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## Preface to the Second Edition

The present second edition of the Zermelo biography corrects the mistakes discovered in the first edition and gives additional information about Zermelo and his work. Part of this information was provided by readers of the first edition and goes back to people who were in direct contact with Zermelo, and part of it originates in the project of Zermelo's Collected Works under the editorship of Akihiro Kanamori and this author. Meanwhile, Zermelo's papers have been published together with English translations and with thorough commentaries written by experts in the respective fields. The present edition of the biography has profited from this enterprise in a twofold manner: implicitly by discussions with the contributors to the Collected Works, and explicitly by making reference to their commentaries. A reader who is interested in more specific scientific or historical details related to Zermelo's work is advised to consult these commentaries. In order to facilitate side-by-side reading, the system of citations used here has been adapted to that of the Collected Works. Moreover, Zermelo's writings have been given the same abbreviations. The few exceptions are described at the end of the Editorial Remarks.

My thanks go to all those who have provided helpful comments on the first edition, especially to Franz Lemmermeyer, who directed my attention to numerous letters containing valuable information about Zermelo. Once again, I have enjoyed the cooperation with Springer-Verlag, in particular with Ruth Allewelt and Ulrike Stricker-Komba, and with Martin Peters, who readily supported a second edition. I would like to express my deep thanks to Akihiro Kanamori. Our extraordinarily collegial and inspiring collaboration on the edition of Zermelo's Collected Works has left its traces also in the following pages.

The biography owes much to the open-minded support lent by Zermelo's late wife Gertrud Zermelo (1901–2003). As a modest token of recognition and with gratitude, this second edition is again dedicated to her memory.

Freiburg, May 2015

Heinz-Dieter Ebbinghaus

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## Preface to the First Edition

Ernst Zermelo is best-known for the explicit statement of the axiom of choice and his axiomatization of set theory. The axiom of choice led to a methodological enrichment of mathematics, the axiomatization was the starting point of post-Cantorian set theory. His achievements, however, did not unfold in an undisputed way. They became the object of serious criticism sparked, in particular, by the non-constructive character of the axiom of choice, making it one of the most debated principles in the history of mathematics. Zermelo defended his point of view with clear insights and discerning arguments, but also with polemical formulations and sometimes hurtful sharpness. The controversial attitude shining through here has become a dominating facet of his image. Further controversies such as those with Ludwig Boltzmann about the foundations of the kinetic theory of heat and with Kurt Gödel and Thoralf Skolem about the finitary character of mathematical reasoning support this view.

Even though these features represent essential constituents of Zermelo's research and character, they fall short of providing a conclusive description. Neither is Zermelo's major scientific work limited to set theory, nor his personality to controversial traits. His scientific interests included applied mathematics and purely technical questions. His dissertation, for example, promoted the Weierstraßian direction in the calculus of variations, he wrote the first paper in what is now called the theory of games, and created the pivotal method in the theory of rating systems. The complexity of his personality shows in his striving for truth and objectivity, and in the determination with which he stood up for his convictions. Well-educated in and open-minded about philosophy, the classics, and literature, he had the ability of encountering others in a stimulating way.

Due to serious illness, which hindered and finally ended his academic career, and due to growing isolation from the dominating directions in the foundations of mathematics, he became caught in a feeling of being denied due scientific recognition, and controversy seemed to gain the upper hand. Those close to him, however, enjoyed his other sides.

The present biography attempts to shed light on all facets of Zermelo's life and achievements. In doing so, quotations from various sources play a major role. Personal and scientific aspects are kept separate as far as coherence allows, in order to enable the reader to follow the one or the other of these threads. The discussion of Zermelo's scientific work does not require detailed knowledge of the field in question. Rather than aiming at an in-depth technical analysis of his papers, the presentation is intended to explore motivations, aims, acceptance, and influence. Selected proofs and information gleaned from drafts, unpublished notes, and letters add to the analysis.

The main text is followed by a *curriculum vitae* which summarizes the main events of Zermelo's life, now in a more schematical manner. It thus provides some kind of chronological index.

All facts presented are documented by appropriate sources. Whenever possible, English versions of German texts follow a published translation. In some special cases such as axioms, the original German version is given in the main text, as well. Original German versions which have not been published previously and whose wording may be of some importance or interest, are compiled in the appendix. In particular, the appendix contains all unpublished quotations from Zermelo himself, supplemented by samples of his literary activity.

There is no claim that the biography offers a complete picture. Rather, the description of Zermelo's life and work should be considered as an approach to a rich and multifaceted personality, which may invite the reader to take an even closer look.

When Zermelo's late wife Gertrud learnt about this project, she gave all possible support. The information and the documents which she provided with warm-hearted interest contributed in essential ways to the picture of Zermelo presented here. With deep gratitude, the biography is dedicated to her memory.

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