

Lisbon Workshop on the History of Logic

Lisbon, 23-24 October 2023

ABSTRACTS

Andrea Reichenberger "Johanna Piesch: A Switching Algebra Pioneer"

In his lecture "The Emancipation of Data Processing" at the University of Hamburg on the occasion of the award of an honorary doctorate on 10 October 1979, Konrad Zuse emphasized the importance of the "close connection between calculating machines and mathematics" (Zuse 1979, 40). A milestone in this development was the application of mathematical logic to switching algebra. The US mathematician Claude Shannon is widely credited as being the first who applied Boolean Algebra to the analysis of electric-relay contact circuits (Shannon 1937). Zuse refers, however, to the work of "Hansi Piesch" (Zuse 1979, 40). Johanna Piesch (1898-1992) was an Austrian engineer, mathematician and librarian and one of the earliest authors on switching algebra. Her name is often abbreviated as "Hansi". My talk presents some historical facts about Johanna Piesch's impact on the development and applications of switching theory, and its central part, the Boolean algebra, in computing and engineering practice.

Wilfried Sieg "Hilbert's Logicism in Context"

Hilbert's paper *Axiomatisches Denken*, delivered in September of 1917 to the Swiss Mathematical Society in Zürich, was pivotal for his (changing) perspectives on the foundations of mathematics: it has deep roots in the past but it also articulates problems that will lead in the following years to mathematical logic, proof theory, and the finitist consistency program. I will describe the roots in Dedekind's mathematical structuralism and Hilbert's own structural axiomatics (both grounded in logic), but also the evolution toward extensions of the finitist consistency program. I will end with brief remarks on two topics. The first is historical in nature discussing Hermann Weyl's role in the *Grundlagenstreit*; the second makes a direct connection to contemporary work on formal verification and a theory of mathematical proofs.

Tabea Rohr "Frege, Plücker and the Function-Argument Distinction"

Tappenden (1995) and Wilson (1992, 2005) mention the hypothesis that Frege took the idea that sentences can be carved up in different ways from Plücker's analytic proof of the principle of duality. In this paper, we firstly show that a closer analysis of Plücker's text reveals good evidence for this hypothesis, which had not yet been presented in the literature. Secondly, we will argue that, contrary to Tappenden's claim in 1995 (page 445), Frege's distinction between concepts of different orders did not originate from Plücker. Therefore, we will demonstrate how Frege's conceptions of arithmetic and geometry differ. We will assert that Frege's concept-object distinction does not arise as naturally within geometry as it does within arithmetic.

Richard Lawrence "Frege vs. the formalists on content and applications of arithmetic"

One of Frege's complaints against formalism is that in formal arithmetic, signs do not have a content (or if they do, that content is ignored as irrelevant). This is puzzling, though, because Frege's formalist interlocutors do attribute content to their signs; sometimes they even attribute "formale Bedeutung" to them! Did Frege simply overlook this aspect of their view? This is unlikely, since he in fact quotes and dismisses it. Instead, I will argue that Frege does not disagree with the formalists about whether signs have content, but rather about how that content is to be conceived. In particular, Frege has a different understanding of the relationship between arithmetic and its applications than formalists do, which he expresses using his distinction between Sinn and Bedeutung. A close examination of the positions on both sides reveals that for Frege, the content of arithmetical signs is intimately connected with the status of arithmetic as a science with applications.

António Zilhão "Frege's logic as the physics of the true and the chemistry of thought"

Besides Mathematics and Philosophy, Frege also studied Physics and Chemistry at Jena. It is thus hardly surprising to find a number of physical and chemical examples and analogies in his logical and philosophical writings. Some of these examples and analogies are more than mere rhetoric auxiliaries though; they provide us with a valuable gateway into Frege's actual philosophical outlook. They also help us understand why the "absurdities", "gratuitous blunders", and "ludicrous deviations [from the norms of natural language]" Michael Dummett accused him of are, in fact, no such things.

Dirk Schlimm "Pasch and Klein on axioms and intuition"

In this talk I will present and discuss some of the interactions between Moritz Pasch and Felix Klein. Both made significant contributions to the development of geometry, and while both agreed that mathematics should ultimately be grounded empirically, they disagreed on the nature of axioms and the role of intuition in mathematical. They discussed their views in correspondence, lectures, and publications, and these documents offer us insight into the origins of their empiricist positions and show that Klein's position gradually evolved over time.

Joan Bertran-San-Millán "Peano's structuralism"

Recent historical studies have investigated the first proponents of methodological structuralism in late nineteenth-century mathematics. In this paper, I shall attempt to answer the question of whether Peano can be counted amongst the early structuralists. I shall focus on Peano's understanding of the primitive notions and axioms of geometry and arithmetic. First, I shall argue that the undefinability of the primitive notions of geometry and arithmetic led Peano to the study of the relational features of the systems of objects that compose these theories. Second, I shall claim that, in the context of independence arguments, Peano developed a schematic understanding of the axioms which, despite diverging in some respects from Dedekind's construction of arithmetic, should be considered structuralist.