

Physics and Metaphysics in Pierre Duhem

Mirella Fortino
Liceo Scientifico “E. Fermi” - Cosenza
e-mail: mirellafortino@gmail.com

1. Metaphysics and Physics
2. The Mechanistic Theory
3. Is the Theory like Natural Classification a Metaphysical Approach?

ABSTRACT - In Pierre Duhem (1861-1916) historical reasons and logical reasons are intertwined for to demarcate, from publication of the article “Physique et métaphysique”, science and metaphysics. The Catholic physicist Duhem is regarded by some interpreters like a scientist who has subordinated the science to metaphysics. His physics is considered the physics of a believer. We intend provide an opportunity of critical reflection on the terms of question in Duhem, in order to put in light his demarcation of physics and metaphysics. In the Duhemian conception this question has an important reason in a fact of history of scientific thinking: the crisis of mechanism in the second half of the XIX Century. The aversion to mechanism, and to atomism conceived like research of last reality, is severe in the second half of the XIX Century, while the history of science imposes the thermodynamics theory. In the Duhem’s perspective what is in discussion is an investigation of nature, methods, limits of physical theory. The Duhem’s thesis of the physical theory conceived like symbolic representation of phenomena, and not like explanation, involves a renunciation that conditions the epistemology: the renunciation to the essentialism. We tried to understand because in the criticism of Duhem physics and metaphysics “ne peuvent ni s’accorder ni se contredire”.

© The Author 2011.

Published by L&PS – Logic and Philosophy of Science

<http://www2.units.it/~episteme> – ISSN: 1826-1043

1. Metaphysics and Physics

The Catholic physicist Pierre Duhem is regarded by some interpreters like a scientist that has subordinated the science to metaphysics. I intend here to put in light his demarcation of physics and metaphysics. What is the metaphysics? The metaphysics for Aristotle is *first science*; it concerns the research of causes and substance. The positivist conception of science has denied the research of causes or substance, and in the “Revue des questions scientifiques”, in 1893, Eugène Vicaire, affirming the necessity, in the science, of the research of causes, reputed that Duhem is a positivist scientist and his philosophy an expression of scepticism.

In the article *Quelques réflexions au sujet des théories physiques* (1892), Duhem has indeed distinguished the physics conceived like an *explanation* of phenomena and the physics conceived like a *representation* of phenomena. This distinction is affirmed to assure the independence of physics by metaphysics. The physics theory is here conceived like a symbolic representation of phenomena. In the essay *Physique et métaphysique* Duhem reports indeed, in replying to Vicaire, the Saint Thomas thinking about *veritas* and *apparentia* (Duhem 1987, p. 101). Here he supports the Kantian philosophical limitation of the human knowledge: the human intellect is incapable of transcending the phenomenal reality. An angelic intelligence only, or an intelligence inspired by God, is capable of surpassing this limitation.

PHYSICS AND METAPHYSICS IN PIERRE DUHEM

The philosophical distinction between *essence* and *appearance* is affirmed with decision in *The Aim and Structure of Physical Theory* and in *To Save the Phenomena*. Is this distinction an instrumentalist expedient - à la Bellarmine - devised to save the faith? Some critics maintain this supposition. In the XVII Century to conceive the physics like an instrument to save the appearances is indeed an antirealist strategy to save the faith. But the Duhemian epistemology of appearances is an expression of a sophisticated philosophical elaboration where historical and logical reasons are intertwined for demarcate science and metaphysics.

2. The Mechanistic Theory

Descartes has affirmed that the human knowledge must be founded on the evidence. He affirms two evident characteristics or essences of things: the *extension* and the *movement*, objects of intelligence by mathematics, evident realities hid under the appearances. He has defined a mechanistic paradigm that according to Duhem involves a metaphysical pretention. The subject, according to Descartes, knows the nature of the matter (extension and movement) and logically by geometric method he can deduce all properties of the brute matter. Duhem writes that “celui qui a le plus contribué à rompre la barrière entre la physique et la métaphysique, c’est Descartes” (Duhem 1987, p. 104).

MIRELLA FORTINO

Some biographical information concerning the Duhem's formation is interesting to understand the doctrine of the French physicist. In the *Physique de croyant*, I read that at Stanislas Collège the French physicist is interesting to mechanistic theory, because his teacher Jules Moutier has a predilection for the mechanistic explanation. But the Bertin's scepticism was here a source of doubts and Duhem conceives gradually the theory like *representation*, as signs reported to things or meaning, and not like *explication*. Consequently, in Duhem these doubts involves the affirmation of the algebraic severity. The physical theory "may be developed with the same rigor as an algebraic doctrine" (Duhem 1954, p. 277). While Duhem was devoted to the Thermodynamics theory he has declared his adversion to the Mechanistics physics, to English physics of models of William Thomson, that for him is a rival theory of Thermodynamics, because in the *pictorial models* he finds the pretension to reproduce the exact image of reality and a "défaillance de la faculté d'abstraire". Duhem exalts the abstrait theories, the rules imposed by the logic. The Thermodynamics has logical and methodological mainstay in the algebraic calcul.

3. Is the Theory like Natural Classification a Metaphysical Approach?

"A physical theory is not an explanation. It is a system of mathematical propositions, deduced from a small number of principles, which aim to represent as simply, as completely, and as exactly as possible a set of

PHYSICS AND METAPHYSICS IN PIERRE DUHEM

experimental laws” (*ibid.*, p. 19). Now I wonder: is the algebraical rigour a very strong reason to demonstrate the independence of physics from metaphysics? or, denied the research of essences, is the idea of a symbolic representation sufficient to deny the metaphysical pretensions? If the Duhemian phenomenism involves the instrumentalist thesis, is this implication an real antidote to metaphysical engagement? But before I’ve ask: is the Duhemian epistemology engaged really in instrumentalism’s defense, lessening the science’s value of knowledge, to save the faith? No. I see that an instrumentalist interpretation of Duhemian epistemology isn’t in harmony with an important idea of the French physicist: the physical theory is a natural classification and it slowly progress. But, considering - at the same time - the idea of physical theory like reflex of an ontological order, Duhem, on the contrary of Poincaré’s *commodisme*, confers an metaphysical meaning or value to physical theory. This admission is epistemologically the source of the real problem. If the theory is the reflex of an ontological order the metaphysics is the heart of physics. But is the supposition of ontological order a sufficient condition to affirm really the metaphysical involvement? Indeed in chapter II of his masterpiece Duhem affirms that

Physical theory never gives us the explanation of experimental laws; it never reveals realities hiding under the sensible appearances; but the more complete it becomes, the more we apprehend that the logical order in which theory orders experimental laws is the reflection of an ontological order; the more we suspect that the relations it establishes among the data of observation correspond to real relations among things, and the more we feel that theory tends to be a natural classification (*ibid.*, pp. 26-7).

MIRELLA FORTINO

So, I find the ideal reason under the metaphysical involvement: this involvement has its reason in the postulation of the perfect theory conceived like the aim of the physics research and in the postulation of the physics's continuous progress.

We said that there ought to be an analogy between the metaphysical explanation of the inanimate world and the perfect physical theory arrived at the state of a natural classification. But we do not possess this perfect theory, and mankind will never possess it; what we possess and what mankind will always possess is an imperfect and provisional theory which by its innumerable gropings, hesitations, and repentances proceeds slowly toward that ideal form which would be a natural classification (*ibid.*, p. 302).

What's the reason that supports the idea of natural classification that seems the antithesis of phenomenism? I think that in *Physique de croyant* is revealed the mysterious reason. This idea has its ground simply in an *expectation of the mind*, and this expectation has not a logical and exact reason. When the physicist works, he expects an accord between theory and facts. The physicist hasn't a certitude – indeed - of this result (*ibid.*, p. 298). I think so that the Duhemian idea of natural classification is intelligible if it can have an heuristic meaning or value. I conceive the awaited theoretic perfection like a controlling ideal. And like I've demonstrated elsewhere the French physicist is not a philosopher of science devoted to a cause of instrumentalism, in spite of his renunciation to research of profound realities. He criticizes the instrumentalism, but he criticizes with severity also the Galilei's realism (Fortino 2005). The Galilei's realism here is defined "illogique".

PHYSICS AND METAPHYSICS IN PIERRE DUHEM

It's legitimate to consider that in the Duhemian's thought the metaphysics is beyond the logic of science in the sense that it is relating to the perfect theory. According to Duhem the history of science, that is a slow way without the sudden fractures, shows – in the theories that are successful - the seeds of an *ideal theory*. Between the different theories, the ideal theory is – according to Duhem – the Thermodynamics, that “présente une analogie non méconnaissable” with peripatetic cosmology (Duhem 1954, pp. 309-10). But the Thermodynamics theory is established by the independent and scientific work of physicists and the Cosmology is affirmed past the Physics and not before the physics. This doesn't mean to deny – nevertheless - the meaning of metaphysics. I must emphasize here that Duhem has not denigrated the metaphysics. On the contrary of logical positivists, he reposes that the metaphysics is important because it can suggest the interesting ideas in the physics.

I've clarify that Duhem has distinguished metaphysical systems and metaphysical propositions. The first are “capables de nous conduire à des conséquences physiques”(Duhem 1987, p. 90), problematic and dubious, that are objet of pronouncement in the physics. Although the metaphysics systems can suggest a physical hypothesis nevertheless “*la physique seule pourra décider si cette proposition est exacte ou inexacte*” (*ibid.*). Indeed, later he affirms that “we cannot therefore derive from a metaphysical system all the elements necessary for the construction of a physical theory” (Duhem 1954, p. 18). It is very important to see that in Duhem if the metaphysical systems

MIRELLA FORTINO

on the contrary of metaphysical propositions can suggest a proposition of physics, the physics only can prove the accuracy of the scientific truth of this proposition. So this epistemological perspective isn't imposed by Catholicism. I think that the physical theory defined by him is not a theory of a believer (because "was it not taught by pagans, by Moslems, by Jews, and by heretics as well as by the faithful children of the Church?") (*ibid.*, p. 310). If the metaphysics - in opinion of Duhem - is before the physics for his excellence, it's second in the physical order. This logical perspective involves – consequently – that "au progrès de la science physique [...] le croyant et l'incroyant peuvent travailler d'un commun accord". The demarcation is of course logically affirmed, however I remember that Duhem has seen in the Catholic Church the power "to maintain human reason on the right road" (*ibid.*, p. 311).

And if I remember too his admiration for Osiander, for the Cardinal Bellarmin's "sagesse" and "prudence", I adds that his instrumentalism is legitimate really by his antimechanistics critics and not by apologia à la *Bellarmin*, or by clericalism. Duhem is only an apologist of the Thermodynamics and Energetics theory. And if the interpreters have maintained the accord of Duhemian philosophy with Thomism¹, if the interpreters have seen in Duhem a defense of faith by epistemological instrumentalism, or by "phenomènalisme", I think that epistemologically the Duhemian phenomenism isn't sincerely in harmony neither with an

¹ On this point see Jaki (1984) and Martin (1991).

PHYSICS AND METAPHYSICS IN PIERRE DUHEM

instrumentalism oriented to the defense of faith, nor with the philosophy devoted to discover the nature of things. The research of the nature of things means for the French physicist to subordinate the Astronomy or the Physics to the Theology.

REFERENCES

- DUHEM, P. (1892): "Quelques réflexions au sujet des théories physiques", *Revue des questions scientifiques*, XXXI, 2^e série, t. I, pp. 139-177; in *Prémices philosophiques*, éd. par S. Jaki, Leiden: Brill, 1987, pp. 1-39.
- ____ (1893): "Physique et métaphysique", *Revue des questions scientifiques* XXXIV, t. IV, pp. 55-83; in *Prémices philosophiques*, pp. 84-112.
- ____ (1905): "Physique de croyant", *Annales de Philosophie Chrétienne*, 77^e année, 4^e série, t. I, octobre et novembre 1905, pp. 44-67; 133-59; in DUHEM 1954, pp. 273-311.
- ____ (1969): *To Save the Phenomena*, Chicago: The University Chicago Press.
- ____ (1954): *The Aim and Structure of Physical Theory*, foreword by Prince Louis de Broglie, translated from the French (*La théorie physique: son objet, sa structure*, Paris: Marcel Rivière & C^e Éditeurs, 1914²) by Philip P. Wiener, Princeton: Princeton University Press.
- FORTINO, M. (2005): *Essere, apparire e interpretare. Saggio sul pensiero di Duhem (1861-1916)*, Milano: Angeli.
- JAKI, S. L. (1984): *Uneasy Genius: the Life and Work of Pierre Duhem*, Dordrecht: Martinus Nijhoff Publishers.
- MARTIN, R. N. D. (1991): *Pierre Duhem. Philosophy and History in the Work of a Believing Physicist*, La Salle (Illinois): Open Court Publishing Company.