Report on the ICHM History of Mathematics Symposium at the International Congress of Mathematicians, Rio de Janeiro, 2018

ICHM History of Mathematics Symposium, ICM 2018, Rio de Janeiro, Brazil
6 August 2018

Organiser: June Barrow-Green

Jemma Lorenat (Pitzer College, USA)
Demands upon your imagination: developing mental images in nineteenth-century pure geometry
(Montucla Prize Lecture)

The classic story of nineteenth-century geometry tells of intuitive, drawn figures gradually abandoned in favor of rigorous axioms and general coordinate equations. However, for some pure geometers, the use of figures was separate from, or even in opposition to, developing spatial intuition. This tension can be seen in Jakob Steiner's *Systematische Entwickelung* (1832). Following a richly illustrated two-dimensional exposition, Steiner then claimed that three-dimensional geometry could only be ``properly understood if they are intuited purely, without any sensory media, through the inner power of representation [*Vorstellungskraft*].'' This requirement is even more apparent in Karl Christian von Staudt's *Geometrie der Lage* (1847), where there are no figures at all. Drawing on published lectures and expository writing, this talk will examine Steiner's methods for developing *Vorstellungskraft* and see how this epistemic value became a trope of nineteenth-century pure geometers.

Further, we will consider why creating mental images was so important for these pure geometers and how this practice supplements our understanding of visualization in mathematics.

Frédéric Brechenmacher (École Polytechnique, France)
Camille Jordan's Galois

Camille Jordan is often considered as the one who unpacked the group-theoretical content of the works of Évariste Galois. In this talk, we shall take a closer look at the "book with seven seals", as Felix Klein called Jordan's 1870 *Traité des substitutions et des équations algébriques*.

We shall see that the main specificity of Jordan's Galois was not the development of the abstract group concept, but the generation of the general linear group over finite fields as an essential step in a method for reducing classes of solvable groups from the most general to the simplest.

Further, we shall see that investigating Jordan's focus on linear groups sheds a new light on both Galois' works and their early circulation. It highlights the importance of a specific practice of writing permutation groups in the 19th century: the "analytic representation of substitutions".

Reinhard Siegmund-Schultze (University of Agder, Norway)
Richard von Mises (1883-1953) — fame and oblivion in mathematics and beyond

In this talk I shall discuss the reasons for von Mises' fame and oblivion in various groups of knowledge producers: pure mathematicians, applied mathematicians, probabilists, statisticians, engineers, educators, publishers, scientific institution builders, philosophers, and literary historians.

Von Mises was part of all of these groups and he left his mark in all of them, although being a towering figure only in applied mathematics. Visibility in one group does not imply visibility in the other, unless the activity is relevant for both. Values of rigor and productivity vary sometimes between the groups, and this matters for mutual recognition and reputation. Being a member of different groups and being torn between contradictory values can hamper over-all reputation and obscure the memory of persons such as Richard von Mises.

Individual cognitive results and exemplary accomplishments by von Mises to be briefly discussed in the talk include the notions of probability and randomness, 'von Mises iteration', theory of rare events, 'von Mises stress' in plasticity, the mathematical Praktikum in Berlin, foundation of the first journal and of the "first serious school" for applied mathematics, the first handbook on philosophical positivism, and new perspectives on the young poet Rainer Maria Rilke. These examples provide reasons for turning our attention to the life and accomplishments of Richard von Mises, but they do not exhaust the interest of the historian who strives for an understanding of the vicissitudes of life and societal change in a period of nationalism, racial hatred and emigrations. These conditions were experienced first-hand by the repeatedly uprooted Austrian, German and Jewish scholar who is the focus of the talk.

Tom Archibald (Simon Fraser University, Canada)
What is the best way to found integration theory? An examination of arguments, 1930-1950

Lebesgue's theory of measure provided one route toward the founding of integration theory, and the developments of measure theory in the first decades of the twentieth century often have the specific aim of building integration. Beginning in the thirties, this approach was contested by the so-called functional theory of integration. Adherents of the two approaches, including P. Halmos and J. Dieudonné, put forward arguments comparing the strengths and weaknesses of the two approaches. The components of the arguments include discussions of the suitability of one approach over another in areas of application; and of the ways in which different approaches yield certain canonical results. In this paper we examine this complicated terrain in a preliminary way. We begin some discussion of the pleas of the proponents of a measure-theoretic foundation, considering its advantages for ergodic theory and probability. We will then look at the approach of various writers to decomposition theorems for functions and functionals, centering our view on the work of F. Riesz at the Bologna congress of 1928 and looking at its antecedents and consequences.