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BOOK REVIEWS

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"THE PRINCIPLES OF CONVENTIONALISTIC PHILOSOPHY OF PHYSICS AHD ASTRONOMY". Polish Scientific Publishers, Warsaw 1989.

The book is devoted to revealing the methodological character of physics and various methodological approaches to physics. The following monographies are the basic starting material for this study: La science et l'hypotheses (1925), La valeur de la Science (1935), Science et methode (1908) of Henri Poincare, and La systeme du monde, Histoire des doctrines cosmologiques de Platon a Copernik, vols. VII and VIII (1958), La theorie physique, son object, sa structure (1914), and Introduction a la mechanique chimique (1883) of Pierre Duhem. The new synthesis of Siemianowski includes 132 bibliographic positions. Although the works of Poincare and Duhem form the basic "date" of the book, nevertheless one can find the concepts of others, for example of Eddington, Berkeley, Mach, Klein, De Broglie et al.

The mentioned above sources of Duhem and Poincare concern meta–theoretical contribution in the field of mathematic and natural history. They are basic for our general view ligitimated by science. Meta–theoretical studium of Siemianowski is a continuation of Lvov–Warsaw School and Polish methodology (Cf Philosophical Lvov–Warsaw School, J.Wolenski, D.Reidel 1988). Poincare and Duhem studied the important fragments of modern science — mathematics, physics and astronomy, hence the study of Siemianowski represents itself the metasearche — theory of theories (of Poincare and Duhem plus the related topics). His study has a meta–methodological character since the study presents itself as two–folded: it concerns the conventionalistic character of physics and varieties of conventionalistic approaches to physics.

Different *empirical* questions are discussed in Ch.I. Ch.2. — affecting all or nearly all topics of the book — is devoted to methodological questions in relation to *practice* of searches. Ch.3. concerns the general questions of *methodology vs history* of science. The second part of the book contains seven chapters. Ch.1. describes the main trends

in *conventionalistic philosophy* of physics and is fundamental for all or most parts of the monography. Ch.2. is devoted to the *historical* questions, e.g. of origin and evolution, of *conventionalism*. Ch.3. presents metatheory of *facts* in physics. In Chs.4. and 5. one can find original conclusions on *conventionalism — conventions — falsificationism* in physics and astronomy. Ch.6. concerns the subject of *holism*, while Ch.7. — of *instrumentalism*.

In Siemianowski's book one can find a whole catalogue of concrete problems and ideas discussed in science and related to phylosophy of physics and astronomy such as, e.g., Poincare's approach to the principles of mechanics resembling Heisenberg's ideas of closed groups of assertions working together. Poincare's discussion of the epistemological status of the principles of dynamics, inquiry about the assessment of Young and Fresnel theories of light in the context of Young and Fresnel experiments (the question of experimentum crucis), Mill's view on inductivism in physics and Poincare's view — point on the limitations of the inductivism in physics and astronomy are also regarded by Siemianowski.

In this monography there are such concrete ideas as the opposition "local vs global" categories in physics and astronomy, the empirical sense of mechanics and dynamics which are not treated as systems of synthetic (and a priori) statements, the affair of the principle of correspondence. With respect to the last problem let us mention only the problem of the original Kepler's laws (Kepler's physics) in the light of Newtonian theoretical system (Newtonian system of Kepler's physics). The author gives also a critical account of very methodological questions: great Duhem's system of physics, Duhem's claims on the inertial law, verification and empirical status of inertia, Duhem's "de la methode positive" vs Poincare's "les hypotheses qu'en apparence", "les definitiones deguisees", Popper's *basic* sentences in physics, Poincare's "razor" principle, De Broglie's view on Duhem's system of physics, affair of Ampere. Foucault and Newton orderliness, debate on wave and corpuscular theories.

List of the interesting problems can be extended. Let us mention also the problem of relation between part and wholeness in physics and cosmology, Schlick's criticism of non–empirical theorems in physics, views on relation between bodies and space, status of axioms of Euclidean and non–Euclidean geometry, Berkeley's judgements and many others.

Siemianowski discusses the methodological questions concerning the debate on the nature of gravitational law, on the role of generalisation and methods of reasoning and discovering the universal laws from individual facts (the relation between the *original* Kepler's system and *Newtonian–like* system of Kepler is only an example). The discrepancies between declarations of scientists and real procedures involved by them, methodological meaninglessness of popular stories (sometimes imaginations) about discovering in physical science, which are usually presented in textbooks and

scientific articles (not only related to gravitation — vide the story about Newtonian apple) and popular opinion are under critical discussion presented by the author. His system (new synthesis) condenses the physical material, so the book may be read from many view–points.

The important part of Siemianowski's study is devoted to the problem of measurement in physics: time and space measurement, assoluteness of space–time, Wiener vs Neumann views, measurements in astronomy (of methodological aspects of the astronomical system presented in Almagest of Ptolemy) and the role of astronomical measurements in appearing of *modo astronomico science* (referring to Mansion's "Sur les principles fondamentaux de la Geometrie, de la Mecanique et de l'Astronomie").

The methodological content of this book ought to be taken by the all authors working on monographies devoted to Einstein's ontology and to the analysis of special relativity (cf "The operationism postulate in the classical kinematics", in: Isaac Newton's Philosophiae Naturalis Principia Mathematica, N.Kaminski (ed.), World Scientific,1968,193–204), assessment of Newtonian and Einsteinian theories (cf "The correspondence between the Einsteinian and Newtonian theories", in: Isaac Newton's Philosophiae..., ibid.,61–68); and the methodological content of this book will be recommended for the authors of books devoted to redshift interpretation controversy, cosmological anomalies, part and wholeness relation, epistemological aspects of measurements in astronomy (particulary extragalactic astronomy).

Poincare's system is important for our theory of knowlege. The whole system of Poincare appeared as the consequence of new problem–situation revealed by non–Euclidean geometry. Poincare's system concerns only physics, astronomy and mathematics. Poincare disagreed with Mill's understanding of geometry. According to Poincare the axioms of geometry are *a priori* and not necessary. At the same system axioms of mathematical theories are analitic, thus we have deal with unusual theoretical system. Of course, mathematician Klein influenced Poincare's system, Poincare's understanding — at the metalevel — of geometry and physics. And the first methodological works of Poincare were devoted just to geometry (Poincare's metageometrical search), while the first metatheoretical paper in physics appeared later (1901). Poincare's results are important part of metatheoretical reflection appeared after the origin of non–Euclidean geometry and contemporary cosmology involving non–Euclidean geometry. Poincare developed his distinguishing between geometry and mathematics. We rejected the view that mathematics has a status of *synthetic a posteriori* (unnecessary) sentences. Siemianowski's book clearly indicates that the debate on the status of geometry, arithmetics and mathematics is not closed in the light of modern science. Poincare did not treat mathematics as a giant tautology, rejected many ideas of Hilbert's School, he disagreed with Cantor's actual infinity, improved many imperfections of systems of *synthetic a priori* sentences.

The study of Siemianowski correctly indicates that the philosophical sense of metasystems of Poincare and Duhem was not properly recognized as far. For example he points out that they created two (i.e. not one) separate systems; in particularly Duhem's system is not — according to Siemianowski — the extremal case of Poincare's syntheses. In the book, Poincare's metatheoretical system is clearly distinguished from the others given by Duhem, Ajdukiewicz, Fleck, Dambska and Eddington. The last methodological system of Eddington distinctly preferred the so-called transcendental laws, i.e. laws describing the behaviour of microparticles. Sir Eddington treated classical mechanics as a system of statements that are obviously true (untranscendental). In this sense Eddington should agree with philosophy of quantum mechanics of von Weizsaecker and — to some degree — of Wheeler (cf "The Weizsaecker and Everett interpretations of quantum mechanics" in: Problems in Quantum Mechanics–Gdansk'87, L.Kostro et al. (eds.), World Scientific,1988,880–906; "The antiNewtonian concept of the observer", in: Isaac Newton's Philosophiae..., ibid.,178–192). On the other side Eddington's idea of transcendental laws (presented in Eddington's "The Nature of the Physical World") and Poincare's theory of things (objects) are related to *Mach's system.*

Many affairs are open. For instance anomalies and ad–hocness problems are connected with appraisal in physical science. Anomalies appearing in science require new hypotheses which may be ad–hoc: empirically, heuristically and theoretically. Anomalies, such as redshift peculiarities, imply changes in the belt of auxiliary hypotheses, sometimes in the hard core of the research programme. Anomalies charge programmes (e.g. other programme). There are no doubts that the book can be enlarged with respect to the sections devoted to anomalies and ad–hocness in physics and astronomy. Next, the problem of verification of sequence of theories $T_1 \subset T_2 \subset \ldots$ is solved insufficiently because it depends on the search on the principle of correspondence. The popular, coniunctural understanding of the correspondence principle violates the inteliectual high–principled atmosphere (cf Newton's Scientific and Philosophical Legacy, P.B.Scheurer and G.Debrock (eds.), Kluwer, 1988, 193–199). The problem of verification of theories and sequences of theories is fundamental in Duhem's "La theorie physique". Duhem was interested only in physics and astronomy (cf De Broglie's "Pierre Duhem, sa vie et son oeuvre", in: Nouvelles perspectives en microphysique, De Broglie (ed.), Paris, 1976) and did not created meta–theory of science as a whole.

The condensed Siemianowski's search should not be ignored in the future studies on the status of laws in theoretical physics — gravitation, cosmology, extragalactic astronomy and other branches of space science. Let us remind that Poincare anticipated a lot of contemporary problem situations in astronomy, e.g. the situation concerning missing mass (missing light, dark matter), redshift anomalies, etc. He

anticipated other problem situations in measurement theory, foundation of relativity, cosmography (cf "La valeur de la science", p.238).

It is our personal impression that the problems, concepts and views discussed by Siemianowski are similar to problems considered by W.I.Scott in "An Intellectual Biography of Michael Polanyi" which is in final stages of interdisciplinary research.

Siemianowski has created a monography of great influence. He takes particular case to quote and clarify the evidence for just about every assertion and according to the best exposition style. The author who conceived a new meta–theoretical reflection in physics has a lot to say that is moreover completely new. No comparable syntheses can be find among the most advanced monographies. This book will find an enthusiastic new audiences and will inevitably raise debate on puzzles, history, problem solving in physics and astronomy. There is no doubt that physics and astronomy cannot neglect the importance of understanding their own methods and aims, unity of physical sciences, interrelatedness of physics, astronomy and metascience. The book translated in English will be available to physicists, astronomers, students and philosophers and methodologists of science.

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