Reviews

Vito Cardone

Gaspard Monge, padre dell'ingegnere contemporaneo

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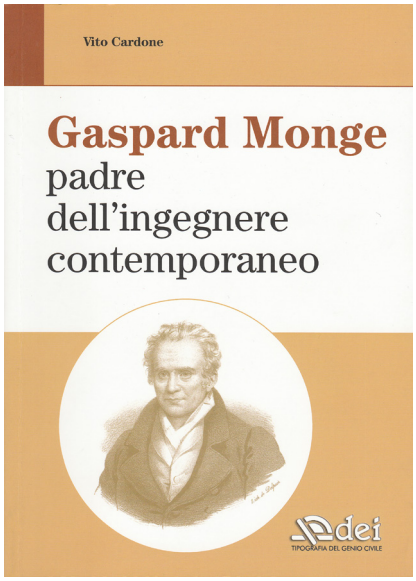

The book by Vito Cardone *Gaspard Monge, padre dell'ingegnere contemporaneo*, published in 2017 by DEI Tipografia del Genio Civile, deals with the precious cultural heritage that the French scientist has passed on to our days. This legacy must be extended not only to the formulation of the rules of descriptive geometry, but also to the study plan designed to train engineers; because, as the author states: "its effectiveness and farsightedness are evident, indeed, after more than two hundred years, it still permeates most of the schools for engineers around the world, whose choices are within the criteria and problems already identified at that time" [p. 79].

Vito Cardone guides the reader in the fascinating and adventurous life of Monge, focusing in particular on the vicissitudes that led to the formulation of descriptive geometry and the organization of the study program for the École Polytechnique in Paris. He also traces the enlargements and transformations of the program over the centuries by his direct successors or by those who have taken inspiration from the cultural heritage left us by the famous French scientist.

The pages of the book outline the multifaceted personality of Gaspard Monge, revealing known 'profiles' of the scientist, first of all that he was a very good teacher.

Monge was undoubtedly a charismatic teacher, he influenced many talented young people who were lucky enough to meet him and follow his famous lessons. He was loved by his students and, despite a slight stutter, he was able to explain in a simple way the complex geometrical phenomena of space; there are many witnesses in this sense: "When he describes, in words, and draws with his hands a surface of revolution, you can see it; a developing surface, you develop it with him […] abstraction takes shape with him; he had the art of making simple things that are complicated and clear the ones that are more obscure" [Jomard 1853, pp. 12-16]. The introduction of Cardone's book shows an emblematic episode: the parade organized by the students, Sunday, August 2nd, 2018, to pay tribute to the master, who had been buried a few days earlier in the Père Lachaise cemetery. The solemnity of the event was immortalized by the painter Hippolyte Lecomte; among the students there were also those who were the promoters of a subscription to erect a funeral monument on the burial site, which is still possible to admire. Today the remains of Monge are at the Panthéon, they were transferred on the occasion of the bicentenary of the French Revolution. This relocation to a more representative place by the authorities of the French Republic should not surprise us; indeed, the pages of Cardone's book show the figure of a civilly engaged man. The author starts from the training years

of the French scientist identifying, also in the difficulties encountered for his non-aristocratic origins, the enthusiasm for the revolutionary movement, which promised to establish a more just, egalitarian and meritocratic society.
In the first chapter Cardone analyzes the political context, talking also about the sincere friendship between Monge and Napoleon. First the general asked for his friend's technical, cultural, and scientific advice; later, while continuing to maintain the relationships of mutual esteem, Napoleon –now an emperor– undermined the Monge's most loved creature, the École Polytechnique, imposing the scientist to transform the institution, ecumenically open to all talented fellows, in a military school subject to the payment of a fee.
Cardone takes advantage describing the important roles held by Monge during the French Revolution and the Empire; the aim of the author is to outline the global figure of the man. So, the reader finds out that Monge was tenderly attached to his family, who kept constantly updated during his long journeys by means of a detailed correspondence. In the missives, written during the Italian campaign, the scientist is not too much impressed by the beauty of our Country, usually providing a political reading of the places more than an artistic and architectural one. He, as a Jacobin, criticizes harshly and repeatedly the Church both as a temporal and spiritual institution. Yet there is no shortage of enthusiasm, such as the one reported in the letter addressed to his wife in which she dwells on the *Ecstasy of Santa Cecilia* by Raffaello Sanzio; or the descriptions of Lake Trasimeno and Campi Flegrei in which he abandons himself to nostalgic reminiscences linked to the readings of his childhood. Instead, the Egyptian campaign sees Monge engaged in the drafting of maps and surveys of ancient monuments and buildings but especially in the analysis of hieroglyphics, thus setting up modern Egyptology.
The second chapter of Cardone's book focuses on the wide scientific legacy left to us by Monge. Indeed, the French scientist, who has gone down in history as a codifier of descriptive geometry, has also worked in other theoretical and practical fields, providing important contributions on partial derivatives and pushing for France to adopt a single measurement system based on the meter. But it is in the didactic approach that Cardone identifies one of the most original contributions of this great master. Cardone analyzes the relationship between science and technology and, in particular, how these produce relapses in descriptive geometry. The reading of the book shows how much Monge was convinced of the close relationship among science and technology and how much effort he has faced to address both the theoretical and practical aspects of the issues. In this regard we can only agree with the author when he states that: "Monge was the most emblematic scientist of that fruitful period of transition from the age of enlightenment to that of the industrial revolution. If this happened quickly it is also thanks to the creation of a new universal scientific and technical language –the graphic one– that he developed so that all the engineers and technicians responsible for the design, management and execution of the engineering works could speak a same language" [p. 16].
On descriptive geometry Monge marked a revolutionary school, it is a unitary method of study, in which applications play an important task: the connection between the various scientific disciplines. The École Polytechnique of Monge will be a point of reference for all the contemporary and successive engineering schools. The topic of the third chapter of Cardone's book deals with the diffusion over the centuries of descriptive geometry and the training model for engineers. The author shows how great the interest of the entire scientific community was both for the new drawing discipline –the *Leçons* were a great success and they were spread out to the point that they could be considered a 'classic'– and for the teaching organization of the École Polytechnique –from the Americas to Russia, schools for engineers were founded, inspired by the French model–. Monge's students spread out throughout the world the teaching method and organization of their professor. From the pages of the book interesting data and considerations emerge in this context, such as: the detailed analyses made by the author on subsequent developments both at a theoretical and practical level carried on by the Germans; the comparison with a certain form of "backwardness" of the British; the pragmatic set in the United States of America, dictated by the need to face urgent infrastructural problems; developments and repercussions in Spanish and Portuguese speaking countries, as well as in Italy and in France.
The book has images related to Gaspard Monge: the artistic works he admired in Italy; the engravings and paintings that portray him in important political moments of the revolution and the empire; the portraits that immortalize him in different moments of his life; and the elegant tables, extrapolated from the treatises of the master and his successors. Finally, Cardone provides in the Appendix the program and excerpts of descriptive

geometry taken from *Géométrie Descriptive. Leçons données aux Écoles Normales, l'an 3 de la République, par Gaspard Monge de l'Institut National*.
Cardone's book is very relevant today, since many nations, including Italy, have started a reform of engineering studies in the last decade of the XX century, driven by a request from the business world that pressed for a first level training of the engineer aimed at strengthening professional practice. This has led to an inevitable impoverishment of basic scientific knowledge in the provision of university courses. At the conclusion of this book, Vito Cardone, having followed these problems very closely as President of the Conference of Deans of Engineering Faculties, expresses a certain confidence in the possibility of absorbing the damage caused by the reform of the Engineering Faculties, hoping for a reformulation of the training courses based on historical knowledge and starting from the origins, i.e. the foundation of the first organic study plan for engineer training that Gaspard Monge delineated within the École Polytechnique of Paris.
The book by Vito Cardone is therefore particularly valuable, not only because it provides a complete, 'all-round' profile, of the French scientist but also because it deals with stringent and current problems, for which this book is a convincing tool for identifying a valid solution. Indeed, it is essential to provide the engineering students with a precise identity starting from their roots.

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