beantwortung Ihres Schreibens moechte ich Ihnen folgendes mitteilen:

Ich lernte Einstein im Jahre 1933 bei meinem ersten Besuch in Princeton kennen. Aber erst nachdem ich mich dauernd in Princeton niedergelassen hatte, kam ich (1942) in naeheren Kontakt mit ihm. Seitdem erfreute ich mich sehr haeufig seiner Gesellschaft. Unsere Diskussionen bezogen sich hauptsaechlich auf Philosophie, Physik und Politik. Einstein erzaehlte mir regelmaessig ueber die Fortschritte (oder Modifikationen) der unifizierten Feldtheorie. Ferner sprachen wir des oeffteren ueber Gegenstaende, ueber die Einstein's Meinung in publizierter Form Vorliegt, und schliesslich auch ueber eine Reihe von Fragen, die durch meine Arbeiten und Ansichten angeregt wurden. Ich habe oft darueber nachgedacht, warum wohl Einstein an den Gespraechen mit mir Gefallen fand, und glaube eine der Ursachen darin gefunden zu haben, dass ich haeufig der entgegengesetzten Ansicht war und kein Hehl daraus machte. Ein "Mitarbeiter" Einstein's bin ich nie gewesen, da ich der unifizierten Feldtheorie sehr skeptisch gegenueberstehe. Meine eigenen Arbeiten ueber die Relativitaetstheorie beziehen sich auf die 1916 veroeffentlichte reine Gravitationstheorie, von der ich glaube, dass sie, sowohl von Einstein selbst, als auch von der ganzen zeitgenoessischen Physikergeneration als Torso stehen gelassen wurde, und zwar in jeder Hinsicht: physikalisch, mathematisch und hinsichtlich ihrer Anwen-

"I came to know Einstein in 1933 on my first visit to Princeton. But only after I had settled permanently in Princeton did I come into close contact with him (1942). From then on I very often enjoyed his companionship. Our discussions mainly had to do with philosophy, physics, and politics. Einstein regularly told me about the progress (or modifications) of the unified field theory. Moreover we frequently spoke about matters on which Einstein's opinion was at hand in published form, and finally also on a series of questions that were stimulated by my own work and views. I have often reflected on why Einstein took pleasure in speaking with me, and I believe one of the reasons was that I often was of the contrary opinion and made no secret of it. I was never a collaborator of Einstein's, since I very skeptically opposed the unified field theory. My own works on relativity theory are concerned with the pure gravitational theory published in 1916, which I, as well as Einstein himself and the entire contemporary generation of physicists, believe was left standing as a torso, and indeed in every respect: physical, mathematical, and as regards its applications (cosmology)."

Einstein's interactions with Gödel

- Gödel's citizenship hearing
- Einstein's 70th birthday celebration
- Gödel's sharing of the first Einstein award
- Their political views and interactions

The citizenship hearing

Einstein and Oskar Morgenstern served as the two witnesses at Gödel's U.S. citizenship hearing.

Since Gödel did not drive, Morgenstern served as chauffeur. On the way to the hearing, Einstein endeavored to distract Gödel from expounding upon an idea that he and Morgenstern thought might jeopardize Gödel's bid for citizenship:

Gödel was convinced that he had found a **contradiction** in the U.S. Constitution, which could permit the establishment of a dictatorship in the United States.

Einstein's 70th birthday

In 1946 Gödel agreed to contribute an essay to a volume commemorating Einstein's 70th birthday — a short article on the relation between the theory of relativity and Kant's philosophy.

In the course of that work he discovered previously unforeseen models of Einstein's equations of general relativity theory, in which there is no notion of absolute time.

Temporality vs. causality

In Gödel's rotating universes there are closed, time-like lines. By following a path along such a time line, one could, without exceeding the velocity of light, revisit one's own past.

Presumably, however, one could not alter that past.

Significance of Gödel's models

The universes Gödel described that permit time travel are non-expanding, unlike the universe in which we live.

Nonetheless, the possibility of such universes shows that our intuitive notion of the passage of time is problematic in a deep sense.

The first Einstein awards

In 1950, Admiral Lewis S. Strauss, an IAS trustee, endowed the Einstein Award, a gold medallion and check for \$15,000, to be given once every three years on Einstein's birthday.

In 1951, the physicist Julian Schwinger was selected to receive the first such award; but in the event, he shared the award with Gödel.

Einstein's influence

What prompted the change?

Entries in Morgenstern's diary show that he and Einstein engineered Gödel's sharing the award, in order to boost Gödel's morale during his recovery from a life-threatening ulcer.

Presented to him by Einstein himself, the award was the first public recognition Gödel had ever received for his work.

Political views and interactions

Einstein was an activist for peace, yet one who helped initiate the Manhattan Project.

But he was also outspoken, and considered a security risk by the U.S. government.

Einstein's letter to Roosevelt

Albert Einstein
Old Grove Rd.
Nassau Point
Peconic, Long Island

August 2nd, 1939

F.D. Roosevelt,
President of the United States,
White House
Washington, D.C.

Sir:

Some recent work by E. Permi and L. Szilard, which has been communicated to me in manuscript, leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. Certain aspects of the situation which has arisen seem to call for watchfulness and, if necessary, quick action on the part of the Administration. I believe therefore that it is my duty to bring to your attention the following facts and recommendations:

In the course of the last four months it has been made probable - through the work of Joliot in France as well as Permi and Szilard in America - that it may become possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.

This new phenomenon would also lead to the construction of bombs, and it is conceivable - though much less certain - that extremely powerful bombs of a new type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory. However, such bombs might very well prove to be too heavy for transportation by

Pirsa: 05100028
air.

-2-

The United States has only very poor ores of uranium in moderate quantities. There is some good ore in Canada and the former Czechoslovakia, while the most important source of uranium is Belgian Congo.

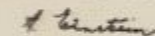
In view of this situation you may think it desirable to have some permanent contact maintained between the Administration and the group of physicists working on chain reactions in America. One possible way of achieving this might be for you to entrust with this task a person who has your confidence and who could perhaps serve in an unofficial capacity. His task might comprise the following:

a) to approach Government Departments, keep them informed of the further development, and put forward recommendations for Government action, giving particular attention to the problem of securing a supply of uranium ore for the United States;

b) to speed up the experimental work, which is at present being carried on within the limits of the budgets of University laboratories, by providing funds, if such funds be required, through his contacts with private persons who are willing to make contributions for this cause, and perhaps also by obtaining the co-operation of industrial laboratories which have the necessary equipment.

I understand that Germany has actually stopped the sale of uranium from the Czechoslovakian mines which she has taken over. That she should have taken such early action might perhaps be understood on the ground that the son of the German Under-Secretary of State, von Weizsäcker, is attached to the Kaiser-Wilhelm-Institut in Berlin where some of the American work on uranium is now being repeated.

Yours very truly,



(Albert Einstein)

Apropos of Einstein's famous letter

In May of 1972 Gödel received an inquiry from Professor Hans Thirring, who had been one of his instructors in physics at the University of Vienna. Crippled by a stroke, and realizing he had not long to live, Thirring urgently wanted to know whether an act of his might have had an effect on world history.

He wrote:

Tel. 34 22 48

Wien, 31. Mai 1972.

Herrn Prof. Kurt Gödel
Institute for Advanced Study, Princeton. U.S.A.

Lieber Kollege Gödel!

Ich bin jetzt 84 Jahre und seit vier Jahren leide ich an Aphasie und bin sehr sprachbehindert. Ich war sechsmal in USA und das letzte Mal im Jahr 1968 fuhr ich per Schiff die Südroute und erlitt einen Gehirnschlag und seit damals kann ich nicht mehr richtig sprechen und auch schlecht schreiben. Ich bin aber absolut nicht gelähmt und auch meine Gehirntätigkeit ist vollkommen normal.

Ich erinnere mich deutlich an Ihren Besuch im Jahr 1940 als Sie sich vor Ihrer abenteuerlichen Flucht vor Hitler über Rußland und China von mir verabschiedeten und schließlich in USA landeten. Ich habe Sie damals auf den Artikel in den Naturwissenschaften vom 9. Juni 1939, Bd. 27, S. 102 von Flügge, einem Mitarbeiter Hahns, aufmerksam gemacht, dessen Titel lautete: "Kann der Energieinhalt technisch nutzbar gemacht werden." Ich bat Sie damals sich mit Einstein in Verbindung zu setzen und ihn dringend zu bitten, Präsident Roosevelt auf die große Gefahr aufmerksam zu machen, die entstehen würde, wenn Hitler-Deutschland die Bombe früher fertig hätte als USA. Ich sprach damals mit drei Leuten, die aus Deutschland emigrierten und bat sie um dasselbe. Ich weiß nicht, ob einer dieser Männer jemals mit Einstein darüber gesprochen

In reply, Gödel said:

“Was Ihre frage betrifft, so erinnere mich nur daran, dass ich Einstein Grüsse von Ihnen überbrachte. ... Ich wusste nicht, dass an der Herstellung einer Kettenreaktion gearbeitet wurde. Als ich später von diesen Dingen hörte, war ich sehr skeptisch, nicht aus physikalischen, sondern aus soziallogischen Gründen, weil ich glaubte, dass diese Entwicklung erst gegen das Ende unserer Kultur-Periode erfolgen wird, die vermutlich noch in ferner Zukunft liege.”

“As to your question, I recall only that I conveyed your greetings to Einstein. ... I didn't know that a chain reaction had been achieved, [and] when I heard of such things later on I was very skeptical, not on physical, but rather on sociological grounds, for I thought that that development would only take place toward the end of our culture era, which presumably still lay in the distant future.”

Shared and unshared political views

Though very circumspect in his expression of political opinions, Gödel agreed with many of Einstein's public utterances.

In a 1950 letter to his mother, then living in occupied Vienna, he quoted one of Einstein's criticisms of U.S. foreign policy:

Einstein wusste, ist, dass man den Frieden durch
Aufrüstung u. Einschüchterung der "Gegner" zu
erzielen suchte. Er sagte, dass dieses Verfahren not-
wendig zum Krieg (u. nicht zum Frieden) führt,
somit er ja recht hatte. Und es ist ja bekannt,
dass das andere Verfahren (auf gutlichem Wege eine
Einigung zu erzielen) von Amerika ja nicht ver-
sucht, sondern von vornherein abgelehnt wurde.
Wer angefangen hat, ist nicht die einzige Frage
u. meistens auch schwer festzustellen. Aber sicher
ist jedenfalls, dass Amerika unter dem Schlagwort
der "Demokratie" einen Krieg für ein vollkommen
unpopuläres Regime führt u. unter dem Namen

einer "Polizeikation" für die V.N. Dinge tut,
mit denen selbst die V.N. nicht einverstanden sind.

Translated excerpt from Gödel's letter to his mother

“Einstein warned against seeking to achieve peace through rearmament and intimidation of the enemy. He said that that would necessarily lead to war, and not to peace, and he was quite right. And it is well known that the other approach (seeking accord by amicable means) was not tried by America at all, but was rejected from the first.

Translation (continued)

Who began it all is not the only question, and is also, for the most part, difficult to determine. But in any case it is certain that, under the slogan of ‘democracy’, America is carrying on a war for a completely unpopular regime, and in the name of a ‘police action’ for the U.N. is doing things with which the U.N. itself disagrees.”

Unanticipated result

Unknown to Gödel, his letter was intercepted by U.S. Army censors, who passed it on to the F.B.I.

Here is their appraisal of it:

SAC, Newark

May 14, 1951

Director, FBI

DR. KURT GOEDEL
SECURITY MATTER - C
Bureau File # 105-14332 - 1
RECORDED

~~Classified 6/9/90~~
~~Declassify on: OADR 1/5/94/90~~
~~FOIA # 318761~~

DECLASSIFIED BY 6974
ON 9/10/90
for Army CW add
8/2/90.

The Censorship Group, Vienna, Austria, has furnished the Bureau the following intercept of a letter from Dr. Kurt Goedel, 121 Linden Lane, Princeton, New Jersey, addressed to [redacted] (S)(u)

"...Einstein warned the world not to try to attain peace by re-armament and intimidating the adversaries. He said that this procedure would lead to war and not to peace, and he was quite right. And the fact is well known that the other procedure (trying to come to an agreement in an amicable way) wasn't even attempted by America, but refused from the first. It isn't the one and only question as to who started matters, and for the most part it would be difficult to establish. But one thing is certain; under the slogan "democracy" America is waging war for an absolutely unpopular regime and under the name of a "police action" for the UN and does things to which even the UN doesn't agree..." (S)(u)

The only information appearing in the Bureau's files identifiable with the captioned individual is set out in New York letter to the Bureau dated February 24, 1944, which listed male German aliens of military age who registered at the German Consulate in New York City subsequent to the outbreak of World War II. This registration was in conformance with German law which required all German nationals of military age who were abroad to report to the nearest German Consulate in the event Germany became involved in a war. Included on this list was Kurt Goedel, 245 Nassau Street, Princeton, New Jersey.

In the event the files of your office contain no additional information concerning Dr. Goedel, it is not believed that an investigation concerning him is justified at this time.

- Tolson _____
- Ladd _____
- Clegg _____
- Glavin _____
- Nichols _____
- Rosen _____
- Tracy _____
- Harbo _____
- Belmont _____
- Mohr _____
- Tele. Room _____
- Nease _____
- Gandy _____

[redacted]

MAILED
MAY 15 1951
COMM - FBI

ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED
DATE 11-23-64 BY 21
ALL
b7c

[redacted]

Contrasting political views

Einstein and Gödel did not always agree, however. In the 1952 presidential elections Einstein supported Stevenson. Afterward, referring to Gödel's well-known mental problems, he quipped to a colleague,

“Gödel is now completely crazy: He voted for Eisenhower.”

Einstein's death

On 18 April 1955, Einstein died of a ruptured aortic aneurysm. The event was a profound shock to Gödel, for although the aneurysm had been discovered more than six years earlier, Einstein had never mentioned it to him.

Aftermath

- Together with Bruria Kaufmann, Einstein's last collaborator, Gödel helped organize the papers left behind in Einstein's office at the IAS.
- Later Gödel attended the IAS memorial service for Einstein. Recounting the event in a letter to his mother, he remarked that it was the first time he had ever allowed himself "to endure two hours of Bach, Haydn, and the like".

Gödel's later years

The last paper by Gödel published during his lifetime appeared in 1958. Another seminal contribution, it outlined a consistency proof for formalized arithmetic.

In 1963 his set-theoretic consistency results were extended — in a way he had expected, but been unable to achieve — by Paul J. Cohen.

Cohen's results

Gödel had shown that the Axiom of Choice and the Continuum Hypothesis could be adjoined to the other axioms of set theory without contradiction.

Cohen showed that the negations of those statements could also be adjoined to the other axioms without contradiction.

Gödel's demise

From 1969 onward Gödel became increasingly withdrawn and his mental problems (paranoia, hypochondria and anorexia) intensified.

He retired from the IAS in 1976 and died on 14 January 1978 of “malnutrition and inanition” — the result of a paranoid delusion that someone was trying to poison him.

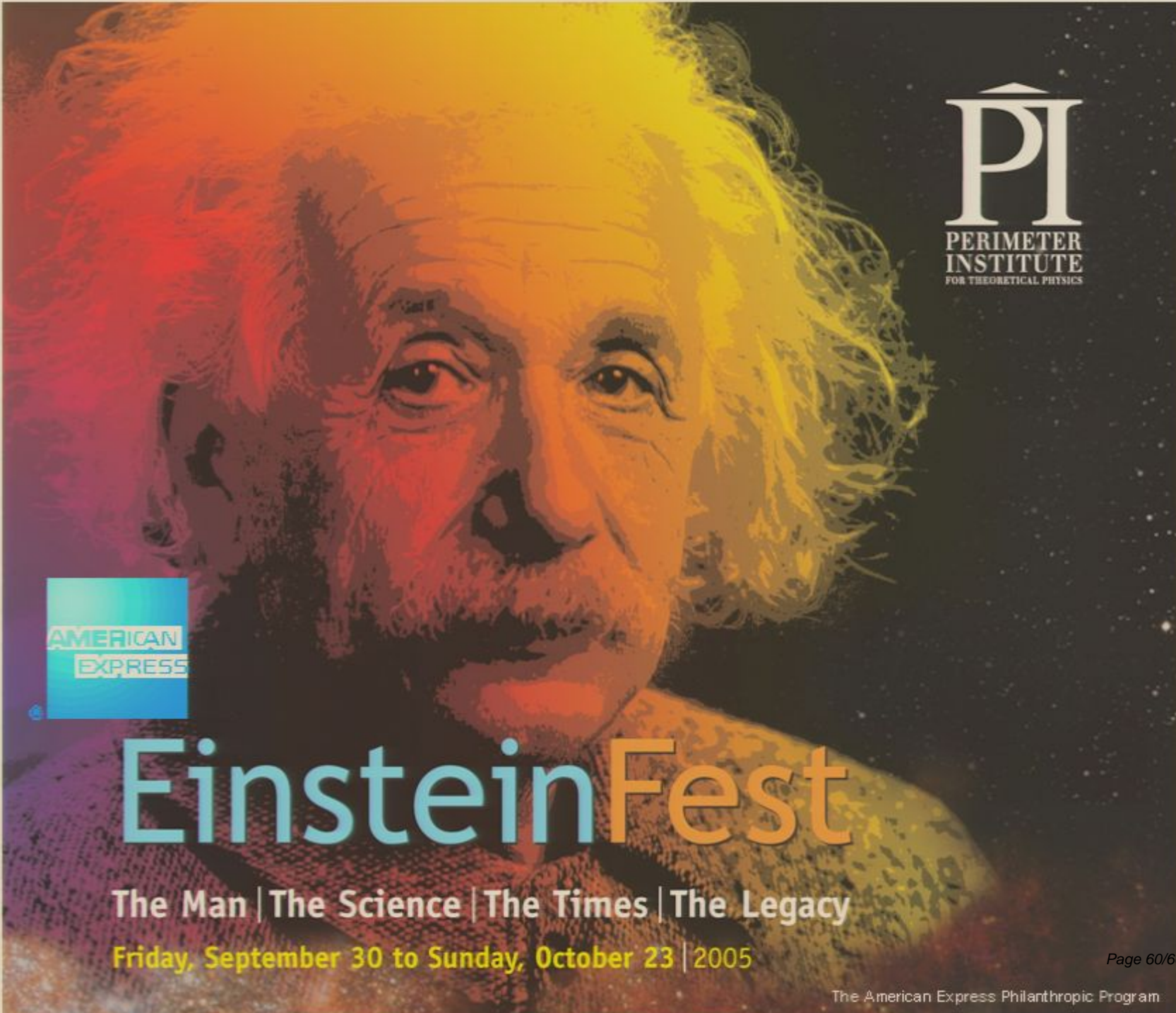
In death as in life

- Einstein's death was announced and mourned throughout the world.
- Apart from a sparsely attended memorial service at the IAS and notices in a few major world newspapers, Gödel's death passed largely unnoticed outside the mathematical community.

References

John W. Dawson, Jr., *Logical Dilemmas: The Life and Work of Kurt Gödel* (Wellesley, Mass., A K Peters, Ltd.)

Abraham Pais, *'Subtle is the Lord ...' : The Science and the Life of Albert Einstein* (New York, Oxford University Press)



PI
PERIMETER
INSTITUTE
FOR THEORETICAL PHYSICS



EinsteinFest

The Man | The Science | The Times | The Legacy

Friday, September 30 to Sunday, October 23 | 2005