

Chapter V

Philosophy of Science and Political Philosophy

1.

We have learned in what way and to what degree the philosophical and metaphysical interpretations of science have been influenced by moral, political, and educational purposes. The question is now in order of whether a similar way scientific theories themselves have also been influenced. The answer is certainly “yes,” since no sharp line can be drawn between theories themselves and their philosophical interpretations. This is clear from the presentation of “theory-building.” When the metaphysical view of a “true theory” was prevalent, the influence of social factors upon a theory could only be a distortion of truth. Hence, it is understandable that the investigation of these influences began with derogatory judgments occasionally launched against some scientific theories and their authors. The metaphysical theory of knowledge has maintained that every set of propositions and, hence, every scientific theory is either valid or invalid and that the ultimate criterion of validity is an act of “intellectual vision,” a “seeing with the inner eye,” an “act of intuition or visualization,” or whatever one may call it. If an author were not motivated by his “insight” to assert the validity of a theory, but by his social situation or by some psychological motives, he was accused of having failed in his duty to search for objective truth; his behavior was taxed as a sign of moral turpitude. “Selfish” motives were frequently imputed to him because the announcement of the “objective truth” would have been disadvantageous to the author because of his life situation.

It is well known that Karl Marx and Friedrich Engels [note 1] derived from their theory of “historical materialism” as an “objective truth” the prediction that a revolution will arise in which the working (proletarian) class will take over the power of government. They claimed that people connected with the capitalist (bourgeois) class would deny this “objective truth” because it would be harmful to their interest to create or support belief in this coming victory of the revolution. According to Marxist doctrine, the bourgeois scientists have been hampered in the search for truth by subconscious drives caused by their life situations. By these instinctive pressures the “objective” search for truth was deviated into channels of wishful thinking. Since the “objective truth” was regarded as favorable to the proletariat, this class could proceed consistently in the search for “objective truth;” it was able to produce “science proper” in the narrowest sense of the word, while members of the “bourgeois” class would always be deviated from strictly scientific research by their life situations. One of the most prominent theoreticians of Marxism, George Lukacs, writes in his book History and Class Conscience: [note 2]

For the proletariat truth is a weapon that brings victory the more ruthlessly it is applied. By this fact we understand the fury of desperation by which the bourgeoisie combats historical materialism; when the bourgeois is forced to accept ideologically this doctrine it is lost. But in this way we can understand that for the proletariat and only for the proletariat a correct understanding of the nature of society is a powerful weapon of primary importance; it is perhaps the weapon that will carry the final decision.

While, according to the Marxist doctrine, the proletariat and its advocates are able to proceed methodically in the search for “truth,” the members and advocates of the bourgeoisie are prevented by selfish motives from a strictly scientific method of investigation. However, the bourgeois thinkers do not realize in their consciousness that the[y sic] are combating objective truth for selfish motives. They replace the selfish motives, in their conscious thinking, by a type of argument that refutes the proletarian doctrine, not by using scientific method, but by introducing wishful thinking in the form of scientific reasoning. This type of argument is called in the Marxist language “ideology.” Engels wrote in 1893:

Ideology is a process accomplished by the so-called thinker consciously indeed but with a false consciousness. The real motives impelling him remain unknown to him, otherwise it would not be an ideological process at all. Hence, he imagines false or apparent motives.[note 3]

R.K. Merton writes that, according to Marx, ideology is “an unwitting, unconscious expression of real motives, these being in turn construed in terms of the objective interests of social classes.”[note 4] Somehow anticipating Freud’s psychoanalysis, the Marxist doctrine assumed that the selfish motives of the bourgeois thinkers are repressed by a moral censor into the subconscious. In order to satisfy this moral censor, the ideological argument that becomes conscious is always of a very unselfish nature. It is very frequently religious reasoning. Max Weber, in his famous book on sociology of religion, has attempted to show that Calvinism has frequently been a disguised plea for capitalist economy. The “freedom of the individual soul” has been used as an ideological argument in favor of “free enterprise.”[note 5]

As, according to Marxist doctrine, ideology is a means for the distortion of truth, scientific argument should be used to “debunk” ideological argument.

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In this respect the Marxist doctrine runs parallel to the pragmatic theory of truth. If we ask for the “operational meaning” of a statement which is formulated in very abstract terms, we challenge the author of the statement to “show cause” why we should not regard it as meaningless. The method of “operational definition” is explained by examples taken from geometry, Newtonian mechanics, relativistic and subatomic mechanics; it is presented, in a general way, in the chapter on “science of science.” In the working of that method, we can often note a “debunking” process. In some way the theory of relativity “debunks” the use of concepts like “mass of a body” or even “length of a body” in the sense in which they had been used in traditional physics. We have learned that we can keep on using these old concepts although this is not practical from a purely scientific point of view. We have learned that the use of the old concepts allows in some cases for a metaphysical interpretation that is believed to be useful for supporting a desirable way of life. In such cases, the discourse in which the old concepts are used usually plays the role of an “ideological discourse” in the Marxist sense. A very instructive example is the suggestion to refrain from adopting Newton’s law of inertia in order to keep physics in closer agreement with Aristotelian and Thomist

philosophy, which has been regarded as an effective support for traditional ethics and religion.

If we use the terms “ideology” and “ideological discourse” in this way, we depart, of course, very far from the way in which these terms were used by Marx and Engels. For them ideology was a means to prevent man from using scientific methods and from discovering in this way a “special truth,” the coming proletarian victory. For them “the theory of ideology is, [“] as R.K. Merton [note 4] writes, “primarily concerned with discrediting an adversary, and is but remotely concerned with reaching valid articulated knowledge of the subject matter in hand. It is polemical, aiming to dissipate ‘rival’ points of view.” However, if we now say that presentations of physical phenomena, like relativity theory or quantum theory, are not accepted, and obsolete theories are retained because of some ideological argument, we are obviously using the term “ideological” in a more general sense than the Marxists did. We say that the new theories are much more satisfactory from the purely scientific point of view but the old theories are retained because they are regarded by some ideology as more satisfactory to support a desirable way of life. If we look at the examples given in this book, we note that this attitude of rejecting theories that were scientifically unsatisfactory was consciously supported by different kinds of ideology, in some cases Nazi ideology, in some cases traditional idealist philosophy or traditional religion.

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The concept of ideology in this more general sense was introduced by Karl Mannheim [note: number ?] He called the Marxist concept the “special concept of ideology,” because it was restricted to bourgeois ideology; the existence of other, e.g., a communist ideology, was not admitted. Instead of this special concept, Mannheim introduced the “general concept of ideology” by applying it to the situation in ancient Greece in the period of Plato. Using this “general concept” we could say that Plato in his Laws made use of an “organismic ideology” which served the purpose of preventing the natural scientists from assuming that celestial bodies consisted of this same material as the earth. Followers of Plato would say that there is a “materialist ideology” which deviated the scientist from the “natural” assumption that the sun and stars are essentially different from the earth. This “materialist ideology” supports the establishment of a unitarian pattern that fits some political and ethical purposes. If we speak in this way, the “general” concept of ideology does not discriminate between parties or groups that fight on another. Ideology becomes a “symmetrical” concept; it is related to all groups in the same way. Merton [note ?4] characterizes the difference between the special and the general concepts as follows: “In the special formulation, only our adversaries’ thought is regarded as wholly a function of their social position: in the general, the thought of all groups, our own included, is so regarded.

Mannheim himself writes:[note 6?]

With the emergence of the general conception of ideology, the simple theory of ideology develops into the sociology of knowledge. What was once the intellectual statement of a party is transformed into a method of research in social and intellectual history generally.

But even if we do not discriminate between ideologies and grant to all of them equal rights, an investigation of ideologies would be an investigation of the actual and potential distortions of truth. One can investigate by what social factors truth has actually been distorted, a problem in social and intellectual history; but one can also attempt a systematic investigation of the ways in which truth can be distorted by the influence of the social situation to which the investigator is exposed. Both types of investigation are very rewarding tasks for sociological research. In both cases, the social facts appear as the subconscious roots of ideologies that are opposing and stalling the advance of scientific knowledge. Up to this point sociology of knowledge is a kind of pathology of knowledge, because it treats exclusively the distortions of truth. Since, according to the ancient and mediaeval theory of knowledge, our knowledge is a picture of the real object, knowledge is produced by the object in our intellect. Hence, it was clear that any factor outside the object of our investigation could only distort the picture. Merton points out correctly that “sociology of knowledge” cannot transcend the limits of a “pathology of knowledge” unless it starts by investigating the social factors that are involved in making “true statements,” in building up “true theories.” Merton writes: [note 4??]

The “Copernican Revolution” in this area of inquiry consisted of the hypothesis that not only error or illusion or unauthenticated belief, but also the discovery of truth was socially (historically) conditioned The sociology of knowledge comes into being with the signal hypothesis that even ‘truths’ were to be held socially accountable, were to be related to the historical society in which they emerged.

When Mannheim developed this idea of a “sociology of knowledge” he was well aware of the basic difficulty, that an influence of social factors upon the formation of a “true” man was incompatible with the idealistic or metaphysical theory of knowledge which had dominated German philosophy and science. Mannheim pointed out that, according to this theory, the validity of a statement is independent of the properties of the author who makes the statement; social factors certainly determine the life situation of the author, but they cannot influence the validity of a pronounced statement. We may agree, tentatively, that the validity of a statement does not depend upon the person who has pronounced it. However, there is no doubt that the process by which men produce statements or systems of propositions is a part of the social process by which the human race develops. The production of scientific systems is, therefore, just as much a topic of social studies as the production of grain or motorcars.

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There are two main types of problems that have been investigated. The first is a very obvious one. If the solution of a scientific problem is helpful in making human life more pleasant, the working for the solution of these problems will be supported by all social powers who are, in some way, interested in producing or increasing this kind of pleasure. The word pleasure is used here in the most general sense; nuclear reactions are helpful in the production of atomic bombs. Those powers who believe that the use of atomic bombs can bring them victory in a war will support the study of nuclear reactions, because they believe that victory in a war will bring to the victor some

pleasure or, at least, the avoidance of some displeasure. By this support of powerful social groups, the investigation of some problems is certainly promoted or, at least, made possible. This influence existed when mediaeval kings supported research in astrology and alchemy, and exists today when government and industry support research that is, or is supposed to be, relevant to military and industrial success. There has been much research in this field, but it has little to do with the philosophy of science, and we shall not discuss it in this book.

Systematized knowledge is also influenced in a second way by social factors; this type of influence is, as we shall see, much more closely connected with the philosophy of science. As a matter of fact, this connection between social factors and systems of knowledge is brought about largely by the philosophical and metaphysical interpretations of these systems. When Marx and Engels launched their attacks against the economic and sociological doctrines of the period, they called them "bourgeois science" and accused them of distorting scientific truth by ideological argument. The answer was, of course, that every scientific research starts from "stubborn" facts that are found by experiment and observation; they cannot be influenced by the wishes of any social class, bourgeois or proletarian. On the basis of these facts, science proceeds by the scientific method of inductions to generalizations, which are also beyond the reach of any social influence. Georgy Lukacs [note ?] defends the Marxist view by analyzing the conception of "fact." He writes:

Of course, every cognition of reality starts from facts. However, one has to ask which datum and in which methodical connections does it deserve to be taken into consideration as a fact that is relevant for this cognition? Narrow-minded Empiricism denies that facts do not become facts without a methodical treatment that depends upon the purpose that we are to achieve by cognition. In this way it is overlooked that the simplest enumeration of "facts" without comment is practically an "interpretation:" the facts are caught by a theory, by a method; they are separated from their original living environment and are fitted into the context of a theory.

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This analysis of the relation between facts and theories, given by Lukacs in 1922, is not a mere interpretation of Marxism by its own conceptual system, but it has obviously absorbed the analysis of science given around 1900 by men like Henri Poincare, Pierre Duhem, Abel Rey, and other representatives of what Rey called the "new positivism." [note 7] What has been called "old positivism," described scientific research as a collection of objective facts and an inductive inference of law from these facts. The "new positivism," however, pointed out that one cannot establish laws between "brute" facts. The scientist has to make use of the brute facts as raw material to construct concepts which are fit to be connected by laws. The construction of such concepts is an achievement of creative imagination. Henri Poincare and his followers have often expressed this by saying that the concepts and laws of science are free creations of the human imagination. This means, in the language of scientific psychology, that these concepts and laws are part of the individual behavior of the scientist and, therefore, dependent upon all factors that determine his behavior. This means especially that the conceptual scheme of science, as James Bryant Conant has preferred to call it, is

clearly dependent upon social factors. To keep the historical record correct, we must admit that this influence of theories upon the choosing of relevant facts was also clear to the "old positivists" like August Comte and certainly Ernst Mach. There is no doubt, however, that it was emphasized strongly in the writings of Poincare and Duhem, and gained even greater strength from the creators of twentieth-century physics like Albert Einstein and Niels Bohr.

While in the natural sciences these ideas did not develop until the end of the nineteenth century, they had been vaguely assumed in the social sciences for a long time. It has been an obvious fact that the results of social science have depended greatly upon the social situation of the author. It has also been easy to realize that the conceptual schemes used by different authors have been dependent upon their social status. Hence, the Marxists, as well as the followers of Mannheim, have directed attention to this conditioning of the conceptual schemes of social science. Mannheim gives an example from which we can see how the basic concepts used in social and political science are not just reflections of brute facts, but are conditioned by the life situation of the author. Mannheim writes:

So, for example, early nineteenth-century German conservatism, and contemporary conservatism, too, for that matter, tend to use morphological categories which do not break up the concrete totality of data of experience, but seek rather to preserve it in all its uniqueness.

By "morphological categories" Mannheim obviously understands such groups of observational data which are recognized by common-sense language as "natural units." In other words, conservatism is inclined to discuss political and social problems by using as much as possible, even on the higher levels of abstraction, terms from common-sense language; such words are state, nation, leader, loyalty to a religious denomination. Mannheim continues:

As opposed to the morphological approach, the analytical approach characteristic of the parties of the left broke down every concrete totality, in order to arrive at smaller, more general, units, which might be recombined through the category of causality or functional integration.

"State" and "nation" will not be treated as natural wholes but will be described by combining recurrent traits of human life and human history as consisting of larger agglomerations like "state," "nation," "national spirit," "loyalty to his faith," which will reappear at any point of human history. The adherents of radical liberalism have been inclined to build up human history by using elementary traits of behavior, like conditioned reflexes, memory, etc. By using this description one can be fairly certain that the basic concepts (e.g. conditioned reflex) will be relevant at every point of human history, while it can by no means be taken for granted that concepts like "state" or "nation" will be helpful for presenting an evolution of mankind in a distant future. We note, however, that the Marxist Leftists have rejected the use of the general traits of behavior and have preferred, like the conservatives, to use "morphological wholes" like "classes," "internal contradictions," etc. as basic concepts.

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From the example that we discussed at the end of the previous section, we can easily understand why different social and political groups; conservatives, liberals, and Marxists have been able, by choosing appropriate basic concepts, to build up different systems of social science, and how the results of these systems were determined by the social status and the social aims of their authors. It has frequently been said that the situation is quite different in the mathematical and physical sciences. Among the theoretical advocates of Marxism, there has been current a complaint that social scientists have attempted to ape the methods of natural science and have, in this way, produced the illusion that an “objective social science” is possible. According to the Marxist complaint, “bourgeois science” has been identified with that objective science, and the claim has been denied that the social situation of the author has a bearing upon the result of his research. Georg Lukacs, the advocate of “orthodox Marxism,” writes that the opponents of this doctrine [block quote?]

take their cue from the method of natural science, from the way in which this science is able to find “pure facts” by observation, abstraction, experiment, etc. and to establish their connections. This ideal of cognition they compare favorably with the arbitrary constructions of the Dialectical method.

The author, who is certainly one of the scientifically-minded advocates of Marxism, describes the “methods of natural science” precisely as they were conceived before the end of the nineteenth century. He does not consider at all the ideas of the “new positivism,” not to mention pragmatism, operationalism, and logical positivism which will be discussed in the following chapter. In this way he can prove that natural science furnishes objective results that are not dependent upon the life situation of the scientist. Even Mannheim, who introduced the sociology of knowledge, has always been uncertain whether this method can be applied to science, whether one can also speak of the “sociology of science.” Robert K. Merton, who has, more than any contemporary sociologist in the United States, worked towards building up a sociology of science, remarked that there has been among Marxists a strong tendency towards a separation of the social from the natural sciences and towards declaring the results of natural science independent of the social situation of the scientist. Karl Marx writes: [note ?]

The distinction should always be made between the material transformation of the economic conditions of production which can be determined with the precision of natural science, and the legal, political, aesthetic, and philosophic—in short, ideological forces in which men become conscious of this conflict and fight it out.

As we have learned previously, the main tenet of Marxism is to assert that the use of strictly scientific methods would lead to the prediction of proletarian revolution and the ascent of the proletariat to power. [Asserting?] Any other result is due to distortion by bourgeois ideology. By “strictly scientific method” one can hardly mean anything but the methods successfully used by natural scientists. Therefore, Marx was

eager to emphasize the point that political economy works with the precision of natural science. It is obvious that this assertion can only make sense if we assume that natural science gives precise results, provided one follows the “scientific method.” From this argument one could easily conclude that Marx gave full endorsement to the results of exact science, and regarded them as independent of the social situation of the scientist. In order to get a more concrete understanding of this attitude, it is instructive to look at the actual conditions in the scientific life of the Soviet Union, where teaching and research have been organized according to the Marxist doctrines. It is easy to note that the results of the exact sciences which have been established in the international community of scientists have by no means been accepted and taken for granted by the Communist Party and the government of the Soviet Union.

In order to characterize the official attitude, we may quote from a textbook that is introduced in the universities of the Soviet Union. The author explicitly rejects the view that what is taught in the books and schools of the western world under the title of “exact science” is identical with the “exact science” which Marx proclaimed as being objective and impartial. There have been authors in the USSR who claimed that western science is at its core objective and impartial, and only at the surface tinged with bourgeois ideology which manifest itself as an idealistic philosophy, appearing occasionally in the introductions of textbooks and anniversary speeches. Mitin writes [note 8]

Idealism is not a surface feature of bourgeois science. As a matter of fact, no reactionary idealistic philosophy compels a blameless and classless science to become a servant of the ruling classes. To assume such an influence would mean to assume that only philosophy is a class science while the exact sciences are by themselves classless sciences which can, however, be exploited for the interests of one or another class. From such a conception that is cherished, in particular, by “our” mechanists follows an uncritical bow to science, their alignment to “exact science” and their fight for the “liberation” of science from the philosophy of dialectical materialism which is to divert science from the path of truth. In a class society every science is, by its very essence, a class science. To follow “science” blindly and uncritically is nothing but to move to the position of bourgeois science.

This clearly means that, according to the Marxist doctrine, only the proletariat and its advocates can produce objective and unbiased science while what is produced by the bourgeois scientists under the name of “objective and exact science” is actually tainted by bourgeois ideology and has become bourgeois science. The belief in scientific method as warranting the achievement of objective truth seems to the Marxist a very dangerous belief. It could be applied to the research in social science done by bourgeois investigators. Hence, the use of scientific methods in social studies, praised by Karl Marx himself, has been disparaged by “orthodox Marxists” in our own period. In his book quoted above, G. Lukacs writes:[note 2]

When the ideal of scientific cognition is applied to nature it serves the advancement of science, but if it is applied to the evolution of society it becomes an ideological weapon of the bourgeoisie. It is a question of survival for it to regard its order of production as a

result of the eternal laws of nature, determined to eternal existence.

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The aversion of Marxism to the general applicability of the scientific method can be traced back to the following argument: as physical science is built on, and will forever be built on the basic concepts of mass, force, velocity, etc., political economy is based upon the basic concepts of supply and demand, value of money and free competition, etc. If these basic concepts are valid forever, the capitalist theory of economy can never be replaced by a new one. The way to Marxist theory is barred from the beginning. The methods of "exact science" are rejected because of their rigidity.

When Mannheim and others replaced the Marxist theory of special ideology with the theory of general ideology and the sociology of knowledge, the role of the exact sciences and their method led also to great difficulties. As we learned previously, the social situation of the author determines the result of his research or, in other words, to every ideology belongs a different system of knowledge. According to the traditional metaphysical theory of knowledge, which Mannheim calls the "idealistic" one, the validity of a proposition depends only upon which relation between the basic concepts is[is] studies. It would be absurd to claim that the life situation of the scientist should have any bearing on the validity of any relation between mass, energy, force, etc. Therefore, Mannheim complained about the fact that the theory of knowledge has been formed after the example of the exact sciences instead of taking the cue from other types of knowledge, e.g., the social sciences. It is obvious that, according to these considerations, it becomes hard to explain the meaning of the "validity of a statement."

However, Mannheim makes the point that we can find, in twentieth-century science, some argument that would give support to the conception of the sociology of knowledge. According to the theory of relativity, the "absolute" speed of a body cannot be determined by any experiment; but we obtain a definite value relative to a determined system of reference which is, of course, arbitrary. Just as we have to reject the answer to the question, what is the real or objective speed of a body, "we must reject," writes Mannheim, "the notion that there is a 'sphere of truth in itself' as a disruptive and unjustifiable hypothesis." The statement that "there is an absolute velocity of a body, but we cannot observe it" is analogous to the statement that there is a truth independent of the life situation of the author, but that we can never find out "which" is that truth. According to the original Marxist doctrine, a statement is valid if it is proved according to scientific methods by a scientist whose social interest is identical with the interest of the proletariat, while "bourgeois" scientists may distort the truth by bringing into the argument the ideology of their class, e.g., some religious beliefs. However, if we argue according to Mannheim's sociology of knowledge, a social scientist reaches a result that depends upon his life situation. The results of different scientists differ from each other, and we must ask which of these results are "valid?"

Instead of invoking the results of scientists who are in sympathy with the proletariat, Mannheim invokes as the arbiter of validity a group of men who do not belong to any definite social class. He makes us of Alfred Weber's view that the "intellectuals," the "intelligentsia," are a "socially unattached" group; he speaks of the "freely floating intelligentsia." For Mannheim, the results obtained by this intelligentsia are the valid results. They take into consideration all possible ideologies, which cancel

each other in the intellectual's mind. The ultimate criterion of validity has been for the Marxist the decision of the proletariat; for the Mannheim school of sociology it is the decision of the intelligentsia. Both criteria are in flagrant contradiction to the criterion of validity that has been taken for granted by the "metaphysical" theory of knowledge. Mannheim recognized very well this incompatibility. He writes [note 6] that it is an axiom of the currently prevailing "idealistic" theory of knowledge that the "genesis of a proposition is under all circumstances irrelevant to truth.... It is regarded as impregnable and is the most immediate obstacle to the unbiased utilization of the findings of the sociology of knowledge."

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However, neither the German school of "Wissenssoziologie" (sociology of knowledge), nor the Marxist school dropped the metaphysical criterion of validity, except that the Marxists call the "materialistic criteria" what Mannheim has called "idealistic criteria." Mannheim has made repeated attempts to reconcile the idealistic epistemology with the sociology of science and has stated that eventually a consistent sociology of knowledge would call for "revision of the thesis that the genesis of a proposition is under all circumstances irrelevant to truth." Neither the Marxists nor Mannheim, however, have made a real attempt to work out a new theory of knowledge. To use their own terminology, they were deterred by "ideological reasons." However, Merton remarks [note 4] that the revolution in the theory of knowledge which Mannheim ascribes to the sociology of knowledge has in its bold outlines for some time been familiar to the American mind.

He refers, of course, to the writings of the pragmatist school, men like Charles S. Peirce, William James, John Dewey, and George Mead.

As a matter of fact, the departure from the metaphysical theory of knowledge started in the "positive philosophy" of Auguste Comte (1830). He wrote flatly that there is no theory without experience, but that neither are there facts without a theory. This means that he denied the existence of "brute" facts which are given to us by nature before we start to conceive a theory. As we mentioned in the previous section, this point was stressed and elaborated by Henri Poincaré and the school of "new positivism." What is immediately given to us can be described in common-sense language either as a continuum of sense impressions or as an agglomerate of "things," if we use this word as it is used in common-sense language when we say that a "table" or an "insect" are things. The actual rise of science has been shown that there are no simple laws between "sense impressions" or between "things." We have to construct concepts like mass, mass point, acceleration, etc., in order to find simple laws like Newton's by which these concepts or constructs can be connected.

From "new positivism" there developed, during the first decades of the twentieth century "logical positivism;" it emphasized the point that the laws of nature are actually relations between symbols; these laws have to be translated into statements about "sense observations" or "things" by relations of coördination. These statements could be checked by direct experiment; the "laws" were regarded as valid if the result of the checking was positive. According to this view, the "metaphysical" theory of knowledge, idealistic and materialistic, was replaced by a new, a "positivistic" theory of knowledge. The "scientific law" was no longer a "picture of objective reality," but an instrument and a

prescription of how to use this instrument. If the instrument and the prescription turned out statements about observable facts that checked with actual observations, the laws were called "true" or "valid;" in this case they could be used practically to guide our actions in producing technical devices and bringing about desirable technical effects.

While "positivism" had started from a logical analysis of the scientific method, the school of pragmatism that developed fairly independently of it started directly from the requirement that a scientific law should be a guide for human actions. The "pragmatic theory of knowledge" was advanced by Charles S. Peirce and William James. When, because of the rise of Einstein's theory of relativity, the theory of knowledge had become a topic of interest for every physical scientist, Percy W. Bridgman, fairly independently of philosophical schools, recommended an "operational" approach which was closer to the way in which the physicist actually operated in the laboratory than the approach of the positivists had been.

For our actual problem, the solution of the puzzle posed by the sociology of knowledge, there is no essential difference between the positivistic, pragmatic, and operational theory of knowledge. the puzzle had partly arisen from the vague meaning of the word "knowledge." One may mean by it "knowing that an animal with a long neck exists and is called a giraffe," but one may also mean "knowing that man has descended from inanimate matter," or "knowing that the earth is actually rotating." In order to have a clear idea of what is meant by sociology of knowledge, we shall understand by "knowledge" in this context "scientific theories." And by "validity of theories" we shall understand "fitness of the theory to serve some definite purpose." This pragmatic or positivistic theory of knowledge is presented elaborately at the end of the second part of this book. Theories are, in this pragmatic "science of sciences," always built up for certain purposes. "Validity of a theory" is only meaningful if we make this expression more specific and speak of "validity for a certain purpose." A theory can be valid for a technological purpose, but invalid as a support for a desirable moral life. If we drop the metaphysical concept of validity as agreement between the theory and objective reality, it is no longer an undeniable truth that the validity of a theory is dependent only upon the words by which it is formulated. The validity certainly depends also upon the author of the statement because he determines the purpose for which he advanced the theory.