Part II: Schools in Contemporary Philosophy

Ch V: The Vienna Circle (Moritz Schlick, Rudolf Carnap, and Otto Neurath)

1.
The positivists of the nineteenth century, men like Mach and Poincaré, had worked with the purpose of eliminating metaphysics from science. They did not deny, however, that philosophy in the metaphysical sense might have some legitimate task outside of science. Ernst Mach, e.g., repeated again and again that he did not claim to be a "philosopher" in the technical sense of the word. Pierre Duhem even maintained that his positivism was to pave the way for a true metaphysics. However, in the twentieth century, the attitude of the positivists became more confident and demanding. They were no longer satisfied to exclude metaphysics from science and to cultivate it in a "reservation" as a "special field of knowledge." The twentieth-century positivists denied to metaphysics any value for cognition in a scientific, or nearly scientific, sense. They regarded metaphysics as belonging to theology or poetry. They maintained that there is no method for cognition of the objective world except the method that has been used in successful research in the physical or biological sciences, and which is briefly referred to as the "method of the special sciences." Their goal was to undo the work of nineteenth-century philosophy, by which a "philosophy proper" was created that was independent of "science proper." They wanted to bridge the gap between science and philosophy by throwing a bridge across from the scientific side of the abyss. They believed that the time had arrived when the dream of Auguste Comte would come true.

The feeling of a decisive turn in the ancient history of philosophy was particularly strong in the group which has become known as the "Vienna Circle" which came into being about 1930, approximately one century after the appearance of Comte's Positive Philosophy. Moritz Schlick [note 1] who has often been called the leader of the Vienna Circle expressed this confidence in the introductory article of the Journal that was to become the organ of the new movement. The title of the article was "The Turn in Philosophy"[sic]. Schlick writes:

I am convinced that we are in the middle of a final turn in philosophy. I am convinced that the sterile conduct of philosophical systems is settled. The present period, so I claim, possessed already the methods by which the idleness of all these conflicts can be shown; what matters is only to apply them to these conflicts resolutely.[note 2]

What are the "good grounds" and what are the "new methods" which provided the Viennese group with this high grade of confidence? There is no doubt that this new confidence was based upon the turn in mathematical and physical science that had taken place at the turn of the century, around 1900.

In twentieth-century science a great many fundamental principles were abandoned, which had been believed to be proved by metaphysical insight and, therefore, eternally valid whatever the changes in mathematics and physics might be. Actually, such changes induced, at the turn from the nineteenth into the twentieth century, the abandonment of the axioms of Euclidean geometry, the patter of classical
(Aristotelian) logic and Newtonian mechanics with its axioms about space, time, force. Even the traditional form in which the law of causality appeared was fundamentally changed. All these changes brought about a breakdown of common sense analogies as principles of knowledge and along with it a breakdown in the belief in metaphysics as the foundation of science.

The twentieth-century positivists even had some misgivings about nineteenth century positivism. They saw in Mach’s emphasis on sense-perception as the foundation of science and in Poincaré’s doctrine that all science consists of conventions, attempts at explanations by common-sense analogies and, therefore, metaphysical interpretations. They understood that Mach’s views are often interpreted as meaning that “the real world consists of sense-impressions.” This statement would support the metaphysics of “idealism.” On the other hand, to say that “behind” the sense-impressions may be an objective world, a “real” world, would support the metaphysics of “realism,” according to which the terms occurring in physics, like mass, force, electric charge, etc. denote “real” objects. As “positivism” seemed to be faced with the danger of encouraging “idealistic” or “realistic” metaphysics, the twentieth-century positivists asked for a thorough reconstruction of the philosophy of science, to which they gave the name “scientific world conception” in order to avoid even the appearance of a relation to a philosophical school.

Originally, Schlick made an attempt to keep away equally from idealism, realism, and positivism. When this “scientific world conception” was actually worked out, however, it became clear that it was essentially a refinement of Mach’s and Poincaré’s positivism, a presentation in a more consistent and logically satisfactory way. For this reason, A.E. Blumberg and H. Feigl proposed the name “Logical Positivism” for this twentieth-century positivism. They wrote:

The new Logical Positivism retains the fundamental principles of Empiricism, but profiting by the brilliant work of Poincaré and Einstein on the foundations of physics, of Frege and Russell on the foundations of mathematics, it has attained a ... unified theory of knowledge in which neither logical nor empirical factors are neglected.

The origin of this doctrine in the twentieth-century science can be seen from the fact that the first book in which it was taught was Schlick’s small book [note 4] On Einstein’s Theory of Relativity. He flatly rejects statements according to which “only the intuitional elements, colors, tones, etc. exist in the world. We might just as well assume that elements or qualities that cannot be directly experiences also exist. These can likewise be termed ‘real,’ whether they be comparable with intuitional ones or not.” Schlick recommends applying the term “real” generally in the same sense in which it is applied in science. He writes:

For example, electric forces can just as well signify elements of reality as colors and tones. They are measurable and there is no reason why epistemology should reject a criterion for reality which is used in physics.
For Schlick the world-picture presented by physics is a system of symbols which gives us our knowledge of reality. He flatly rejects the “strictly positivistic” conception, according to which only the intuitional elements would be real while others, like electric force, etc. would be merely “auxiliary concepts.” According to the “scientific world conception” advocated by Schlick, “this antithesis between conceptions that denote something real and those which are only working hypotheses finally becomes untenable.” The system of symbols including the operational definitions denotes as a whole the physical reality, but we cannot say of an individual symbol whether it denotes something real or an auxiliary hypothesis. It would be awkward (as Schlick says) to say that “the pen in my hand is to be regarded as ‘real’ whereas the molecules which compose it are to be pure fictions.”

Schlick suggests that “every concept which is actually of use for a description of physical nature can likewise be regarded as a sign of something real.” In formulating this criterion for the validity of a theory, Schlick takes his cue from the way in which in actual science the validity of a theory has been tested. The typical method in theoretical physics consists in finding the value of a physical quantity (e.g., Planck’s constant h) by different chains of conclusions and measurements. For example, one computes the value of h from the hydrogen spectrum, and from the photoelectric effect. If the values of h obtained by these two methods were different from one another, the system of symbols and propositions describing a set of physical phenomena would contain logical contradictions. Hence, we can say: a theory is valid for a certain set of physical phenomena if, and only if, all the systems of concepts and propositions that can be derived from the theory and the phenomena are logically compatible. The existence of such a theory is called by Schlick the existence “of a unique correspondence between conceptions and reality.”

This definition of “correspondence” replaces the Aristotelian-Thomistic doctrine, according to which the “correspondence of theory and reality” is the correspondence of an image to its original. “If such a unique correspondence exists,” writes Schlick, “it is possible, with the assistance of the network of propositions in the theory to derive the successive steps in the phenomena of nature, e.g., to predict the occurrences in the future.” It is obvious that this conception of reality is adapted to the technological tasks of science. According to this view, every special science consists of a system of propositions which are relations between a number of basic symbols. In addition, every science contains operational definitions by which a part of the symbols are connected with symbols of direct sense observations. Theoretically, to every set of observable phenomena belongs a special science. However, in the usual language, we use the term “special science” to denote one of the traditional sciences like physics, chemistry, biology, etc. Each of them corresponds to a set of phenomena for which man has actually succeeded in setting up a helpful theory. There is, however, no objection to applying the notion of special science to the theory that embraces as many observable phenomena as one has actually succeeded in coördinating by a theory.

According to Schlick, “cognition” of a certain domain is setting up a scientific theory about this domain. “The whole of the sciences,” he writes in his paper “The Turn in Philosophy,” “is the system of cognition.” Therefore, there cannot be a “philosophical
cognition” that is different from scientific cognition. “There is no realm of ‘philosophical truth’ beyond the special sciences; philosophy is not a system of propositions; it is no science.” According to Schlick, philosophy is not a cognition but a “system of acts, namely the activity by which the meaning of propositions is recognized and revealed. By philosophy statements are clarified, by science verified[.]

The meaning of a proposition is recognized, according to the author, when we know what observable facts can be derived from this proposition. To “clarify” a proposition of science by philosophical activity means to find out what observable facts can be derived from this proposition.

If we keep these considerations in mind, we can easily understand the passage with which Hans Hahn, [note 5] introduced the new “scientific world conception” to the scientists and philosophers of the period around 1930. He wrote: “The name ‘scientific world conception’ is to be a conception and a delimitation. What can be said meaningfully is a statement of a special science.” He continues: “To work in philosophy means merely to examine the statements of the special sciences as to whether they have the clearness and meaning which is ascribed to them by the representatives of the special sciences, or whether they are pseudo-statements.” He believes that working in philosophy means further “to debunk all statements which pretend to have a meaning of a different kind, superior to the meaning in the special sciences, and to show that they are ‘pseudo-statements.’” One could easily be led to believe that by this restriction of philosophy from a “system of knowledge” to an “activity of clarification,” the role of philosophy is down-graded; but this was not the intention of the founders of the “scientific world conception.” They knew very well that the starting point for the work of twentieth-century physics was Mach’s and Einstein’s, Bohr’s and Heisenberg’s clarification of the propositions by which the eighteenth- and nineteenth-century physics had described the motions of bodies. Schlick writes:

The decisive advances of science are always of the type that are a clarification of the fundamental propositions. Only people who are gifted in philosophical activity succeed in this kind of world, All great scientific investigators are great philosophers.

There seems to be a sharp contrast between the “task of clarification” ascribed to philosophy by the Vienna Circle and the “task of integrating knowledge into a coherent picture” that has often been assigned to philosophy as its main work. This contrast has often been described as the distinction between “analytic philosophy” and “speculative philosophy.” It is obvious that the clarification of propositions is a much lower goal than the creation of an integrated picture of the universe. It looked as if the advocates of a “scientific world conception” as well as other groups of supporters of “analytic philosophy” had abandoned the old proud dream of philosophy to create a coherent world view and had restricted themselves to a much more modest goal, the analysis of propositions. However, it is now clear that this contrast arises only if one looks at the “scientific world conception” in a perfunctory way. Among the Vienna Circle, Otto Neurath stated unequivocally that the new philosophy had not abandoned the search for a unified world-picture, but would work on it with renewed vigor and through the methods of twentieth-century science. He wrote:
Some persons proposed to use the term “philosophize” for an activity which makes concepts and statements clear.... If one takes the thesis seriously that in the field of knowledge one only has to deal with scientific statements, the most comprehensive field of statements must be that of unified science.[note 6]

Neurath continues: “If one does not care to avoid the term ‘philosopher,’ one may use it for persons engaged in unified science.” It seems not to matter much whether we define “philosophy” as the activity of clarification or the building of a unified science. “It is common to all these persons,” writes Neurath, “that they do not join scientific statements with a second type of specific ‘philosophical’ formulation.” “Philosophy” was eventually defined by the Vienna group as it was defined by Comte or, if we believe Comte, as it was envisaged by Aristotle [note 7]. However, we must ask how it comes about that the activity of clarifying the propositions of the special sciences leads eventually to the construction of a unified science. If we investigate the meaning of mathematical concepts (like point, straight line, etc.), our results are propositions which do not belong in the special sciences, because we have to find out what the role is that is actually played by mathematical propositions in the life of men. This has been carefully and lucidly pointed out by Neurath, since the beginning of the Vienna movement. “One cannot separate the clarification of concepts from the scientific world to which it belongs. It is inseparably intertwined,” wrote Neurath in 1931 [note 8].

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If we attack any problem in the philosophy of science, we soon note that the “special sciences” are purely conventional entities; if we investigate the relation between science and philosophy, we must always understand by “science,” “unified science.” The traditional special sciences must not be taken as the basis for the solution of the fundamental problems. Neurath proved very convincingly that the scientific problems set to man by nature lead necessarily to the concept of unified science. Not even the simplest question can be solved or even be formulated by the special sciences. He writes:

One can separate from each other different kinds of special laws, e.g., chemical, biological, sociological, but one cannot say that the prediction of a concrete individual fact depends upon a special type of law. This is obvious from very elementary examples.

Whether a forest situated at a particular place will burn at a certain time does not depend only upon the weather, but also upon whether or not men by their actions will interfere. The actions resulting from man’s interference can only be predicted if one knows laws of human behavior. This means that there must be a possibility of connecting occasionally all kinds of laws. All laws, whether they are chemical, climatological, or sociological laws, must be regarded as parts of a system of unified science.

If we speak on the level of unified science, all propositions can be regarded as proposition of one and the same type: statements about facts, expressed in the language of daily life. Neurath voiced with particular vigor and directness the rejection
of the ancient and mediaeval conception that valid statements are a true picture of reality. He said: [note 9]

Propositions are compared with propositions, not with experiences, not with the world or with anything else. All these meaningless duplications belong to a refined metaphysics and are, therefore, to be rejected. Each new proposition is confronted with the totality of all existing propositions which are already brought to an agreement with one another. A proposition is true if it can be fitted into this system. What cannot be fitted is to be rejected as false.

One always tries to fit new propositions into the existing system, but if we find more and more propositions that are hard to fit into the existing system, it becomes advisable to modify the large system of propositions to such a degree that the new propositions can be fitted into it. “Within this unified science,” Neurath writes, “there is an important task of transformation.”

A particular kind of transformation, of course, are the mathematical or logical transformations of the type that was discussed when the science of geometry was presented. In mathematical geometry arbitrary rules of transformation are laid down in the axioms. We understand what we mean in geometry by “two equivalent propositions” or “a tautological statement.” But when we apply geometry to an empirical science, we cannot prove that two “logically equivalent” propositions lead to two physically equivalent propositions. If we speak about the propositions of unified science, we have to introduce an “operational” definition of what we mean by the “equivalence of two propositions.” He describes how one can check the equivalence of two propositions. One investigates the impact of systems of imperatives upon men. The imperatives contain different kinds of propositions, A, B, ...; e.g., “If A is true, do this and this.” One can check the change of reaction to the imperatives that occurs when A is replaced by another proposition B. If this replacement does not change the reaction, we may say that “A and B are equivalent.” Such statements are an essential part of a theory and must be checked by experiment like any other hypothesis or axiom.

In the doctrine of the Vienna Circle, no point has caused so much excitement as the criterion of what is meaningful and, perhaps even more, of what is meaningless. If we apply Neurath’s criterion, we must say that a “proposition is meaningful” if it changes the reaction to an imperative if this proposition is added to the imperative. If there is no change in reaction, the proposition is meaningless. We can easily see that the reaction to a proposition depends upon how the recipient is conditioned. The “science of meaning” would be an empirical science and, at that, a very complex and difficult one. It would be a part of physiology and sociology or, more generally, of “behavioral science.” Like every “empirical science,” the “science of meaning” can also be considered as a record of sense-observations. However, just as in physics or biology, the attempt has been made, in the case of every empirical science to coordinate the sense-observations by a pattern that consists of symbols, by a theory. To give an example: the theory of the weather that leads to the predictions published in the papers yields statements about directly observable facts, but the predictions obtained in this
way are not absolutely reliable. If we replace this theory by a “more theoretical” theory, which consists in differential equations for “temperature at a certain point,” “velocity of air at a certain point,” etc., the prediction consists in the integration of these differential equations; it is therefore very reliable but does not tell us much about directly observable facts.

However, in a great many sciences, the introduction of such an abstract pattern has been of great importance; correlations have been found among observable facts that are very close to the symbolic pattern. The most impressive examples are in geometry, mechanics, and a great many other parts of theoretical physics. The attempt has been made to construct a “theory of meaning” along similar lines, to introduce patterns by means of which we can find out by clear-cut logical operations which propositions have meaning and which have not. In the Vienna Circle, the most successful efforts toward a theory of meaning have been made by Rudolph[sic] Carnap. His first attempt closely followed the line of Mach’s positivism; he defined the meaning of a proposition by translating it into a set of statements about direct sense observations. Propositions of the type “Otto sees a red quadrangle” were called by Neurath “protocol statements.” As a matter of fact, as we mentioned previously, even Mach mentioned occasionally that there are scientific propositions, like the wave theory of light, that are not directly translatable into sets of protocol statements. Science, however, makes use of such propositions, because protocol statements can be logically deduced from them. They are, in Mach’s language, “indirect descriptions.”

In his principal book, Carnap points out that Maxwell’s equations, which contain the basic theory of electromagnetism, cannot be translated into protocol statements, “although, of course, sentences of protocol form can be deduced from Maxwell’s equations. In this way Maxwell’s theory is empirically tested.” Carnap suggests, therefore, defining as meaningful all systems of propositions from which protocol statements can be deduced. A concept like “electromagnetic charge” is meaningful if there are meaningful propositions in which it occurs. Carnap quotes as a counter example concepts like “entelechy” or “vital force,” which occur in the writings of vitalistic biologists. According to Carnap, there are no laws that can be empirically tested in which these concepts occur. No protocol statements can be derived from them; hence, they are meaningless. However, the mere fact that a concept cannot be defined in terms of observational concepts is not justification for declaring it meaningless. What is necessary is only the fitness of a concept to serve as a building stone in a system from which protocol statements can be logically derived.

Carnap takes aid and comfort from the characteristic features of twentieth century physics. He emphasized that the physicists are now inclined to choose a method that does not start the building of a theory from protocol statements. Their method “begins at the top of the system.... It consists in taking a few abstract terms as primitive signs and a few laws of great generality as axioms.” The general theory of relativity and quantum mechanics are obvious examples. Taking his cue from this method of modern physics, Carnap calls a theory “meaningless” if no protocol statement can be logically derived from it. In this category belong, according to Carnap, all the systems of traditional metaphysics: realism and its opposite, idealism; the same judgment holds, according to Carnap, for solipsism and even for positivism, if we take it to mean that “nothing real exists except sense-impressions.”
As Schlick did, Carnap saw the work of the Vienna Circle, the new “scientific world conception,” as a decisive turn in intellectual history. He writes: \[\text{note 12}\]

The difference between our thesis and that of previous opponents of metaphysics is now clear. Metaphysics is for us not a mere fancy or fairy tale. The propositions of a fairy tale are not incompatible with logic, but only with experience; they are completely meaningful, although wrong. But metaphysics is not superstition, because one can believe true and false propositions, but not meaningless series of words.

A great many authors, not only philosophers, but also men from various walks of life, have greatly resented the statement that metaphysical propositions are “meaningless.” Everyone knows the great role that metaphysical creeds like idealism or materialism have played in shaping the behavior of men. It seemed to be absurd that these powerful weapons in political and religious battles should be called “meaningless.” However, Carnap recognized very well the meaning of metaphysical propositions in this pragmatic sense. Carnap writes: \[\text{note 12}\]

The pseudo-propositions of metaphysics do not describe states of affairs (in the physical world)... they express attitudes towards life. What is objectionable in metaphysics is the fact that it makes use of a form of expression that is misleading. The form of metaphysical discourse is a system of propositions that looks like a scientific theory (like geometry or mechanics). The system pretends to have a theoretical content although it has none.

Since an “attitude towards life” certainly influences human actions, metaphysical propositions have, according to Carnap, a meaning if we understand “meaning” in the sense of Neurath. We remember that John Dewey emphasized again and again that metaphysical propositions are not propositions about the objective reality of the physical universe, but propositions about human aspirations. Essentially, what Carnap calls “attitudes toward life” is not very different from what Dewey called “human aspirations.” Practically the Vienna Circle shared the opinion of the pragmatists about the “meaning of metaphysics.” The salient point is that metaphysical propositions about the physical universe are actually meaningful propositions about human behavior or, in other terms, propositions of sociology. It would be wrong, however, to say that metaphysical propositions are “not cognitive, but emotional.” The propositions about human behavior are as cognitive as the propositions of geometry or mechanics. The point is that, according to the opinions of the Vienna Circle, metaphysical propositions about the physical world are meaningless within the system of physical concepts, but have meaning within the wider “universe of discourse” that embraces physical and sociological concepts. In this way, the “scientific world conception” of the Vienna Circle agreed basically with Comte’s positive philosophy. As a matter of fact, the great Classic of philosophy, Immanuel Kant, declared when he was in his more “positivistic” mood, that metaphysics has no speculative meaning but only a practical one.

As we have already mentioned, great efforts have been made to develop a
logically coherent theory of meaning. Carnap and his collaborators have attempted to define “meaningful concepts,” “meaningful sentences,” and to build up on this basis criteria according to which a scientific theory can be proved to be meaningful or not. In other words, men have looked for criteria of “cognitive significance” in contrast to merely emotional significance that has been ascribed to metaphysical systems. Although these efforts have been successful in a great many and very important special cases, it has been very difficult to build up a highly general theory of meaning. The main difficulty has been the fact that every logical theory of meaning had to be confronted with the pragmatic concept of meaning which was, as we have described, introduced by men like Neurath.

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These difficulties are very aptly described by Carl G. Hempel [note 13], one of the most prominent authors who has worked on a logical theory of meaning. He reaches the conclusion “that a satisfactory criterion of cognitive significance cannot be reached by means of specific requirements for the terms which make up significant sentences.”

In agreement with the general ideas of contemporary science, Hempel stresses the point that cognitive significance can only be attributed to a theory as a whole. From our presentation of geometry, mechanics and twentieth-century theories, we have learned that the meaning of a theory cannot be judged unless the operational definitions of the symbols are added to the axioms. In full agreement with these findings of science, Hempel writes: “The decisive mark of cognitive significance in such a system seems to be the existence of interpretations in terms of observables.” A scientific theory is the more valuable to the scientist the more observable facts can be deduced from the axioms and operational definitions (=interpretation in terms of observables). Whether the deduced facts agree or disagree with actual observations, in any case, the theory reveals facts about the physical world which have been unknown before. The more suggestions for actual observations a theory provides, the greater its cognitive significance. Hempel writes: “Cognitive significance is a matter of degree.” He identifies “cognitive significance” with what is called here “scientific significance.” Hempel gives several characteristics which help us to estimate the degree of cognitive significance in a theory. Perhaps the most relevant of these characteristics is: “the systematic, i.e. explanatory and predictive power of the system in regard to observable phenomena.”

If we summarize all these considerations, we could say that—with a grain of salt—the cognitive significance of a theory is proportionate to its scientific value. Then, Carnap’s statement that the propositions of traditional metaphysics are without cognitive significance would mean that these metaphysical doctrines are theory without scientific value. However, the more refinement was achieved in the logical theory of meaning, the clearer it became that the more general problems cannot solved without going back to the study of actual science, to the logical and empirical aspect in the philosophy of science and, in particular, to the “science of science.”

W.V. Quine started his work on the criteria of significance by taking his cue from Carnap. He has certainly been one of the most thorough and broad-minded researchers in this domain of logic. His result was, in agreement with Hempel, the recognition that
the criteria, whether a theory is meaningful or not, do not answer by “yes” or “no” but by a statement about a degree. Quine recognized that the criteria of cognitive significance are closely connected with the criteria of cognitive synonymy or equal significance. He recognized that they can only be formulated as the criteria for the value of a scientific theory or formulated by using the concept of empirical confirmation. He writes:

As an empiricist I consider that the cognitive synonymy of statements consists in sameness of the empirical conditions of their confirmation. A statement is analytic when its operational condition of verification is, so to speak, the null condition.

This formulation comes very close to Neurath’s formulation, according to which an analytical (tautological) proposition has, as a part of a given order, no effect upon a human reaction to the order. Quine stressed, as did Neurath, the point that from the pragmatic point of view, the conceptions of “cognitive significance” and of “synonymy” are inseparably connected with each other.