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Fusionism in Italy and Europe: a didactic fashion or a research on the foundations of mathematics?

Abstract :

"Fusionism" was an attempt to reform the teaching of elementary geometry involving the Italian school (after the French, German and Danish ones) in the last decades of the 1800s and the early 1900s. It intended to introduce plane and solid geometry at the same time, inferring the theorems in plane from analogies in space and linking to research on the foundations of elementary geometry. In this presentation, from the origins of fusionist method, which draws inspiration from the descriptive geometry and projective geometry of Monge, Poncelet and Brianchon, we first recall the main treatises published in France, Germany and Denmark (Mahistre, Bretschneider, Steen, Meray). We will then examine the situation of the main texts for the teaching of elementary geometry in Italy in the second half of the nineteenth century, and in detail the organization of the discipline in the two fundamental texts for fusionism in Italy (De Paolis, Lazzeri-Bassani) and recall some of the key findings and theories that benefit from the fusionist method, such as the theory of the radical axis and the theory of homothetic figures. We will furthermore illustrate the debate between supporters of the fusionist method and that of the traditional method, called "separatist", which took place mainly in the context of the newly-established Italian Society of Teachers of Mathematics ("Mathesis", 1895). The arguments in favor of the fusionist method were based not only on educational issues, but also on

demands for greater simplicity and rigor in elementary geometry. Apart from didactic considerations, the ambition that really subtended the fusionist choice was to make explicit the dependence of the various theories of elementary geometry from the axioms, and actualize secondary education by introducing new concepts and results of the recent geometric research. In this debate the crucial role of Desargues' theorem emerges, which is decisive in all cases in which the fusionist method is more effective in reducing the axioms from which the theorems depend. This role of Desargues' theorem, which is characterized for plane geometry as the result of the elimination of space axioms, was clarified in Peano's and Hilbert's works (1894, 1899).

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