

Title of the Symposium**Real Numbers in Transition
Aspects of the 18th and 19th centuries**Speakers and Titles

- EDUARDO DORREGO LÓPEZ (University of Seville): «**The 18th century as the germ of an in-depth understanding of irrational numbers**».
- ELÍAS FUENTES GUILLÉN (UNAM): «**The tensions underlying Bolzano's *Groößenlehre***».
- JOSÉ FERREIRÓS DOMÍNGUEZ (University of Seville) (Chair): «**The transitional contributions of M. Ohm and Grassmann**».

Abstract of the Symposium

It is usually accepted that the notion of real numbers was more or less «there», prior to the publication of detailed theories (often called «constructions») in the 1870s. However, a closer look indicates that the extent of the domain of real numbers was far from well determined, or well understood, in the 18th and early 19th centuries. Up until 1800 it was still common to understand by irrational numbers only the radicals such as $\sqrt{3}$ or $\sqrt{1 - \sqrt{5}}$; but gradually there was a transition from the conception of decimal fractions (or continued fractions, etc.) as a tool for approaching irrationals, to their conception as mathematical objects. Meanwhile, the preeminence of analytic methods introduced in the 17th century made possible some proofs of the irrationality of transcendental numbers during the 18th century. At the turn of the 19th century the need for a clear conceptual characterization of the continuity of the real-number domain was not yet been envisioned and indeed crucial ingredients of a mature theory of real numbers were still lacking, as evidenced by the sporadic introduction of irrationals. But this is not to deny some groundbreaking features contained in the works of mathematicians of the first half of that century.

The aim of this symposium will therefore be to throw light on that transitional period, before the 1870s, by examining the relevant contributions due to key authors of the German-speaking area, namely Lambert, Bolzano, M. Ohm and Grassmann. In doing so, and partly by paying attention to their biographies, we intend to address the ways in which those mathematicians and some of their contemporaries worked during that period

and context, thus contributing to the themes of the conference.

Keywords: Number systems; 18th century; 19th century; Mathematical Analysis.

About the speakers

Eduardo Dorrego López is graduate student at IMUS (Seville), where he is pursuing his PhD in History of Mathematics in the Research Line of Mathematical Analysis under the supervision of José Ferreirós and Guillermo Curbera. As part of his training as PhD researcher, he was at the University of Oxford as visiting student in the Research Group on History of Mathematics headed by Dr. Christopher Hollings, consulting primary sources and writing his thesis. His main interests lie in irrationality- and transcendental-related issues in the 18th and 19th centuries with special attention to Lambert's work, and in the concept of infinity from both a historical and a philosophical perspective, particularly in connection with Cantor's thoughts. Besides, he is Teacher of Mathematics of Secondary School.

Elías Fuentes Guillén is a postdoctoral fellow at the National Autonomous University of Mexico. In 2017 he obtained a PhD in Logic and Philosophy of Science from the University of Salamanca, under the supervision of José Ferreirós and María Manzano, and in 2018 he was awarded the Josef Dobrovský Fellowship by the Czech Academy of Sciences. He is a member of the Association for the Philosophy of Mathematical Practice and the Internationale Bernard Bolzano-Gesellschaft. His research focuses on the development of the modern notion of number. His recent publications include «The notion of variable quantities ω in Bolzano's early works» (*Historia Mathematica*).

José Ferreirós is professor of Logic and Philosophy of Science at the Universidad de Sevilla, Spain. A former Fulbright Fellow at UC Berkeley, and member of the *Académie Internationale de Philosophie des Sciences*, he was founding member and first president of the APMP (Association for Philosophy of Mathematical Practices). Among his publications one finds *Labyrinth of Thought* (Birkhäuser, 1999), a history of set theory and its role in modern maths, the monograph *Mathematical Knowledge and the Interplay of Practices* (Princeton UP, 2016), an intellectual biography of Riemann (*Riemanniana Selecta*, CSIC, Madrid, 2000), and the collective volume *The Architecture of Modern Mathematics* (Oxford UP, 2006).

