Mechanics and Natural Philosophy in History

Subjects: Engineering, Mechanical

Contributor: Danilo Capecchi , Giuseppe Ruta

This entry presents a historical view of the meaning attributed to the terms *mechanics* and *natural philosophy,* from a hint to ancient Greece, the Middle Ages, and the Renaissance to a special focus on the 18th Century, which represents a turning point for the development of modern physics and science in general. Since we are not concerned with the summation of the histories of natural philosophy and mechanics, but only with their interrelations, this makes a detailed description of the two disciplines unnecessary.

mechanics   mathematics   natural philosophy   Aristotle   Euclid

Mechanics and natural philosophy are two locutions with completely different meanings today. Mechanics is normally understood as the science that studies the equilibrium and motion of bodies and is a highly formalized discipline; with this meaning, it is also labeled as "classical" in academic circles, so as to juxtapose it with relativistic and quantum mechanics. In the engineering world, the adjective "applied" is often juxtaposed with the noun "mechanics" to denote a discipline devoted to the investigation of technical applications of kinematics, dynamics, and statics of rigid and deformable bodies, and their encompassing fluids and gases. In this sense, mechanics is linked with the history of technicians and technology, starting from the ancient architects and manufacturers who also wrote about their techniques—one remarkable instance being the Latin architect Vitruvius.

Natural philosophy is a less common locution, and it is not possible, within the limits of this entry's contribution, to describe all its meanings with enough detail; with some gross simplification, it can be said that, for some historians of science, it is an extinct discipline that took care of searching for explanations per causas of natural phenomena; for others, it is the name of a new branch of philosophy that studies nature as a whole, including mental states [1]. It is worth mentioning the existence of an important association of scientists named the *Society for Natural Philosophy*, founded by the mathematician Clifford Ambrose Truesdell in 1963, which "nourishes specific research aimed at the unity of mathematical and physical science" (from the by-laws of the society itself). The members of this society are scholars of exact sciences: mathematics, physics, biology, chemistry, meteorology, and so on. The name of the society is due, on the one hand, to historical continuity, since in English-speaking countries, the terms "physics" and "natural philosophy" were long exchangeable; on the other hand, it is meant to stress that the problems studied by the ancient natural philosophy are now the fields of investigation of exact sciences.

As a matter of fact, historically, the locutions *mechanics* and *natural philosophy* did not mean unrelated branches of knowledge. The following quotation gives a very good idea of how the two disciplines have been related in the past.

Natural philosophy encompassed all natural phenomena of the physical world. It sought to discover the physical causes of all natural effects and was little concerned with mathematics. By contrast, the exact mathematical sciences—such as astronomy, optics, and mechanics—were narrowly confined to various computations that did not involve physical causes. Natural philosophy and the exact sciences functioned independently of each other. Although this began slowly to change in the late Middle Ages, a much more thoroughgoing union of natural philosophy and mathematics occurred in the seventeenth century and thereby made the Scientific Revolution possible. The title of Isaac Newton's great work, The Mathematical Principles of Natural Philosophy, perfectly reflects the new relationship. Natural philosophy became the "Great Mother of the Sciences", which by the nineteenth century had nourished the manifold chemical, physical, and biological sciences to maturity, thus enabling them to leave the "Great Mother" and emerge as the multiplicity of independent sciences we know today [2].

(Backcover)

The quotation compares science and natural philosophy, but it is equally valid if science is intended to be limited to mechanics, and natural philosophy to the study of motion.

Before going further, as many of the terms in use in the past and still in use today have changed their meaning, a clarification is needed:

- *Traditional natural philosophers:* people trained in the investigation of nature by using the concepts of matter, causation, ethics. Examples are Aristotle, Plato, Descartes, and Leibniz, but not Newton and many of his successors.

- *Mathematicians:* people trained in theoretical mathematics and in practical activities.

Of course, one can envision a spectrum of intermediate figures ranging between canonical philosophers and mathematicians.

References

1. MacLennan, B.J. Philosophia naturalis rediviva: Natural philosophy for the twenty-first century. Philosophies 2018, 3, 38.

2. Grant, E. Much Ado about Nothing: Theories of Space and Vacuum from the Middle Ages to the Scientific Revolution; Cambridge University Press: Cambridge, UK, 1981; Available online: https://www.cambridge.org/core/books/much-ado-about-nothing/A129F6EFC013C7DD6B5EDEF011605DA4 (accessed on 1 April 2022).