

# THE CONCEPT OF SCIENTIFIC TRUTH AND THE UNITY OF SCIENCES<sup>1</sup>

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**Abstract.** This contribution deals with the problem of the unity of sciences through a critical analysis of the concept of scientific truth. As a first result it establishes some traits of the concept of truth according to the present dispersion of the different sciences. From this perspective, it proposes a possible content of scientific truth as a «relative» and «sufficient» truth derived, on the one hand, from the epistemological reduction operated by science, and, on the other hand, from the nature of the scientific object investigated. Finally, it shows the possible epistemological power of this conception in order to overcome the dispersion before mentioned.

**Resumen.** Esta contribución plantea el tema general de la unidad de las ciencias llevando a cabo un análisis crítico del concepto de verdad científica, tratando de establecer ciertos rasgos de éste último acordes con la situación actual de dispersión de los diversos saberes científicos. A tal efecto, se propone un concepto de verdad científica como verdad «relativa» y «suficiente» en función de la naturaleza de la reducción epistemológica propia de la ciencia en general y de la naturaleza del objeto científico tratado en cada momento, para así mostrar su posible virtualidad para superar la dispersión antes mencionada.

Every kind of knowledge carries out a specific gnoseological reduction of reality. This gnoseological reduction consists of two phases: firstly, it demarcates the realm of objects to investigate, and secondly, it delimits the outlook from which these objects will be investigated. Then, it establishes a proper methodology in order to develop the cognitive aims according to the previous gnoseological reduction, and finally it will establish a set of practical ends for applying its epistemo-

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logical results to reality. It follows that the possible modes of knowledge can be very different because of the diverse features of each well-determined gnoseological reduction and its subsequent development. Natural science is one of these cognitive modes, perhaps this is the area in which the most important achievements in human reason have been made, but the so called human sciences must also be considered as they too have gained a sufficient epistemological status in recent years. Obviously, the gnoseological reduction operated by natural science is different from that of human sciences.

From the view-point of natural science and also from the outlook of human sciences, the general situation of scientific knowledge shows a certain dispersion. We currently possess a set of well-established «sciences» encompassing many different aspects of reality, but this set does not show any sufficient integrated perspective of our knowledge as a whole. Undoubtedly there exist basic connections between physics and cosmology, chemistry and biology, etc., but we are very far from obtaining a general view of Nature. So to speak, the situation can be described as an «abstract mosaic», in which any part possesses a very relevant brightness –that is to say, each particular scientific branch increases and moves forward continuously– but the mosaic, taken as a whole, does not show any well-determined shape giving a full unity to the picture. Of course, both the historical development of different natural sciences and the clear epistemological success of them contribute to this situation greatly: at present, scientific branches are much more numerous than a hundred years ago; and, in addition, the use of scientific paradigm is enlarged to many new fields of reality as a rule.

Both factors, the nature of the initial gnoseological reduction and the successful development of scientific knowledge, raise the problem of the unity of sciences as a philosophical reflection nowadays. The following ideas deal with clarifying some conditions to be taken into account for considering this problem according to its complexity.

From a historical point of view it seems logical to state that the unity of sciences has become greatly weakened at the end of Modernity, and not only because of the former facts, but also because of a deeper cause. It deals with the loss of the unity of reason, which is an immediate consequence of the so-called crisis of modern reason, or, in other words, of the crisis of rationality models developed in the modern age. Certainly without the unity of reason, as it was conceived during the eightieth century for example, it is very difficult to speak about the

unity of knowledge, the unity of sciences, etc. Nowadays we do not possess any «tree of knowledge» because we do not have any «tree of reason»; rather we find «fragments» of reason or «fragments» of knowledge, although these fragments are very bright indeed, as we said before. As well we also find a certain dispersion at the methodological level of scientific knowledge, and in this way it is not by chance that, in recent decades, some important contributions to scientific thought are the developments of new methodological paradigms, ranging from system-theory to self-organisation categories.

From this perspective, the disunity of sciences is an effect of the disunity of reason, that is to say, an effect of the current fragmentarity of reason. Consequently, it is necessary to analyse the specific cause of this disunity of reason, which conditions logically the problem of the unity of sciences. Of course, some easy answers can be given, namely, the natural historical exhaustion of the paradigms of modern reason, or the existence of new research fields which require an enlargement of the gnoseological reduction of science, etc. Undoubtedly all this is true, but the query is deeper. To my mind, the disunity of reason depends largely on the crisis of the concept of truth, especially during the second half of twentieth century: in a certain way the crisis of reason is actually the crisis of the concept of truth. Hence, many scholars have proposed to abandon this notion and to replace it by other ideas such as validity of knowledge, objectivity, etc. Furthermore some recent philosophical proposals, as the sociology of scientific knowledge and some kuhnian and postkuhnian positions, have tried to justify this weakening of the truth concept by arguing that science is, above all, a «social product» which derives essentially from the social organisation and from the specific culture of the concerned society. Of course, it is necessary to accept the influence of the social and cultural conditions on scientific knowledge, but however the problem cannot be solved in this way, in fact it is only delayed, because it is very hard for scientists to accept that their work has nothing to do with truth but only with «validity» or with «objectivity». Scientists try to find truth and not only objectivity. Obviously, this truth is not «absolute or definitive», that is to say, it is a «partial» truth, which can always be improved. If the concept of truth turns into a suspicious idea, into an unreliable concept, then one of its main epistemological purposes fails, and therefore the unity of knowledge, in a general sense, is impossible to reach. In our view this is one of the deep underlying causes responsible for the disunity of knowledge, and consequently, for the disunity of sciences at present.

On that account the problem of the unity of sciences is strictly connected with the crisis of the epistemological concept of truth. Of course, the crisis of truth has also touched the philosophical reflection on science, and not only because of the philosophical currents mentioned above, but it can also be seen, for example, in Popper's philosophy, that is to say, in a philosopher that has defended the necessity of the concept of truth to a large extent. For Popper, truth is a regulative concept of researching but not a constitutive idea of scientific activity (in the Kantian sense of these terms), or in other words, the notion of truth acts only as a sort of aspiration in scientific research, but it is *never* reached because of the conjectural and falsifiable features of every human knowledge. Accordingly, we can only obtain «truthlikeness» or «verisimilitude» in scientific knowledge, that is to say, an idea reflecting a relevant weakness of the concept of truth in the making of science.

From the former ideas it follows that the task of the unity of sciences requires a certain reinstatement of the concept of truth within philosophical reflection about scientific knowledge in general. But of course it is not a case of returning to some old proposals in which truth was justified as an undoubted premise. Such positions ignore a very relevant part of the critical reflections about this issue developed during the twentieth century. From the beginning it is necessary to state that many aspects of the rational criticism of the idea of truth must be admitted, otherwise some naive epistemological positions would be repeated. Rather it is necessary to assume some important traits of these criticisms, which have shown that some traditional concepts of truth were pretentious and idealistic to a certain extent.

First of all, it is very important to understand that the concept of truth is a *relative* concept. Obviously this term –relative– does not mean that we can say anything we like or that the criterion for justifying cognitive contents is only the social production of them. Relativeness of the concept of truth does not imply relativism. This relativeness originates from the beginning of every human knowledge, namely, it is derived from the gnoseological reduction which establishes every kind of knowledge, and is also applied to scientific knowledge. Essentially it means that truth to be obtained in science depends on the features of the particular gnoseological reduction carried out by science. So there can not exist any «absolute» truth in scientific knowledge, because it is forbidden by the inherent and necessary limit originated from each gnoseological reduction. Therefore, scientific truth always has to be

relative to the foundational features of scientific knowledge. Moreover, it is necessary to add another cause to this idea, namely, knowing reason is always finite, consequently its cognitive results are improvable and perfectible.

But, generally speaking, this relativity does not signify that scientific knowledge is only likely –truthlikeness–. Rather it means that cognitive content is always partial and capable of being improved. Correct scientific knowledge reaches something true, otherwise it would be impossible to justify why scientific knowledge is used for transforming and for manipulating reality to a large extent, or in other words it would be hard to justify why scientific predictions coincide with the phenomena of physical reality, as for example, the construction of a space rocket, of a long bridge on a river, or the healthy effect of a drug on the human body. In all these cases there is not properly «truthlikeness» of scientific knowledge, but rather something true about reality, although something true which is relative –or related, if you prefer– to the epistemological framework used and to the methodological limits of it.

This implies indirectly that the content of the concept of scientific truth can be the old criterion of correspondence with reality, but as long as it is understood in the same sense as before, that is to say, it must be relative to the features of the gnoseological reduction and to the subsequent researching methodology, and, lastly, to the technological means employed in scientific investigations. Today these means possess a specific influence on the reality structures known by science, and this influence increases more and more. As can be seen, we are not arguing here for a sort of acritical return to the realistic criterion of correspondence, but for a special concept of correspondence according to the former reflections. From this point of view, scientific epistemological correspondence is a kind of correspondence which is mediated by –or is relative to– the features of reality coming from the initial gnoseological reduction, and of course, it has nothing to do with an «absolute» correspondence or with a sort of «copy» of the object. Precisely the features imposed by the gnoseological reduction at the beginning are responsible for obtaining scientific objects as such. By this reason, the gnoseological reduction carries out two important and indispensable results: on the one hand, as we pointed out above, it establishes the specific modality of knowledge, and establishing this modality, it thereby distinguishes it from other possible cognitive modalities; on the other hand, it makes possible the epistemological

construction of scientific object, and in so doing, it also makes possible intersubjectivity, that is to say, the possibility of repeating experiments and of testing results by different researchers, and therefore, the comparison of cognitive contents and the progress of knowledge in general. Or in other words: it makes possible that different researchers can be sure of speaking about the same scientific object, and in this manner, the information exchange can be taken into consideration.

By these reasons, scientific objectification –derived from the initialgnoseological reduction and from the subsequent researching methodology– constitutes an indispensable instrument for the making and for the development of scientific knowledge. This essential mediation imposes some specific features to reality as long as it is transformed into a scientific object, all which determines, in turn, the type of correspondence we are speaking of. It is necessary to remark that reality, in order to be known in any way, must be subjected to these epistemological mediations, which can largely modify the natural presentation –so to speak– of the real object to be investigated from a scientific outlook. Nowadays this is clear if we consider the important role of technological means necessary for transforming reality into scientific objects. In many branches of science, technology constitutes a condition of the possibility of scientific knowledge, and its indispensable use modifies the natural state of reality; for example, this is the case in microphysics and in biochemistry. Therefore, the concept of scientific truth is also relative to the technological means, which implies that the notion of epistemological correspondence is not a simple or naive correspondence, but, on the contrary, a very complex correspondence.

However, this complexity is not an obstacle for defending the use of the notion of truth in sciences. The former epistemic mediations are necessary for the progress of scientific knowledge and without them the correct understanding of cognitive tasks in science is not possible. Nevertheless, their influence prevents the maintainance of a naive idea of truth conceived as a sort of pure correspondence with reality, which would be an idealistic purpose.

But, how can we be sure that, at least, a partial or a relative correspondence has been reached correctly? At this point, empirical testing acquires its most epistemological relevance, because the testing would be the final condition for affirming that correctness. If theoretical predictions are corroborated by experimental testing, then it is possible to assure that a partial or relative correspondence has been achieved. A

well-known case will help to understand this assertion. Today science frequently works according to model simulations. Models possess a theoretical character and are established for explaining scientific objects under consideration. The model, often simulated by computer, leads to some quantitative testable predictions, and if experimental measurements agree with these predictions then we say that the model is correct. But in fact the model is correct only regarding the initial conditions of the problem and it is not possible to say that this model is a definitive «mirror» reflecting the «final» structure of reality, because of the reasons exposed above, and, in addition, because every model raises a set of new problems which has to be investigated in turn for improving it. Or, in other terms, we can say that the model is *sufficient* as regards the problem raised, but we cannot consider it to be complete or definitive.

This idea leads to another very important aspect of the concept of scientific truth conceived as a relative correspondence. It is the notion of *sufficient* truth. So to speak, «sufficiency» of truth also has to be understood in connection with the conditions imposed by the initial gnoseological reduction, that is to say, scientific truth will be sufficient respecting the nature of the problem posed. On that account, its epistemological correctness is assured by overcoming empirical testing, taking part the testing methodology from those initial conditions. So for example, broadly speaking, Classical Mechanics is sufficient for scientific problems at the macrophysical level, and is not sufficient for problems at the quantum level. General relativity would be correct for classical macrophysical problems, but, so to speak, it would be an «excessive» and unnecessary truth for the level of accuracy required for problems in which the motion speed is very far from being a relativistic quantity. In this sense, we say that Classical Mechanics constitutes a «sufficient» truth regarding the kind of problems determined by its initial gnoseological reduction, and, at the same time, it cannot be considered the general and definitive mechanics –because we need both quantum mechanics and relativistic mechanics as well–.

Not taking into account this idea of sufficient truth has led to a lot of misunderstandings. Both the loss of trust in scientific rationality and the criticism of the concept of truth comes from it many times. For many years the aim of reaching an exhaustive and full knowledge of reality by scientific paradigm was an unquestionable premise, but after the epistemological crisis of physics at the beginning of twentieth century, many scientists thought about the fall of science, even many physicists

thought about the end of physics. The underlying reason of this was, in reality, a certain absolutistic consideration of scientific knowledge, and so, if that exhaustiveness failed then the complete building failed to some extent. But this position was scientism in philosophy and in science. The misunderstanding is clear: in fact the gnoseological reduction of science was considered the definitive modality of knowledge, and if this modality was flawed, then many main epistemological concepts were flawed as well, for instance, the concept of truth. But it is impossible to obtain a complete gnoseological reduction because it is forbidden by the quality of every gnoseological reduction, included that of science. Hence, scientific truth is only relative and sufficient for the framework of each gnoseological reduction of science, that is to say, it is a correct cognitive content about reality, but a relative and improvable content.

Generally speaking, this leads to assert that every kind of truth in cognitive processes is always relative and sufficient; there is not any different possibility because of the structure of our knowledge about reality. It has always been in this way from the beginning of scientific knowledge. This concept of relative and sufficient truth can open some interesting perspectives as regards the issue of the unity of sciences. Firstly, it avoids any attempt of reductionism among sciences, on the contrary it demands an integrated organisation of the epistemological results coming from different sciences in order to reach a wider outlook about the general cognitive aims of them. Therefore, it implies the necessity of interdisciplinarity in human knowledge. Secondly, only by means of that integrated organisation can a set of general categories concerning some large fields of reality be obtained. For instance, this is the case of the self-organisation category today. These general categories emerge from the parts to the whole, but obviously they can not pretend to encompass the totality because of the reasons exposed up to here. Consequently, the unity of sciences will always be relative and sufficient: it is relative because it is built starting from diverse gnoseological reductions, and it will be sufficient as long as it can show, in a given situation, a framework of scientific knowledge which can satisfy the epistemological requirements for unity in this given situation. And thirdly, it constitutes a researching program in which each scientific branch obtains its epistemological relevance not only by itself but also by reference to its integration with other branches. By using our former example, the abstract mosaic would not only be bright in each piece by itself but also because of the contribution of different pieces to the general epistemological framework, that is to say, because of the



relationship among them. This framework, in turn, cannot be conceived as a totality in a strong sense, but rather as a totality related to its pieces. Finally, this program admits the emergence of new scientific fields, even more, it requires novelties, because the making of that integrated organisation will raise new problems, which will demand new gnoseological reductions.

Perhaps, from this perspective the current dispersion of scientific branches could be overcome, but this involves a deep change respecting two things: on the one hand, the mentality of researchers has to change by acknowledging the «principle of relativity» in the sense explained before, but at the same time a strong concept of scientific truth must be accepted, which would be always related to the features of the respective gnoseological reduction. A strong concept does not mean an absolute concept, but only the recognition of apprehending the effective structures of reality progressively. In short: both relative-sufficient truth and unity of sciences could be two necessary aspects for a possible progress in the task of the unity of knowledge.

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