Nuncius, XXVIII (2013), pp. 492-493

Cesare S. Maffioli, *La via delle acque (1500–1700): Appropriazione delle arti e trasformazioni delle matematiche.* Firenze: Olschki, 2010, ill., 394 pp., ISBN 9788822260086.

The book by Maffioli covers the centuries that witnessed the birth of modern science, using as a privileged viewpoint the science of waters. Keeping the figure of Galileo and his notion of science in the background, the book convincingly reconstructs the debate that took place among engineers, philosophers and mathematicians about the behaviour of running water, hydraulic machines, such as pumps and syphons, and the hydro-geological problems linked to the regimentation of waters. This was in fact a debate among diverse disciplines, each with traditions of their own. As Maffioli convincingly argues, during the sixteenth and seventeenth centuries they favoured the remarkable development of the science and technology of water, especially with regards to the mathematics relating thereto. With the "invention of Galilean science", and the consequent contribution of mathematics to the understanding of nature, the arts became an object of study for mathematicians, while mathematics became a tool for engineers.

The six chapters of this book trace the most significant events of the process of intellectual appropriation of the mechanical arts. This process is a huge cultural movement that Maffioli analyses beginning with Leonardo da Vinci, who, already in the early sixteenth century, clearly understood the importance of applying mathematics to the practical arts and knowledge of nature. Leonardo's ideas regarding water and its control are very important, but they must be seen as a reflection of practices and ideas shared by Renaissance engineers, and also relating to engineering hydraulics in the ancient Roman and Byzantine periods. Significantly, his remarks on the problem of the definition of an "ounce of water" (oncia d'acqua) – trying to determine how to measure water withdrawals from canals – shows that Leonardo knew the physical content of the law of continuity of fluids. If the studies and trials by Leonardo constitute a forerunner of sorts to the science of water, the first steps towards the mathematization of this discipline were taken by Girolano Cardano in his *De subtilitate*, where he presents a trial to define, for the first time, a mathematical model to explain the behaviour of running water. The path proposed by Maffioli involves protagonists, several of which were almost unknown, focusing on Benedetto Castelli's and Domenico Guglielmini's works and professions. From the books of both these authors it is possible to get a glimpse of the rise of the "science of rivers". Guglielmini in particular picked up on an idea already present in both the philosophical and engineering traditions, also to be found in Leonardo's and Galileo's works: he presented a geometrical and physical structure of water representation as if it were a set of spherical particles.

The hydro-geological optimization of the course of rivers, and the development of hydraulic machines, also had important political and social implications. It is the public interest in water management that facilitates the connection between multidisciplinary themes. An example in this regard is the diversion of the river Reno between Bologna and Ferrara, during the seventeenth century. After its rerouting into the Po, the river became the object of continuous hydrological

 DOI 10.1163/18253911-02802012

works, to define its course and its emptying into the Adriatic sea. Both Castelli and Guglielmini, along with many other lesser-known protagonists, were involved as consultants in the Reno canalization affair. The discussion between Castelli, representing the Galilean approach to science of rivers, and Nicholas Cabeus, representing the Jesuit school, which rejected the mathematical approach to physics after Galileo's condemnation by the Inquisition, is one of the most intense moments of this debate. Guglielmini made the Reno River a 'scientific laboratory' for the study of running waters and their erosion action on riverbeds and banks. Guglielmini's intervention in the "science of rivers" represents the completion of the intellectual acquisition process of the arts and the acknowledgment of their 'naturalness'. For Guglielmini, but this could also be applied to Cardano and Galileo, there was no ontological difference between objects of art and nature. The artifacts must be in accordance with the laws of nature – and therefore these laws constitute the ultimate limit of human action. Ultimately, then, if we consider the Galilean movement from the perspective of the "science of rivers", and more generally from the point of view of technical knowledge and practices, we can view it as an expression of the intellectual achievements of the mechanical arts and the parallel and concomitant sociological and disciplinary change in the field of mathematics. According to Maffioli, the cases analyzed in his book demonstrate that the recovery of the Greek-Alexandrian science; the social and intellectual uprising of the arts; and the seventeenth century science renewal movement found a strong boost in the work carried out by mathematicians who began to engage both with engineering and philosophical issues.

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