

New research on the discovery of the field equations of the general relativity by David Hilbert and Albert Einstein

DANIELA WÜNSCH¹

¹Göttingen, Institut für Wissenschaftsgeschichte;
Hamburg, Schwerpunkt Geschichte der Naturwissenschaften, Mathematik und Technik der Universität Hamburg,
Bundesstr. 55, D-20146 Hamburg, Germany
dwuensch@gwdg.de

The only extant historical source of Hilbert's first communication DIE GRUNDLAGEN DER PHYSIK. ERSTE MITTEILUNG VOM 20. NOVEMBER 1915 („The Foundations of Physics. First Note of 20 November 1915") is a set of proofs of Hilbert's paper bearing a printer's stamp dated 6 December 1915. This historical source was only discovered a few years ago. It is this source material which, in the main, formed the basis of Corry, Renn and Stachel's sensational article published in 1997 in the scientific journal *Science*. Up to this point, Hilbert was frequently considered to be the first to have found the correct field equations of the general theory of relativity, as Einstein only submitted his work on this topic five days later, on 25 November. The proofs of the Hilbert communication of 20 November do contain these equations in the implicit form but not in the explicit form of the field equations. Thus Corry, Renn and Stachel were able to reverse the prevailing viewpoint and claim that Einstein was the first to find the explicit form of the correct equations and that Hilbert must have taken them from Einstein after receiving his article – which was published already on the 2 December 1915.

Corry, Renn and Stachel, however, did not mention the fact that a fragment of the text on pages 7 and 8 had been cut off. The importance of the missing section of the proofs was only realized later. In all probability it was precisely this excised part which contained the explicit form of the field equations of the general theory of relativity.

This book investigates in detail the significance of this fragment now missing from Hilbert's proofs of his first communication on the „Foundations of Physics" of 20 November 1915. The archival examination of these proofs shows that the passage which was cut off from the proofs was not excised originally but rather that it must have been deliberately removed in more recent times in order to falsify the historical record.

Several arguments are presented which demonstrate that Hilbert had already developed the explicit form of the correct field equations in the proofs of his first communication and that the missing part contained them.

This comprehensive study concludes with a historical interpretation. It shows that while it is true that Hilbert must be seen as the one who first discovered the field equations, the general theory of relativity is indeed Einstein's achievement, whereas Hilbert developed a unified theory of gravitation and electromagnetism.

Part of this scientific-historical analysis is a comparison of Newton's incomplete second axiom of dynamics in his PRINCIPIA MATHEMATICA and Einstein's field equations in his general theory of relativity.

Additional information:

Wünsch, Daniela: „zwei wirkliche Kerle". Neues zur Entdeckung der Gravitationsgleichungen der Allgemeinen Relativitätstheorie durch Albert Einstein und David Hilbert. Göttingen: Termessos Verlag 2005.

<http://s-edition.de/EinsteinHilbert.htm>