Immanuel Kant. *Natural Science*. Ed. Eric Watkins. Cambridge University Press 2015. 822 pp. $175.00 USD (Hardcover ISBN 9780521363945); $52.00 USD (Paperback ISBN 9781107552142).

Immanuel Kant, as is well known, tried to free philosophy from the fallacies of metaphysics conceived as a knowledge that overcomes the limits of experience, and for that reason he turned his gaze to the form of knowledge that he considered paradigmatic: that is to say the scientific one. The immortal *Kritik der reinen Vernunft* (1781) can be seen as a theory of knowledge that aims to overcome the theoretical limits of both rationalism (Descartes and Spinoza) and empiricism (Hume, Locke, Hobbes, and so on). That was possible thanks to synthetic a priori judgments just because, as Kant upheld, they are universal, necessary, and they increase our knowledge. While the a priori analytical judgement is tautological, the a posteriori synthetic one increases our knowledge, but it is not universal and necessary.

In Kant's transcendental approach the epistemological perspective is privileged because scientific knowledge (a priori synthesis), on the one hand, features universality, and on the other, increases our knowledge. That's why Immanuel Kant conceived science (especially mathematics and physics) as characterized by a level of perfection that was missing in metaphysical knowledge. A priori synthetic judgments are possible by virtue of the transcendental structures (pure forms), that is to say on one side in sensibility (thanks to the pure intuitions of space and time) and on the other in intellect (thanks to the pure concepts represented by the twelve categories that allow transcendental apperception, that is to say the 'I think', to unify the multiple phenomenal reality). The pure intuitions of space and time are objects of the transcendental aesthetic, while the pure concepts of the intellect are objects of the transcendental analytic. This Kantian architectonic, which is obviously more complex but which reasons of space prevent us from analyzing further, shows the phenomenal nature of scientific knowledge, even though it would be a mistake to confuse it with the reductionist perspective of Logical Positivism which aimed to reduce the theoretical level to the empirical one. In fact, the scientific object in Kant's view is a phenomenon qualified as an object, and that means that it is modelled by the subject on the basis of his a priori mental structures. This is the so-called Copernican revolution, where the transcendental deals not with objects, but rather with our mode of knowing them, and from that point of view the active role of the subject in concrete scientific practice reached its highest level in the philosophical field. As is well known, Kant conceived the Newtonian paradigm as the most perfect form of knowledge and aimed to justify it from a philosophical point of view, and there is no doubt that the transcendental logic has many aspects in common with the experimental one (Newton and Galileo): the dynamic character of the subject-object relationship, the denial of cognitive absolutism, and the empirical testing of theories.

Immanuel Kant is better known as a *philosopher* but in the pre-critical period he studied in a very deep way many aspects of the natural sciences. This is why the new volume of the English edition of Kant's works is devoted to the publications of Kant's writings on natural science. This massive volume is edited by Erik Watkins and Kant's writing are translated by Lewis White Beck, Jeffrey B. Edwards, Olaf Reinhardt, Martin Schönfeld and Erik Watkins.

As Eric Watkins rightly identifies in his general introduction, it is very important to draw a distinction between Kantian 'conception of science in general and of natural science in particular' (xiv). Since I already sketched the outlines of Kant's general conception of science at the beginning of this review, let's now see how Kant conceives of natural science in particular.

All these Kantian writings on natural sciences constitute the so-called pre-critical period, which is mainly characterized by the way Kant tried to describe scientific phenomena that is to say without resorting to any theological principles or arguments. What strikes us, in reading all these Kantian pre-critical writings on natural science, is the deep knowledge that the philosopher of Königsberg had of the main scientific issues that he analyzed. An emblematic case is the 1755 work, *Universal natural history and theory of the heavens or essay on the constitution and the mechanical origin of the whole universe according to Newtonian principles*, where Kant applied Newtonian principles of the forces of attraction and repulsion and the theory of universal gravitation in order to provide a theory concerning the formation of the universe; this theory is nowadays known as the Kant-Laplace Nebular Hypothesis because Pierre-Simon de Laplace formulated, independently, something similar. According to this theory the solar system came from a primordial nebula of particles, and from the point of view of the history of science, this text provided a great contribution to cosmology. Another important example of Kant's writing on scientific issues is *Thoughts on the true estimation of living forces and assessments of the demonstrations that Leibniz and other scholars of mechanics have made use of in this controversial subject, together with some prefatory considerations pertaining to the force of bodies in general*. This writing concerns the law of motion as it was conceived by Descartes and Leibniz, and in this respect Kant tries to provide a solution about the *vis viva* (living force) debate.

As is well known, Descartes, in his *Principia Philosophiae* of 1644, stated that the quantity of motion and the quantity of matter in the universe are constant so the formula $mv=const$, where m = mass and v = velocity. Leibniz, in his essay entitled *A Brief Demonstration of Memorable Errors of Descartes and Others Concerning a Natural Law* of 1686, criticized Descartes' point of view by stating that force is proportional to the product ofthe mass and the square of velocity, so the formula mv^2. Immanuel Kant tried to solve the Descartes-Leibniz debate by dividing all motions into two main kinds: 'One kind has the property of conserving itself in the body which is communicated, and of persisting infinitely if no impediment opposes to it. The other is an enduring effect of a constantly driving force which does not even require resistance to destroy it, but which depends solely on an external force and disappears as soon as this force ceases to sustain it' (30-31). While Leibniz admitted only the first type of motion and Descartes the second, Kant tried to conciliate the two positions, but he did not succeed.

The writings translated in this volume concern not only issues in physics, but also other scientific disciplines such as astronomy. (See, for example, *Examination of the question whether the rotation of the Earth on its axis by which it brings about the alternation of day and night has undergone any change since its origin and how one can be certain of this, which [question] was set by the Royal Academy of Sciences in Berlin as the prize question for the current year*). There are also contributions to geology (see *On the causes of earthquakes on the occasion of the calamity that befell the western countries of Europe towards the end of the last year, History and natural description of the most noteworthy occurrences of an earthquake that struck a large part of the Earth at the end of the year 1755*, as well as *Continued observations on the earthquakes that have been experienced for some time*), meteorology (see *New notes to explain the theory of the winds, in which, at the same time, he invites attendance at his lectures* of 1756), geography (see *Plan and announcement of a series of lectures on physical geography with an appendix containing a brief consideration of the question: Whether the West winds in our regions are moist because they travel over the sea*), and so on.

Many of the theories and hypotheses published in this volume are now obviously outdated, but what really matters is Kant's attempt to overcome genuine scientific problems. They confirm that the philosopher of Königsberg was deeply informed of issues in the natural sciences and that all his pre-critical writings on natural science can be seen as a kind of preparatory material for the transcendental philosophy systematized in the *Kritik der reinen Vernunft*. This volume is very important for two main reasons. On the one hand, it allows us to better understand the Kantian conception of science of the pre-critical period. On the other, that is to say from a more general point of view, it provides, especially to new scholars, intrinsically interesting material that is very useful to those who want to follow Kant's footsteps towards transcendental philosophy.

Furthermore, at the end of the volume, readers can also find some very useful instruments for an easier access to all Kantian concepts, that is to say a German-English glossary, so that they can compare Kantian words with the English translation, an index of places, an index of names and finally an index of subjects.

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