Gino Tarozzi

SCIENCE, METAPHYSICS AND MEANINGFUL PHILOSOPHICAL PRINCIPLES

According to the standard conception of logical empiricism the main theses of traditional philosophy are rejected as metaphysical, in the sense that they are considered neither true nor false but simply devoid of any cognitive meaning.

This was the case in some of the most famous statements made in the course of the history of philosophy, such as Descartes's, "*Cogito, ergo sum*", Berkeley's "*Esse est percipi*", Hegel's "Actuality is the direct unity of the essence with the existence", Heidegger's "The Nothing nothingeth", which were refuted by the empiricists of the Vienna circle by showing that one was dealing with propositions of an existential content which are not empirical, and for which any method for the determination of their truth is not given.

Concerning the problem of realism, there were, however, rather different positions as stressed by Carnap:

The rejection of the thesis of reality was not generally accepted. Wittgenstein had not explicitly included these theses among the metaphysical doctrines that were to be refuted; Schlick called himself a realist and accepted my position only later; Reichenbach did not share it at all.[1]

This statement appears in the preface to the English translation

of *Der logische Aufbau der Welt*, the treatise containing Carnap's refutation of the theses of realism and idealism based on the argument of the two geographers.

Carnap supposed that the two geographers, one a realist and the other an idealist, went on a scientific expedition in search of a mountain to be found somewhere in Africa. According to him, at the end of the expedition, the two scientists agreed on the empirical properties of the mountains, such as geographical coordinates, height, geological structure and so on, but their opinions differed completely from a philosophical point of view. In fact, while the realist maintained that the mountain had, in addition to its empirical properties, the one of being also real, the idealist denied the reality of the mountain, assuming that only our perceptions (or his own perceptions, in the case of the solipsist variety of idealism) and conscious processes were real.

With a very similar argument, Ayer[2] imagined the case of the discovery of a painting attributed by its finder to Goya. After the discovery, some experts were invited to examine the picture. These experts were historians of art but had also studied philosophy, and, therefore, did not limit themselves to advancing arguments in favour or against the attribution of the picture, but they raised a further point of dispute about the question whether the picture is a collection of ideas" or rather "its colours are objectively real", according, respectively, to their idealist or realist point of view.

The divergence between the two geographers and between the two historians of art did not, however, occur in the empirical domain "so far as empirical facts are concerned". It follows, therefore, according to Carnap and Ayer, that 'the theses of realism and idealism go beyond experience and have no factual content'. This did not mean that the two theses are false but rather that 'they have no meaning at all so that the question of their truth or falsity can *never* be posed'.

On account of the metaphysical nature and the consequent lack of meaning of the main philosophical statements, logical empiricists maintained the non-existence of philosophy as a discipline independent of science and able to formulate significant proposi-

tions. Such an opinion was, for example, clearly emphasized by Weinberg holding that:

The ultimate and definitive doctrine of logical positivists is that the only propositions endowed with meaning are those of science.[3]

Only a few years later, two different, and successful, attempts to reformulate the thesis of realism in a meaningful way were made. One was due to Carnap[4], although he never explicitly recognized this fact, and as regards this problem, he always referred to his argument of the two geographers as a conclusive proof of the metaphysical nature of realism (and idealism). In the second part of his well-known article "Testability and meaning", Carnap discussed the macrorealist hypothesis "if all minds (or living beings) disappear from the Universe, stars still go on on their course", proposed for the first time by Lewis[5] as an example of a meaningful philosophical statement not satisfying the two narrow conditions imposed by the principle of verification of logical empiricists. This macrorealist hypothesis, that can be viewed as an explicit reformulation of the metaphysical thesis of realism refuted by Hume which identified reality with "that thing that would exist even if we and every sensible creature were absent or annihilated"[6], is shown by Carnap to satisfy his criterion of factual meaningfulness, since it appeared to be an incompletely testable statement.

The other attempt was made by Einstein, Podolsky and Rosen (EPR) through the proposal of their criterion of physical reality and the demonstration that such a criterion, together with the other three hypotheses of locality, correctness and completeness of quantum mechanics represented a necessary condition in the derivation of their famous paradox[7]. More recently, it has been demonstrated that the EPR reality principle is also a necessary condition in the proof of the empirical prescriptions of the Bell-type inequalities which are violated by quantum-mechanical predictions.

More general formulations of the EPR criterion of reality have been given that satisfy the same requirements as the original one. The first of these generalizations corresponded to the statement: 'If without disturbing the system, we can predict with a high de-

gree of inductive probability the property of a physical system, then we can attribute such a property to that system, i.e. we can consider that property as real"[8], in which the notion of predicability with certainty of the EPR criterion is abandoned since it constituted an idealization too strong with respect to real physical situations.

Another, more general meaningful formulation of the reality principle has been given through the statement: "If without in any way disturbing a physical system U we can predict that the different possible values $\{r_1, r_2, ..., r_n\}$ of the measurement of the physical quantity R will be found with certain probabilities $\{p_1, p_2, ..., p_n\}$, then there exist elements of physical reality belonging to the system U and which are such that the probabilities $\{p_1, p_2, ..., p_n\}$ are not different"[9], which corresponds to an entirely probabilistic reality principle not simply based on the replacement of the notion of predictability with certainty of EPR with the (very similar) one of predictability with a high degree of inductive probability, but assuming that the predictable probabilities are objective properties to be attributed to the physical system on which they are defined.

Further probabilistic generalizations of the reality principle have been advanced showing that they all must be considered meaningful statements in that each of them is a necessary condition in the proof of Bell-type inequalities.

In this way, each of these formulations of the reality principle satisfies at least the requirement of indirect verifiability advanced by Ayer which needs the following conditions to be satisfied:

First [...] in conjunction with certain other premises [in our case the hypothesis of Einstein locality and of the correctness of quantum formalism] it entails one or more verifiable statements which are not deducible from these other premises alone; and secondly that these other premises do not include any statement that is either analytic or directly verifiable or capable of being independently established as indirectly verifiable.[10]

It should be added, however, that there have been efforts to demostrate the Bell theorem or to derive some versions of the EPR paradox without appealing to the reality principle. These ap-
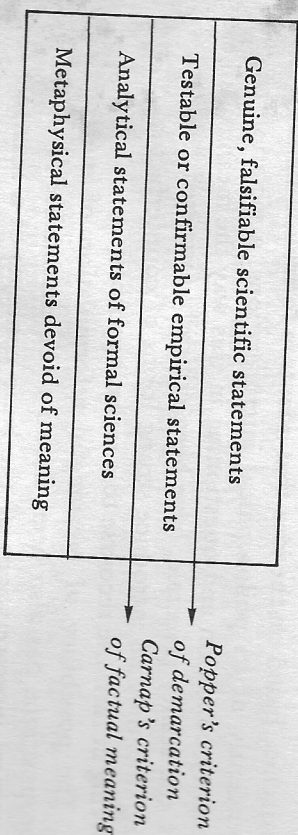
proaches, based on the idea that quantum formalism implies, independently of its philosophical interpretations, a violation of the locality condition and questioning in this way the meaningfulness of the reality principle, have been critically discussed[11] by showing that they all introduce strong forms of counterfactuality, implying in turn the recourse to a realist hypothesis.

The possibility of meaningful reformulation of metaphysical propositions has also been shown to be extendable to the philosophical interpretations of the basic concepts of a scientific theory. In the case of the quantum mechanical notions of wave function ψ and of measurement, it has been proved how we can even discriminate experimentally between the Copenhagen and a realist interpretation without necessarily contradicting the predictions of quantum formalism[12].

As a result of the previously mentioned research, we can maintain that it is possible to reformulate metaphysical principles in the form of philosophical statements endowed with meaning. I should now like to add a few words about how this is possible.

This implies trying to answer the question of the nature of philosophical statements, a very basic problem which, in a sense, comes before the very question of their existence, since it was precisely the refusal to acknowledge a specific peculiarity of these propositions that brought, as in the case of logical empiricists, to the negation of their existence. We have just seen how Carnap had demonstrated the existence of a realist hypothesis endowed with factual meaning, but it was really his incapacity to distinguish it as such, i.e., as a philosophical principle, from the other ordinary statements of empirical sciences, that prevented him from appreciating the importance of the result obtained.

My proposal of characterization of philosophical statements is explained in the scheme below and starts from the acceptance of two classical distinctions.

Genuine, falsifiable scientific statements	*Popper's criterion of demarcation*
Testable or confirmable empirical statements	*Carnap's criterion of factual meaning*
Analytical statements of formal sciences	
Metaphysical statements devoid of meaning	

The first distinction is between empirical and analytic statements endowed with meaning, and metaphysical statements devoid of meaning, and is based on the application of the principle of verification in some of its forms, such as Carnap's confirmability or testability and Ayer's incomplete verifiability.

The second distinction is between scientific and pseudo-scientific statements and is founded on the recourse to Popper's criterion of falsifiability, according to which the only genuine scientific statements are those which can be experimentally falsified.

In this perspective, one therefore shares the main consequences both of Popper's criterion of falsifiability and of Carnap's principle of verification. Nevertheless, the implications of the first are accepted only in the positive, in that it establishes what scientific propositions must be, whereas those of the second are allowed only in the negative, in that it prescribes what philosophical propositions must not be. As a matter of fact, on the one hand, one agrees with Popper's point of view, that does not exhaust the scientificity of a proposition in its factual meaning requiring the more restrictive requisite of falsifiability and, on the other hand, one makes recourse to Carnap's view to refute speculative metaphysics.

This means that one cannot accept either Carnap's thesis that any form of verifiability is in itself, a guarantee of scientificity, nor Popper's negation of the existence of a genuine problem of meaning for any given statement which does not allow, for example, any kind of distinction between speculative metaphysics and scientific philosophy.

The rejection of the logical empiricists' rigid division of prop-

ositions into the two classes of scientific and metaphysical, together with a critical acceptance of some of their criteria of meaning allows one to identify an intermediate class of propositions containing, in addition to the cognitive meaningful analytic statements of logic and pure mathematics, also other propositions endowed with factual meaning but not falsifiable.

According to my proposal, philosophical propositions can be found inside this intermediate class, between science and metaphysics, and have the logical structure of conditional statements the validity of whose premise depends on the truth of an empirical hypothesis. This special kind of conditional propositions may be in turn empirical but not falsifiable statements as the Lewis-Carnap macrorealist hypothesis or analytic statements the domain of whose applicability is established by experience through the possibility of an experimental falsification of their premises, as in the case of the EPR criterion of physical reality or of its subsequent probabilistic generalizations, which would be demonstrated inapplicable in microphysics if Einstein locality were refuted by the tests of the Bell inequality.

As it is my intention to come back to investigate this matter thoroughly on another occasion, I should now like to conclude by stressing the idea on which my proposed characterization of philosophical statements is based, and which is to identify them with those propositions endowed with meaning, in a factual sense, but not directly falsifiable by experience which may, however, determine their domain of applicability.

In this way, while philosophical propositions may be distinguished from metaphysical propositions devoid of meaning, they are perfectly differentiated from the empirical ones of the natural (and social) sciences which must satisfy the further requirement of falsifiability and from the analytic ones of the formal sciences devoid of any factual meaning and completely insensitive to experience.

Institute of Philosophy
University of Urbino

NOTES

1. R. Carnap, *The Logical Structure of the World: Pseudoproblems in Philosophy*, University of California Press, Berkeley, 1967.

2. A.J. Ayer, "Demonstration of the Impossibility of Metaphysics", *Mind* 43 (1934), p. 335.

3. J.R. Weinberg, *Introduzione al positivismo logico*, Einaudi, Torino, 1950, p. 127.

4. R. Carnap, "Testability and Meaning", *Philosophy of Science* 4 (1937), p. 37.

5. C.I. Lewis, "Experience and Meaning", *The Philosophical Review* 43 (1934), p. 143.

6. D. Hume, "An Enquiry Concerning Human Understanding", in T.H. Green and T.H. Grose (eds.), *Essays by David Hume*, London, 1882, vol. II, p. 124.

7. A. Einstein, B. Posolsky, and N. Rosen, "Can Quantum-Mechanical Description of Physical Reality Be Considered Complete?", *Physical Review* 47 (1935), p. 777.

8. G. Tarozzi, "The Conceptual Development of the EPR Argument", *Mem. Accad. Naz. Science, Lett. e Arti di Modena* XXI (1979), p. 370.

9. F. Selleri, and G. Tarozzi, "A Probabilistic Generalization of the Concept of Physical Reality", *Speculations in Science and Technology* 6 (1983), p. 55.

10. A.J. Ayer, *Language, Truth and Logic*, V. Gollancz Ltd, London, 1951, p. 13.

11. G. Tarozzi, "On the Relevance of the Realist Assumption in the Proof of Bell's Inequality", *Mem. Accad. Naz. Scienze, Lett. Arti di Modena* XXII-XXIII (1980-81), p. 81; "On the Essential Role of the Realist Hypothesis in All Derivations of EPR-Type Paradoxes", *Epistemologia* IV (1981), p. 407.

12. G. Tarozzi, "Interprétation réaliste et niveaux de contrôlabilité de la théorie quantique", in E. Agazzi (ed.), *L'objectivité dans les différentes sciences*, Editions Universitaires, Fribourg, 1988.