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Abstracts

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History of Modern Mathematics–Gauss to Wiles

Organizers:

José Ferreirós (Universidad de Sevilla)
David Rowen (Universität Mainz)

Index of Abstracts

(In this index, in case of multiple authors, only the speaker is shown)

The Politics of Infinitesimals: Marx, Mao, Nonstandard Analysis, and the Cultural Revolution

Joseph W. Dauben (City University of New York)

The Mathematical Manuscripts of Karl Marx were first published (in part) in Russian in 1933, with a more definitive edition produced under the direction of S.A. Yanovskaya in 1968. Subsequently, numerous other translations have also appeared. Marx regarded questions about the foundations of the differential calculus as a touchstone for the application of the method of materialist dialectics to mathematics. Nearly a century later, Chinese mathematicians explicitly linked Marxist ideology with the foundations of mathematics through a new program interpreting calculus in terms of nonstandard analysis. During the Cultural Revolution (1966-76), mathematics was suspect for being too abstract, but when Chinese mathematicians first learned of Marx's mathematical manuscripts in the early 1970s, these offered fresh grounds for justifying abstract mathematics, especially with concerns for foundations and critical evaluation of the calculus in mind. Moreover, Chinese mathematicians were able to undertake their "reforms" of the calculus with new technical tools unknown to Marx, namely with nonstandard analysis newly-created by Abraham Robinson only a decade earlier. As a result, considerable interest in nonstandard analysis developed soon thereafter in China, and almost immediately after the Cultural Revolution was officially over in 1976, the first all-China conference on nonstandard analysis was held in Xinxiang, Henan Province, in 1978.

Alfred Tarski: The Warsaw Years

Anita Burdman Feferman*

Solomon Feferman (Stanford University)

Alfred Tarski (1901-1983) was one of the greatest logicians of the 20th century, some think of all time. With characteristic, but tongue-in-cheek, immodesty, he called himself "the greatest living sane logician." Born in Poland of Jewish parents, he changed his name from Alfred Teitelbaum to Alfred Tarski and converted to Catholicism just before receiving his Ph. D. in 1924. Tarski's first thirty-eight years were spent in Warsaw; he matured during the remarkable interwar period of Polish independence with its renaissance in philosophy and mathematics that developed in close connection with the rise of scientific philosophy in Vienna and other parts of Europe. Hitler's accession to power and the conflagration that followed destroyed this extraordinarily rich intellectual environment. But even before the worst had come to pass Tarski was unable to get a university position commensurate with his exceptional achievements, which included the Banach-Tarski paradox, the decision procedure for algebra and geometry, the set-theoretical foundations of metamathematics, and the theory of truth. An invitation from W.V. Quine to speak at a Unity of Science conference at Harvard University in September 1939 in effect saved Tarski's life; he left Warsaw just three weeks before Germany invaded Poland. His wife, who was not Jewish, and their two children were left behind; they survived the war, but his parents and some thirty members of his family perished in the Holocaust.

Alfred Tarski: Building an Empire

Anita Burdman Feferman

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Stranded in the United States in 1939, Tarski spent three difficult years going from one temporary position to another until 1942, when he got his toe in the door at the University of California in Berkeley as a lecturer in the Mathematics Department. Quickly recognized as a star who would add luster to the department, he was promoted to full professor in 1946. In this new and secure situation, Tarski began to build an empire of logic, attracting students, researchers, and distinguished colleagues from all over the world. He was endlessly energetic and ambitious, especially in promoting his program of logic as central to the methodology of science and to all rational thought. He organized many international congresses and was extraordinarily active and influential in his wide-ranging research activities, especially in model theory, set theory, algebraic logic, and the foundations of geometry. Napoleonic, judgmental, quick to anger, aggressive and relentless, Tarski alie! nated many people; but in spite of that, others found him warm and charming. His admirers called him kingly, even god-like, and held him in awe, while behind his back, his students called him ”Papa Tarski”. He was all of that and more: fully human, with wide-ranging interests in science, art and politics, a gregarious bon-vivant, he lived life to the fullest.

Hilbert and logicism

José Ferreirós (Universidad de Sevilla)

Hilbert is frequently regarded as the founder of the formalist school in the foundations of mathematics. Thus he is mainly remembered for the ideas and viewpoints he elaborated late in life, in the 1920s, within the context of the logico-mathematical project known as “Hilbert’s programme”. As some historians of mathematics (Rowe, Corry) have emphasized, this approach obscures many of Hilbert’s own viewpoints, and particularly the evolution of his foundational views. Indeed, Hilbert’s writings and lectures abound in sentences that directly contradict the usual understanding of formalism. The aim of this contribution is to throw new light on Hilbert’s foundational ideas by focusing on his changing views in connection with logicism. The logicist project was particularly powerful and influential in two different periods: during the 1890s in the wake of Dedekind, and in the years 1914–1930 in the wake of Russell. We shall consider evidence showing that Hilbert was very close to logicism in the earlier period, and that he came back to this approach for a short period after reading Principia Mathematica. I shall analyze the reasons for his embracement of such views, and the main factors the led him to abandon them. More generally, I shall try explore the evolution of Hilbert’s views and his concrete foundational projects, charting some general features of the landscape that become visible when one factors in the role of the logicist approach.

On Hilbert, Bourbaki and eternal truths in mathematics

Jesús Hernández (Universidad Autónoma de Madrid)

Starting from a recent paper by L.Corry about "eternal truths in mathematics" which is mainly concerned with the views of Hilbert and Bourbaki and where he uses his notions of "body" and "image" of knowledge, we provide a somewhat different approach to the same matters. In particular, even if we agree on some points, we have rather contrasting views on others as, for example, the role of error in mathematics following Hilbert and Bourbaki or Bourbaki's idea of mathematical progress.

Daniel Kan's discovery of adjoint functors

Jean-Pierre Marquis (Université de Montréal)

In 1958, Daniel Kan published two fundamental papers, the first one entitled "Adjoint Functors" and the second one "Functors Involving C.S.S. Complexes". Although the second paper presupposes the first, more general, paper on adjoint functors, we believe that the discovery of adjoint functors was triggered by the problems solved in the second. We intend to show that Kan was lead to the discovery of adjoint functors because: 1) he was trying to apply category theory to homotopy theory, that is, he was looking for an abstract set up to develop homotopy theory, something that had been suggested already by Eilenberg and Mac Lane in the appendix of their original paper on category theory published in 1945 but that had not been done completely and successfully; 2) looking at some specific problems in homotopy theory, Kan was lead to consider functors going in opposite directions between two categories, something that was not as natural in other contexts at that time, namely in homology theory and homological algebra, the two areas in which category theory was becoming the standard framework; 3) some functors, in particular, the functor representing the operation of geometrical realization of a c.s.s. complex, have a natural "dual" operation, that is an adjoint functor. It is these that Kan first understood. Kan proceeded from his basic examples to the general theory, that is to the paper on adjoint functors and their fundamental properties.

On the Early Reception of GRT: Some Mathematical, Philosophical, and Physical Perspectives

David Rowe (Universität Mainz)

In practically all accounts of the early history of general relativity, two dates stand out as decisive for all that followed: Einstein's discovery of generally covariant field equations in November 1915 and his subsequent presentation of this work in his definitive paper from May 1916. This work gave his theory of gravitation a new and presumably firm foundation. But was there really a consensus of opinion regarding the need for a generally covariant approach to gravitation? Did Einstein's famous papers really provide a basis for answering all the central questions posed by such a theory, thereby setting the stage for the famous British eclipse expeditions and the "final" confirmation of GRT in November 1919? Perhaps not surprisingly, a closer look at the reception of Einstein's theory in the intervening period reveals a far more complex dynamic. By comparing the diverse perspectives of representative mathematicians, philosophers, and physicists in the period 1916-1922 we can begin to understand some important, but largely overlooked features in Einstein's revolution.

Einstein, relativity, and the world of mathematics

José Manuel Sánchez Ron (Universidad Autónoma de Madrid)

Aparte de una visión general de la relación de Einstein con la matemática y de la naturaleza cambiante del contenido matemático de sus trabajos, en esta conferencia nos ocuparemos de cómo algunas "comunidades" nacionales, especialmente la británica, se relacionaron con o reaccionaron ante la matemática "provocada" por la relatividad. Se trata éste, de un tema que ya he tratado en algunos trabajos, mayoritariamente en inglés, en publicaciones (como los "Einstein Studies") dedicadas a la relatividad. Incluiremos asimismo, al final, algunos comentarios sobre los trabajos de Einstein con el matemático E. Straus, su último colaborador. Antes de morir, Straus me envió una carta en la que explicaba un cierto detalle de esos trabajos, cuestión que todavía no he publicado y que tiene que ver con la cuestión "acciones a distancia" o "campos".

On a long neglected aspect of Hermann Weyl's contributions to cosmology

Erhard Scholz (Universität Wuppertal)

H. Weyl's contributions to cosmology have been considered in the history of mathematical sciences mainly from the point of view how they relate to the Einstein-DeSitter debate (Weyl's contributions in the years 1918 to 1921), his later proposals (in the early 1920s) mainly under the aspect how his idea of a diverging "sheaf" of world lines on the DeSitter cosmos was used by him to represent the cosmological redshift (*Weyl hypothesis* in comology). These proposals relied on Lorentz geometry, as generally accepted among relativists, and were directly absorbed in the cosmological discourse. Weyl attempted, moreover, to relate his own geometrical achievement of the time, his early gauge geometry of 1918, to cosmological questions, although in a "weak form" only, as one could call it. Only rather recently (in 2001) P. Cartier proposed to reconsider these questions and represent the cosmological redshift in terms of the "length connection" of Weyl's early gauge geometry from 1918 directly. This leads, in the simplest cases (assumption of maximal homogeneity and isotropy), to a class of beautiful cosmological models which are essentially Robertson-Walker manifolds considered in terms of Weyl's gauge geometry. The second part will give a short "ahistorical" introduction to the recent Weyl-Cartier approach to cosmology and, if time allows, try to indicate some points of overlap with Segal's conformal chronometric approach and distinctions from it.