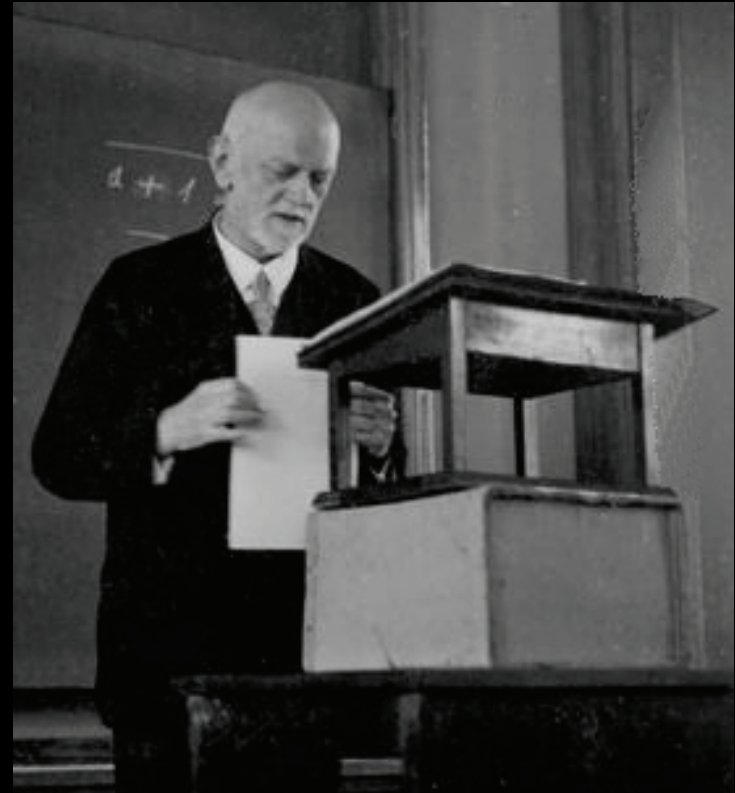


**History and Pedagogy of
Mathematics, Americas Section
Midwest History of
Mathematics Conference
Wabash College, 17-19 October 2014**

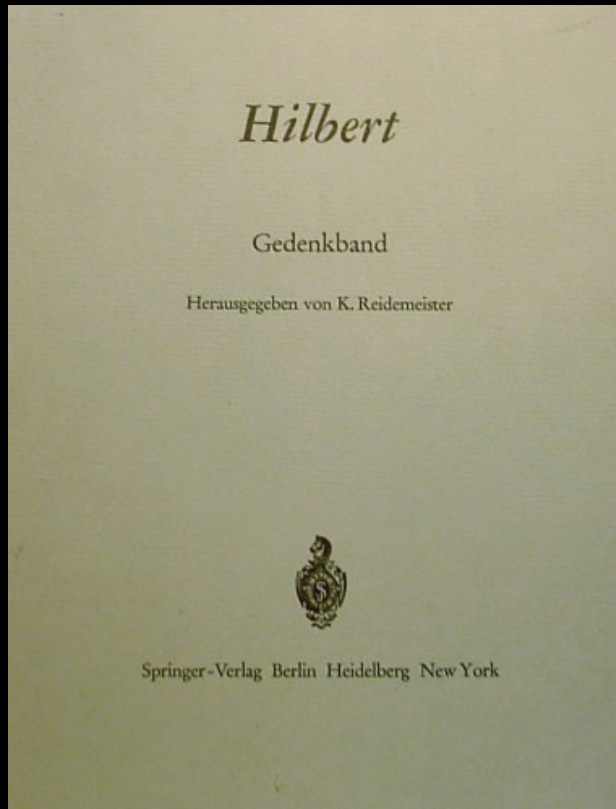
**David Hilbert,
Guest Speaker**

**James T. Smith, Professor Emeritus
San Francisco State University**



David Hilbert, Guest Speaker

How did this project originate?



Reidemeister, Kurt, editor. 1971. *Hilbert Gedenkband*. Berlin: Springer Verlag. Contains Hilbert [1930] 1971. Reissued in 2012 but without that.



Hilbert, David. [1930] 1971. Radio address. 4-min 45-rpm disk record of Hilbert reading material excerpted from Hilbert [1930] 1996.

David Hilbert, Guest Speaker

What did I do with the recording?

- ➔ **Casette tape—1972?—not very suitable in class**
- ➔ ***.mp3 on my website, transcribed and translated—1998?**
- ◆ **Good! A general device that I can control**
- ◆ **It became a standard Internet source**
- ¿ **Will it survive me?**
- ◆ **Prof. Janet Beery, editor, MAA online journal *Convergence* :**
 - **Publish it there!**
 - **But provide substantial background**
- ◆ **Smith, James T. 2014. David Hilbert's radio address. *Loci: Convergence* 11. 7 scrolling pp.**

David Hilbert, Guest Speaker

How did I use my website?

- ◆ **History of mathematics course, and**
- ◆ **Advanced mathematics courses**

- ◆ **In conjunction with Hilbert's famous 1900 problem set, or**
- ◆ **As a course climax**

- ◆ **Rehearse the sound!**
- ◆ **Display the translation and point to it with a long pointer**

David Hilbert, Guest Speaker



<http://www.maa.org/publications/periodicals/convergence/david-hilberts-radio-address-introduction>



David Hilbert's Radio Address - Introduction

Author(s): James T. Smith (San Francisco State University)

Introduction

In Königsberg on 8 September 1930, David Hilbert addressed the yearly meeting of the Society of German Natural Scientists and Physicians (*Gesellschaft der Deutschen Naturforscher und Ärzte*). Generally regarded as the world's leading mathematician, Hilbert was born and educated in Königsberg and spent the early years of his career there. Retiring at age sixty-eight from his professorship at Göttingen, he was being honored by his home city. Hilbert forcefully delineated a basic tenet of his research philosophy—that every mathematical problem is solvable—and countered a widespread but controversial opposing opinion. Shortly afterward, he read on German radio a four-minute version of the finale of his speech. This excerpt stands on its own as a dramatic poem or anthem that has inspired many mathematicians and will continue to do so, and it has the potential to reinforce public appreciation of the historical and present context of mathematical research.

On subsequent pages, you will have the opportunity to listen to Hilbert's radio address (Hilbert [1930] 1971) while reading a German transcription, an English translation, or a side-by-side transcription and translation.

Hilbert's address did not spring forward in isolation. It climaxed a development that is evidenced in his earlier work, and reacted to broad and deep trends in philosophy and mathematical culture. The present article concludes with a discussion that will steer the reader to some of this lore. It identifies persons and explains terms that Hilbert mentioned, and provides both background for the occasion and a hint of subsequent related developments.



David Hilbert in 1912
(Source: [Convergence Portrait Gallery](#))

James T. Smith (San Francisco State University), "David Hilbert's Radio Address - Introduction," *Loci* (February 2014)

Convergence

Tags: [Foundations of Mathematics](#)
[History of Mathematics](#)
[Mathematics in Western Culture](#)
[Philosophy of Mathematics](#)

David Hilbert's Radio Address

- [David Hilbert's Radio Address - Introduction](#)
- [David Hilbert's Radio Address - German Transcription](#)
- [David Hilbert's Radio Address - English Translation](#)
- [David Hilbert's Radio Address - German and English](#)
- [David Hilbert's Radio Address - Hilbert and Mathematical Inquiry](#)
- [Hilbert's Radio Address - Hilbert's Sources - Their Own Words](#)
- [Hilbert's Radio Address - Bibliography - About the Author](#)

Mathematical Association of America

P: (800) 331-1622

F: (240) 396-5647

E: maaservice@maa.org

Copyright © 2014



David Hilbert's Radio Address - German and English

Author(s): James T. Smith (San Francisco State University)

Listen to David Hilbert's 1930 radio address (4 minutes) while reading along in German and English.



Das Instrument, welches die Vermittlung bewirkt zwischen Theorie und Praxis, zwischen Denken und Beobachten, ist die Mathematik; sie baut die verbindende Brücke und gestaltet sie immer tragfähiger. Daher kommt es, dass unsere ganze gegenwärtige Kultur, soweit sie auf der geistigen Durchdringung und Dienstbarmachung der Natur beruht, ihre Grundlage in der Mathematik findet.

Schon GALILEI sagt: Die Natur kann nur der verstehen der ihre Sprache und die Zeichen kennengelernt hat, in der sie zu uns redet; diese Sprache aber ist die Mathematik, und ihre Zeichen sind die mathematischen Figuren. KANT tat den Ausspruch: "Ich behaupte, dass in jeder besonderen Naturwissenschaft nur so viel eigentliche Wissenschaft angetroffen werden kann, als darin Mathematik enthalten ist."

In der Tat: Wir beherrschen nicht eher eine naturwissenschaftliche Theorie, als bis wir ihren mathematischen Kern herausgeschält und völlig enthüllt haben. Ohne Mathematik ist die heutige Astronomie und Physik unmöglich; diese Wissenschaften lösen sich in ihren theoretischen Teilen geradezu in Mathematik auf. Diese wie die zahlreichen weiteren Anwendungen sind es, denen die Mathematik ihr Ansehen verdankt, soweit sie solches im weiteren Publikum genießt.

The instrument that mediates between theory and practice, between thought and observation, is mathematics; it builds the connecting bridge and makes it stronger and stronger. Thus it happens that our entire present-day culture, insofar as it rests on intellectual insight into and harnessing of nature, is founded on mathematics.

Already, GALILEO said: Only he can understand nature who has learned the language and signs by which it speaks to us; but this language is mathematics and its signs are mathematical figures. KANT declared, "I maintain that in each particular natural science there is only as much true science as there is mathematics."

In fact, we do not master a theory in natural science until we have extracted its mathematical kernel and laid it completely bare. Without mathematics today's astronomy and physics would be impossible; in their theoretical parts, these sciences unfold directly into mathematics. These, like numerous other applications, give mathematics whatever authority it enjoys with the general public.

Trotzdem haben es alle Mathematiker abgelehnt, die Anwendungen als Wertmesser für die Mathematik gelten zu lassen. GAUSS spricht von dem zauberischen Reiz, der die Zahlentheorie zur Lieblingswissenschaft der ersten Mathematiker gemacht habe, ihres unerschöpflichen Reichtums nicht zu gedenken, woran sie alle anderen Teile der Mathematik so weit übertrifft. KRONECKER vergleicht die Zahlentheoretiker mit den Lotophagen, die, wenn sie einmal von dieser Kost etwas zu sich genommen haben, nie mehr davon lassen können.

Der grosse Mathematiker POINCARÉ wendet sich einmal in auffallender Schärfe gegen TOLSTOI, der erklärt hatte, dass die Forderung "die Wissenschaft der Wissenschaft wegen" töricht sei. Die Errungenschaften der Industrie zum Beispiel hätten nie das Licht der Welt erblickt, wenn die Praktiker allein existiert hätten und wenn diese Errungenschaften nicht von uninteressierten Toren gefördert worden wären.

Die Ehre des menschlichen Geistes, so sagte der berühmte Königsberger Mathematiker JACOBI, ist der einzige Zweck aller Wissenschaft.

Wir dürfen nicht denen glauben, die heute mit philosophischer Miene und überlegenem Tone den Kulturuntergang prophezeien und sich in dem Ignorabimus gefallen. Für uns gibt es kein Ignorabimus, und meiner Meinung nach auch für die Naturwissenschaft überhaupt nicht. Statt des törichtigen Ignorabimus heisse im Gegenteil unsere Losung:

Wir müssen wissen,
Wir werden wissen.

Nevertheless, all mathematicians have refused to let applications serve as the standard of value for mathematics. GAUSS spoke of the magical attraction that made number theory the favorite science for the first mathematicians, not to mention its inexhaustible richness, in which it so far surpasses all other parts of mathematics. KRONECKER compared number theorists with the Lotus Eaters, who, once they had sampled that delicacy, could never do without it.

With astonishing sharpness, the great mathematician POINCARÉ once attacked TOLSTOY, who had suggested that pursuing "science for science's sake" is foolish. The achievements of industry, for example, would never have seen the light of day had the practical-minded existed alone and had not these advances been pursued by disinterested fools.

The glory of the human spirit, so said the famous Königsberg mathematician JACOBI, is the single purpose of all science.

We must not believe those, who today with philosophical bearing and a tone of superiority prophesy the downfall of culture and accept the *ignorabimus*. For us there is no *ignorabimus*, and in my opinion even none whatever in natural science. In place of the foolish *ignorabimus* let stand our slogan:

We must know,
We will know.

James T. Smith (San Francisco State University), "David Hilbert's Radio Address - German and English," *Loci* (February 2014)

Convergence

David Hilbert's Radio Address

- [David Hilbert's Radio Address - Introduction](#)
- [David Hilbert's Radio Address - German Transcription](#)
- [David Hilbert's Radio Address - English Translation](#)
- [David Hilbert's Radio Address - German and English](#)

David Hilbert, Guest Speaker

- ¿ What was the context of this 1930 address?
- ¿ Was it appropriate for his 1900 address on problems?

Hilbert 1900, introduction:

...every mathematician shares...[the conviction] that every definite mathematical problem must necessarily be susceptible of an exact settlement, either in the form of an actual answer to the question asked, or by the proof of the impossibility of its solution and therewith the necessary failure of all attempts. ... We hear within us the perpetual call: There is the problem. Seek its solution. You can find it by pure reason, for in mathematics there is no *ignorabimus*.





**Emil Du Bois-Reymond
(around 1885)**



**David Hilbert
(1886)**

David Hilbert, Guest Speaker

Context

Emil Du Bois Reymond, 1872, to the Society of German Natural Scientists and Physicians:

Concerning the riddles of the material world the natural scientist has long been accustomed, with manly renunciation, to pronounce his '*Ignorabimus*'. Reviewing the victorious road traveled [to scientific progress], he carries beside this the silent awareness that, when he does not know now, at least in certain circumstances he could know, and perhaps one day will know. But concerning the riddle, what matter and force might be, and how they can be conceived, he must once and for all decide on the much heavier verdict: '*Ignorabimus*'.

David Hilbert, Guest Speaker

Biosketch

- ◆ Born 1862, near Königsberg
- ◆ Entered University there 1880
- ◆ PhD 1885
- ◆ Deeply interested in philosophy of science
- ➔ Göttingen 1895, became leader
- ◆ Paris 1900 address on Problems
- ◆ Festschrift 1922 in the journal of that Society: *Naturwissenschaften*
- ◆ Retired, aged 68, in 1930
- ◆ Honored by Königsberg
- ◆ Addressed Society there:
Hilbert [1930] 1996
- † Died 1943



David Hilbert, Guest Speaker

How can you use the online article?

- ◆ **As I used the website, or**
 - for “mathematics appreciation” courses or presentations,
 - for independent-study projects

- ◆ **Example projects**
 - Emil Du Bois-Reymond
 - Hilbert’s background, career, or legacy in greater depth
 - Königsberg & its scientific heritage
 - 1922 *Festschrift*, 1971 *Gedenkband*
 - Intentions of those whose names Hilbert dropped (I gave a start)
 - ⊗ Kronecker ➔ Jacobi, Homer ➔ Gauss ➔ Schiller ➔ Archimedes !!
 - Was *lotus-eater* a positive or negative image?
 - Pure vs. applied mathematics
 - ⊗ In Germany, 1890–1910

David Hilbert, Guest Speaker

Online Format and Showmanship

◆ Text

- Different reader psychology
- Different visual impact
- Line breaks not entirely under your control
- Page breaks not entirely relevant

◆ Graphics

- Lots of room
- Anchor them!
- More predictable than hardcopy

◆ Hyperlinks

- + + But not up to early hype
- Can be overdone

◆ Involvement with webmaster (via journal editor)

- + + Experience
- Minor goals and matters of taste may differ

◆ Speed !!

David Hilbert, Guest Speaker



Michael Sowa, "Their master's voice" (19??)

Thank you for your interest !