

Hilbert

Constance Reid

Hilbert



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Questions upon Rereading *Hilbert*

By 1965 I had written several popular books, such as *From Zero to Infinity* and *A Long Way from Euclid*, in which I had attempted to explain certain easily grasped, although often quite sophisticated, mathematical ideas for readers very much like myself—interested in mathematics but essentially untrained. At this point, with almost no mathematical training and never having done any biographical writing, I became determined to write the life of David Hilbert, whom many considered the profoundest mathematician of the early part of the 20th century. Now, thirty years later, rereading *Hilbert*, certain questions come to my mind.

The first question is, with the background I have described, how could I have presumed to write the life of a mathematician so singular that even those who had known him best were convinced that they could not write about him?

The answer is that at the time I simply felt the lay public for whom I had written *From Zero to Infinity* and *A Long Way from Euclid* would be interested in knowing about this very unusual and influential mathematician. So I set out to contact Hilbert's friends and former students who were still living. There were two whose closeness to Hilbert made it vital that I talk with them. One of these was the physicist Max Born. His response came promptly—on a postcard. He would welcome a biography of Hilbert, he wrote, but by a woman who was not German? Who was not a mathematician? Who had never known Hilbert? The other was Richard Courant. His reply did not come for a long time. Then he wrote that he imagined my project was by now completed and his help was no longer needed! Although ultimately he agreed to talk to me about Hilbert, he remained doubtful: "I confess I have no idea how you intend to proceed."

Well, I proceeded by writing to others who had known Hilbert and, when they were responsive, going to interview them in this country and in Europe. (In the course of my research, I was able, among other things, to recover the letters long thought lost, which Hermann Minkowski had written to Hilbert over their long friendship.) When I finally had a manuscript, I sent copies to

the physicist Paul Ewald, who was one of those I had visited, and to a few others. Ewald was delighted with what I had written and suggested that I send a copy to his good friend Max Born. Remembering Born's postcard, I demurred. But Ewald insisted. Born was old and ill and might not live to see the published book. So I sent him a copy of the manuscript and received an enthusiastic note in reply. Richard Courant was equally enthusiastic. It was he who insisted the book must be published by Springer-Verlag, the scientific publisher who had done so much after World War I to return German science to its pre-war eminence.

Springer-Verlag promoted the book enthusiastically, although not to the readers of my earlier books, but rather to its own audience—the professional scientific community. The result was that *Hilbert*, to a large extent, never reached those for whom it had been written. It was read almost entirely by mathematicians and other scientists—an audience that I never expected it to have.

So the second question that comes to mind upon rereading *Hilbert* is the following:

If I had known who my readers were going to be, would I have written the book differently?

The answer is of course that I would not have written the book at all. I was never so daring as to think that a nonmathematician like me could write a book *about a mathematician* that *mathematicians* would read.

This brings me to my third question. Today, having written the lives of three other outstanding mathematicians and a number of short biographical articles about mathematicians, could I still write *Hilbert*?

The answer to that question is no.

Someone else may some day write a scholarly biography of David Hilbert, but the book *Hilbert* that I wrote—I could not write that again. It is a romantic book, written in a kind of mathematical innocence that I no longer possess. I am most happy if indeed it is, as Freeman Dyson once described it, “a poem in praise of mathematics.”

In this new edition under the Copernicus imprint of Springer-Verlag, I hope that *Hilbert* will continue to be read with enjoyment by mathematicians and that it will also come at last into the hands of the mathematically interested laymen for whom I originally wrote it.

San Francisco, California
November 30, 1995

Constance Reid

Preface

To a large extent this book has been written from memory.

I received much friendly assistance from men and women who took their doctoral degrees from Hilbert: Vera Lebedeff-Myller (1906), Robert König (1907), Andreas Speiser (1909), Richard Courant (1910), Hugo Steinhaus (1911), Paul Funk (1911), Ludwig Föppl (1912), Hellmuth Kneser (1921), Haskell Curry (1930), Arnold Schmidt (1932), Kurt Schütte (1934).

Written recollections of other former students, no longer living, were also of great assistance. I would like to acknowledge here my special debt to Otto Blumenthal (1898), who wrote the biographical sketch for Hilbert's collected works and the one for the special edition of *Naturwissenschaften* honoring Hilbert's sixtieth birthday; and to Hermann Weyl (1908) for the obituary notice for the Royal Society and the article "David Hilbert and his mathematical work," which is reprinted in this book.

Perhaps most helpful to me because they had the longest, closest acquaintance with Hilbert were Richard Courant, who was his colleague from 1919 to 1933, most of the time as head of the Mathematical Institute; and Paul Bernays, who was from 1917 to 1934 his assistant and his collaborator in his work on logic and the foundations of mathematics.

Among Hilbert's former physics assistants, Alfred Landé, Paul Ewald, Adolf Kratzer and Lothar Nordheim were most generous with their time and knowledge. I would especially like to thank Professor Ewald for his suggestions on the literary treatment of Hilbert's life.

I was also able to obtain a great deal of information about Hilbert in personal interviews with people who, although they were not his students, were close to the Göttingen circle at various times. These included Hans Lewy, Alexander Ostrowski, George Pólya, Brigitte Rellich, Carl Ludwig Siegel, Gabor Szegő, Olga Taussky-Todd, Jan van der Corput, B.L. van der Waerden, Ellen Weyl-Bär. Letters from Kurt and Elizabeth Reidemeister and from Helmut Hasse described Hilbert's last years. Alfred Tarski and Kurt Gödel, as well as Professor Bernays, answered my questions about Hilbert's work in logic and foundations.

Hilbert

I am grateful to Lily Rüdénberg and Ruth Buschke for their kindness in allowing me to quote from the letters which their father, Hermann Minkowski, wrote to Hilbert during the many years of their close friendship. Unfortunately, the Hilbert half of the correspondence, which was returned to Mrs. Hilbert by Mrs. Minkowski in 1933, is—as far as I have been able to determine—no longer in existence. The few quotations from Hilbert's letters to Minkowski which do appear in this book are from Blumenthal, who had the opportunity to read Hilbert's letters before he wrote the biographical sketch for the collected works.

Horst Hilbert, the son of Hilbert's cousin, supplied many details about the family. J.K. von Schroeder of the Geheimes Staatsarchiv der Stiftung Preußischer Kulturbesitz searched out vital statistics. Kin-ya Honda translated his biographical sketch of Hilbert into English for me. H. Vogt, director of the Niedersächsische Staats- und Universitätsbibliothek, made available the letters from Hilbert which are in the Klein and Hurwitz papers. Martin Kneser, the present director of the Mathematical Institute, provided me with office space and gave me access to the Hilbert papers. Ursula Drews, the secretary of the Institute, was most helpful. Irma Neumann, whose mother was the Hilbert's well-loved housekeeper for many years, shared with me the Hilbert family pictures.

Special thanks are due to my sister, Julia Robinson, who never faltered in providing assistance, advice and encouragement; to Volker Strassen, who introduced me to Göttingen and its mathematical tradition; to Ursula Lorenz, Christa Strassen and Edith Fried, who supplemented my knowledge of German and of Germany.

It makes me very happy that the book is being published by Springer-Verlag, who had close ties with Hilbert and Göttingen and who, by taking the risks of publication, substantially contributed to the revival of German science after the first world war.

The manuscript has been read at various stages by Paul Bernays, Richard Courant, Paul Ewald, Lothar Nordheim, Julia Robinson, R.M. Robinson, Volker Strassen, Gabor Szegö, John Addison Jr., and Max Born.

After all this very generous assistance, any errors which remain are most certainly my own.

San Francisco, California
August 3, 1969

Constance Reid

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Königsberg
and
Göttingen

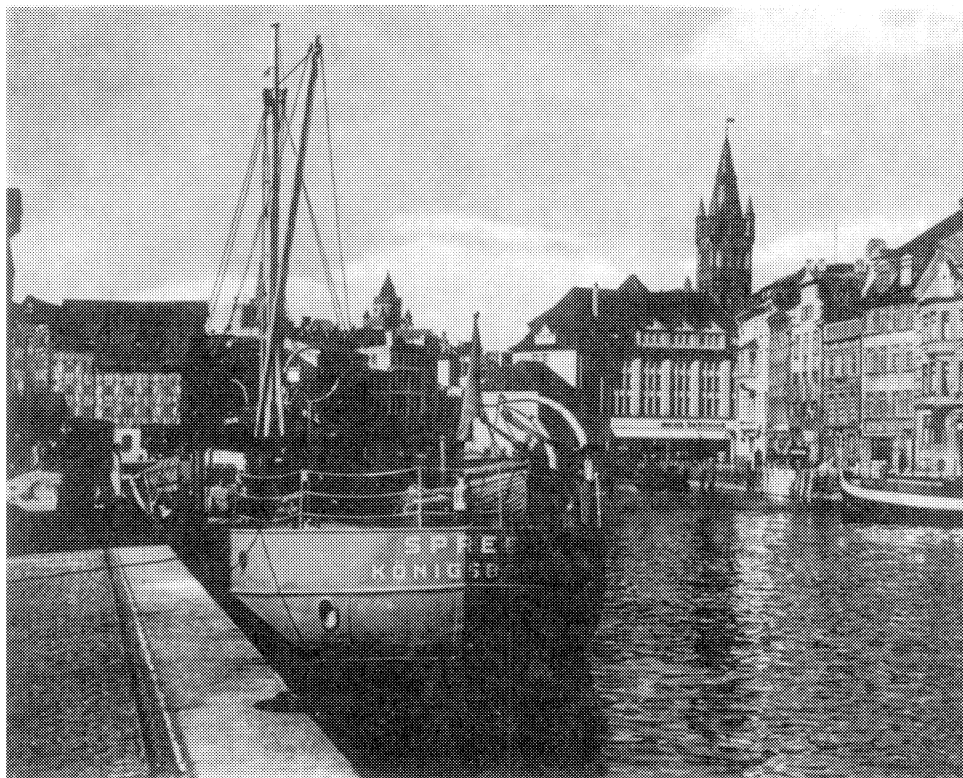
An Album



Otto Hilbert, father of David Hilbert, as a university student in 1850



The Königsberg cathedral (reprinted from *Ostpreussen, Westpreussen, Danzig*, Gräfe und Unzer Verlag, München)



The Pregel river with the Königsberg castle in the background (reprinted from *Ostpreussen, Westpreussen*. Danzig, Gräfe und Unzer Verlag, München)



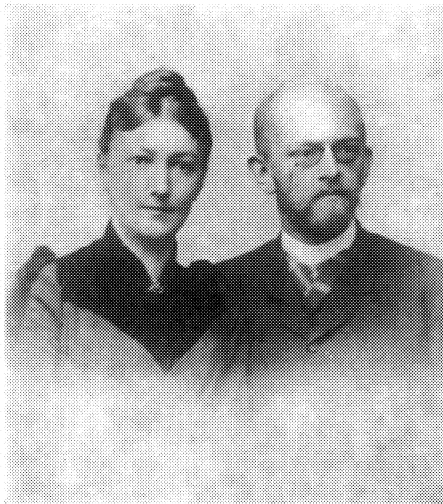
Hermann Minkowski when he won the prize of the Paris Academy



Adolf Hurwitz as an Extraordinarius in Königsberg



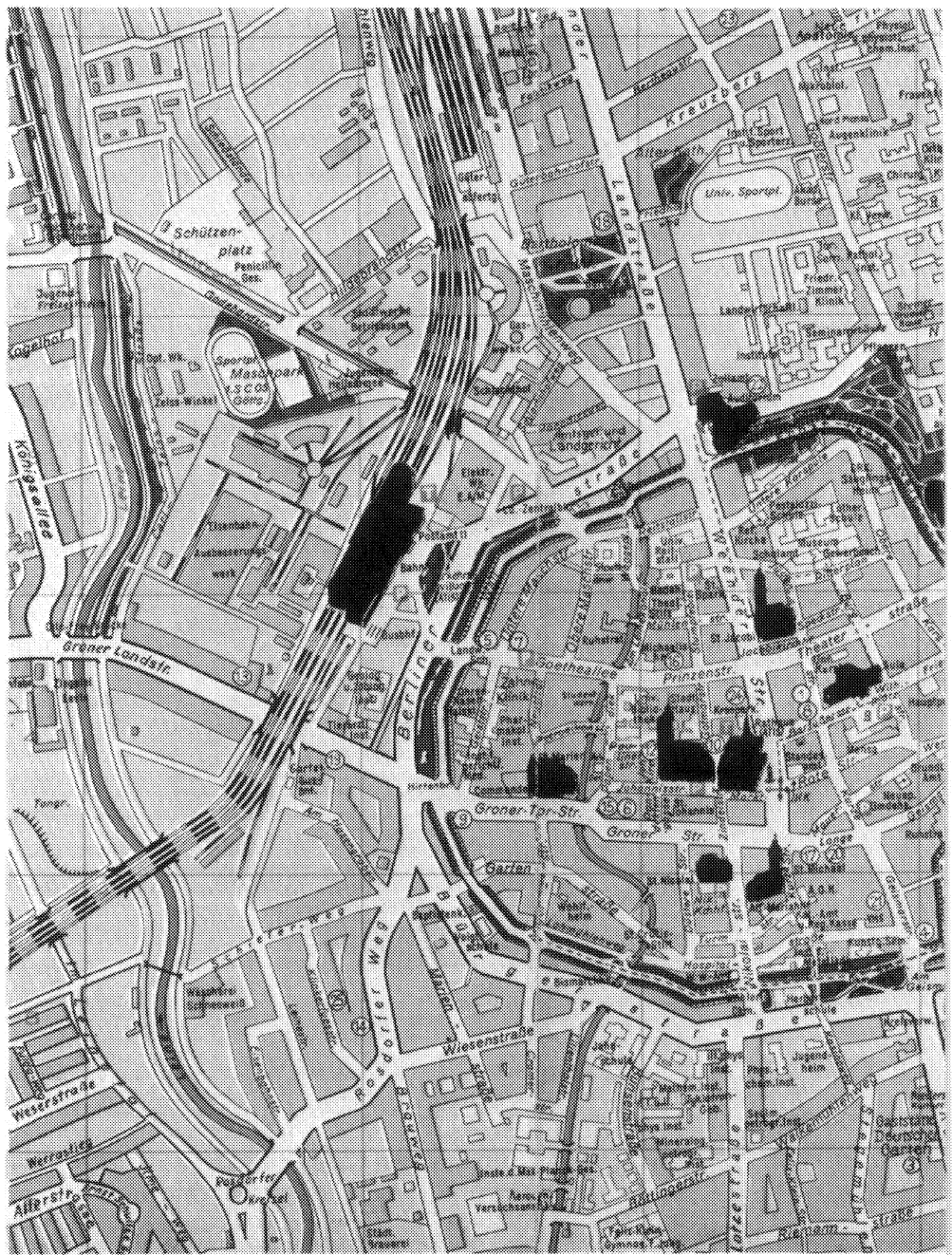
David Hilbert, 1886



David Hilbert and Käthe Jerosch, 1892



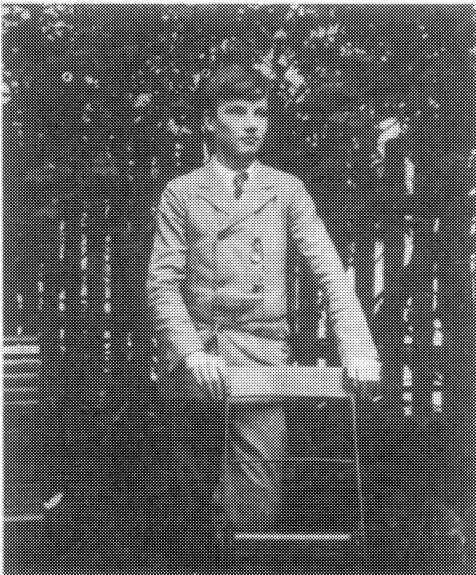
Felix Klein during his Leipzig days







David Hilbert, c. 1900



Franz Hilbert, only son of
David and Käthe Hilbert



The Mathematics Club of Göttingen, 1902

Left to right, front row: Abraham, Schilling, Hilbert, Klein, Schwarzschild, Mrs. Young, Diestel, Zermelo; second row: Fanla, Hansen, C. Müller, Dawney, E. Schmidt, Yoshiye, Epstein, Fleisher, F. Bernstein; third row: Blumenthal, Hamel, H. Müller (Courtesy of Kinyu-Honda)



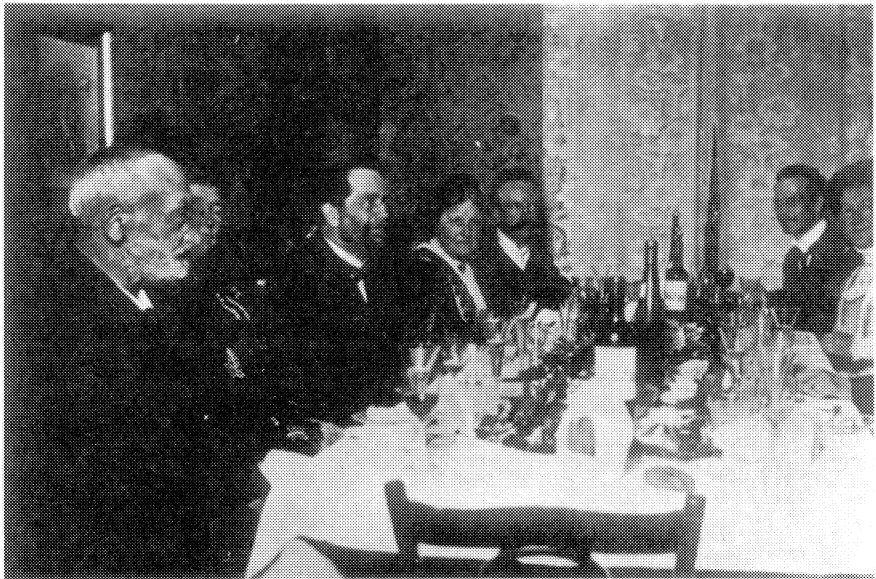
Carl Runge



Max Born as a Privatdozent in Göttingen



Edmund Landau



A dinner party at the Kleins' with Paul Gordan (far left), Klein (center and Käthe Hilbert (far right)



Richard Courant as a student in Göttingen



Hermann Minkowski



David Hilbert, 1912—one of a group of portraits of professors
which were sold as postcards in Göttingen



Emmy Noether



The van der Waerdens and the Hopfs saying goodbye to the Courants in Zürich: Mrs. Hopf, Mrs. van der Waerden, van der Waerden, Heinz Hopf in front



Constantin Carathéodory



Hilbert's sixtieth birthday party

Front row, left to right: Richard Courant, Franz Hilbert, Mrs. Courant (Nina Runge), Hertha Sponer (later Mrs. Franck), Mrs. Grotrian; second row: Mrs. Esslen (later Mrs. Springer), Mrs. Landau, Mrs. Hilbert, David Hilbert, Mrs. Hofmann, Mrs. Minkowski; third row: Ferdinand Springer, Felix Bernstein (behind Mrs. Landau), Mrs. Prandtl, Edmund Landau, Mrs. Franck, Fanny Minkowski (at end of row); fourth row: Ernst Hellinger, Erich Hecke (behind Landau), Walter Grotrian (behind Mrs. Hofmann); fifth row: Peter Debye, Theodore von Kármán (behind Hecke), Mrs. Rüdberg (Lily Minkowski), Paul Bernays, Leonard Nelson, "Klärchen" (second from end of row).



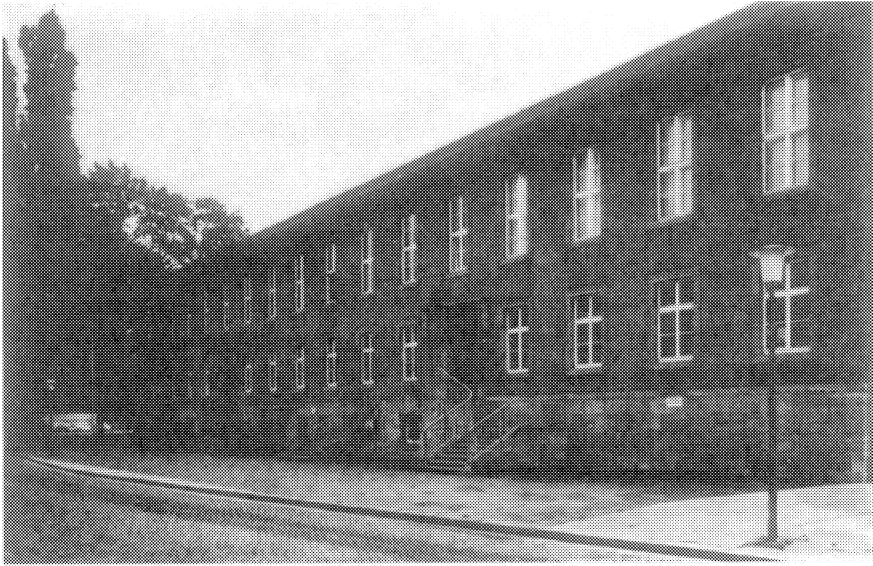
Hermann Weyl



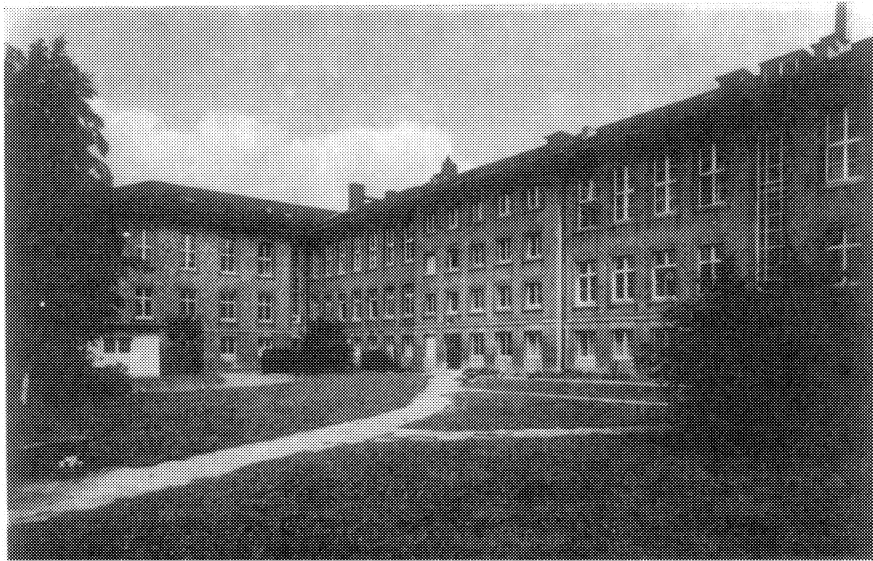
Richard Courant



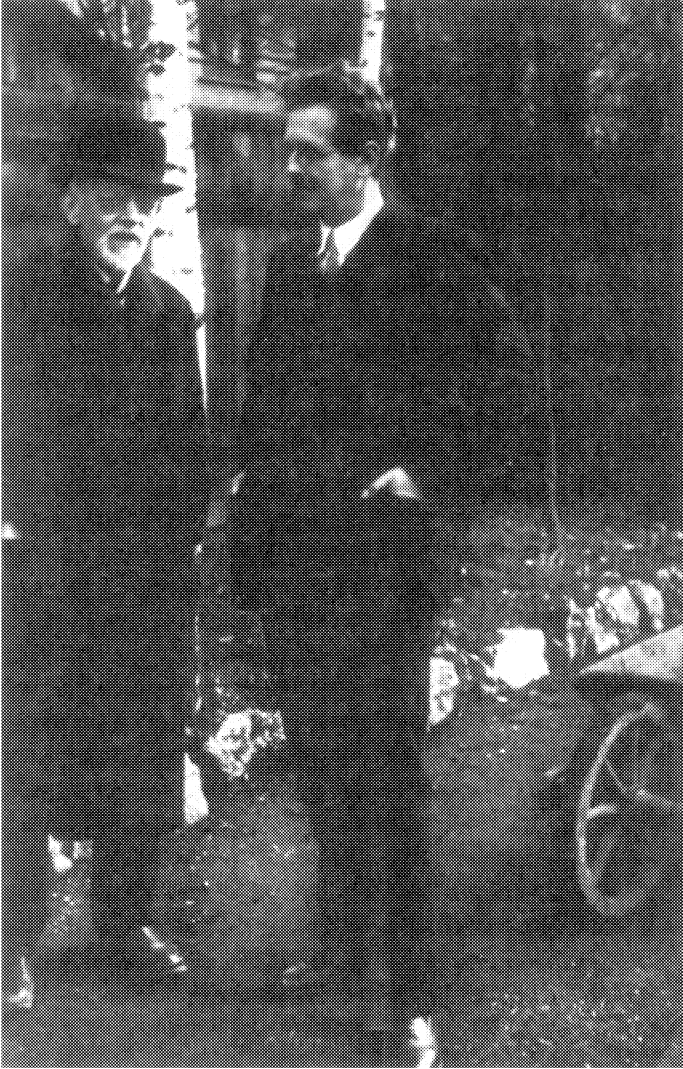
Max Born



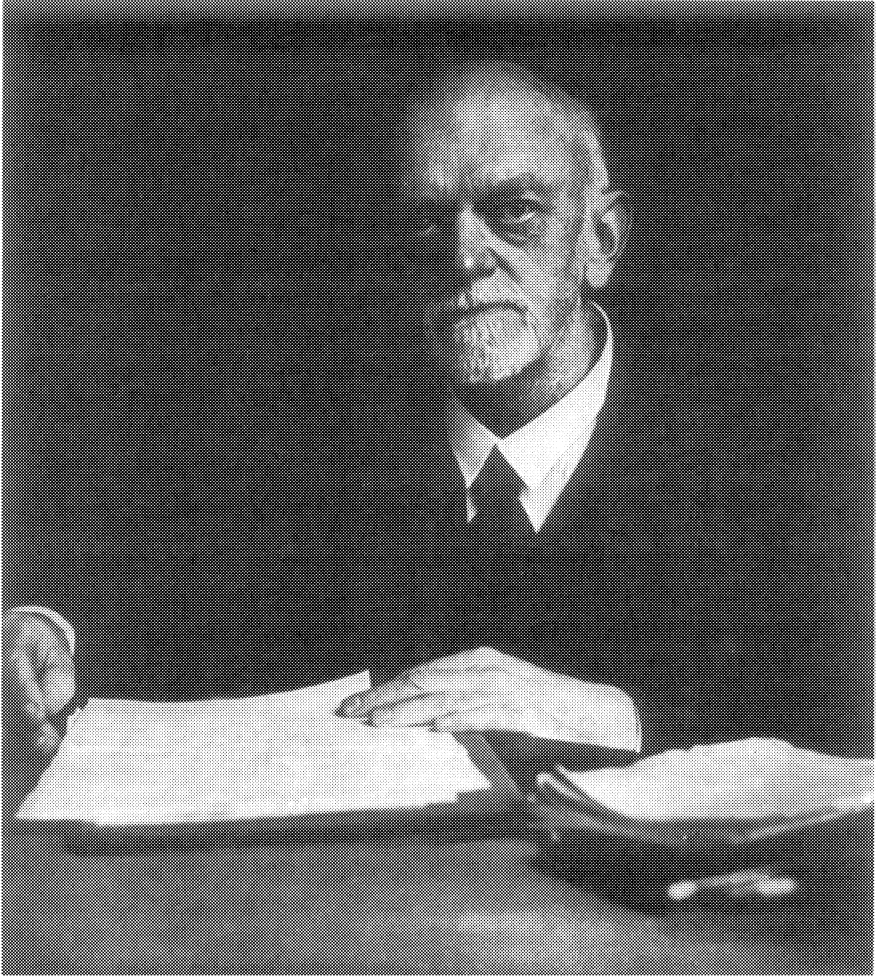
The entrance to the Mathematical Institute of Göttingen



Rear view of the Mathematical Institute



David Hilbert and Hermann Weyl during the mid-twenties



David Hilbert, 1932

Hilbert