PROBABLE TRUTH VERSUS PARTIAL TRUTH

Acad. prof. univ. dr. TEODOR DIMA,
Universitatea „Al. I. Cuza", Iaşi

Abstract: *The present study reiterates one of the main ideas that we exposed in 1983, in the paper Din fals rezultă orice (From False Follows Anything), published in the volume Întemeieri raţionale în filosofia ştiinţei (Rational Foundations in the Philosophy of Science) when we referred to the notion of semi-truth, as a third alethic value, placed between „truth" and „falsehood", thus contributing to the functionality of the trivalent logic. Now we analyze the conceptions of Petre Botezatu, Mario Bunge, Karl R. Popper and Nicholas Rescher, in order to argue that it is important not to identify the epistemological term „probable" (= uncertain) with the semantic term „partial" or „approximate", when we speak about the concept of truth.*

Key words: *Probable truth, partial truth, half-truth, partial correspondence of truth, degrees of truth, proposition true within a certain degree of truth, degrees of verisimilitude, truth content, falsehood content, degrees of plausibility.*

1. The notion of imprecise explanation

In our study, *From False Follows Anything*[1] we referred to the notion of *half-truth*, which we used in an example of explicative systematization, present in the Theory of Relativity. The example was given by Mario Bunge[2] and we undertook it in order to argue that there are *imprecise explanations* because they contain *erroneous information* and they are to be found also in scientific contexts, not only within pseudo-scientific and pre-scientific doctrines[3]. In a series of papers, the following explicative answer is given to the question "*Why are light rays bent away when they pass grazing a star?*" First, the special theory of relativity contains in the law "Energy = Mass x Square of the velocity of light in vacuum" (a half-truth, because this theorem belongs to a theory of systems endowed with mass and is consequently inapplicable to light). Second, the former equation means that mass and energy are the same up to a constant factor (false) or at least equivalent (another half-truth) and, particularly, that anything having energy has also a mass (false). Third, since light has energy (true), it has also a mass (false). Fourth, since light has a mass (false) and since anything that has a mass is attracted and consequently deviated from its path by a massive body (true), a body will attract light (false). Fifth, since whatever attracts deviates, a body will deviate light; in particular, a celestial body will deviate a light ray (true).

Commenting upon this example, Mario Bunge maintains that this explanation is perfectly rational because it subsumes the explanandum (a generalization) under more comprehensive generalizations; but it is wrong explanation. Moreover, it is unscientific because it hinges on an unwarranted generalization of a mechanical theorem – "$E = mc^2$" – to optics. This generalization is fallacious because, from the proposition "if the mass of a system is m, then the total energy of the system is $\underline{m} = \underline{E}/\underline{c}^2$", the converse "If the total energy of a system is $\underline{E}$ then the mass of a system is $m = E/\underline{c}^2$" does not follow. The

---

[1] Dima, T., (coord.), (1983), *Întemeieri raţionale în filosofia ştiinţei*, Iaşi, Junimea Publishing House, pp. 1-91.

[2] Bunge, M., (1967), *Scientific Research II: The Search for Truth*, Springer-Verlag Berlin Heidelberg New York, pp. 14-15.

[3] Dima, T., *Explicaţie şi înţelegere*, vol. 1, Bucureşti, Ed. Ştiinţifică şi Enciclopedică, pp. 97-98.

derivation has been "formal" in the sense that an arithmetical transformation (of "$E = mc^2$" into "$m = E/c^2$") has been performed without paying attention to the physical meaning of the symbols – a meaning that can be disclosed only by bringing to light the object variable of both *E* and m – a variable which denotes an arbitrary mass point but not a light quantum. In this way the condition of semantic closure has been violated, because the concept of mass of a light ray has been smuggled into a theory that does not contain it to begin with.

In this example, Mario Bunge introduces the notion of *half-truth*, to which we have referred, for the first time, in 1982, in an article published in the journal *Cronica* (nr. 37) and then, in the study mentioned at the beginning of this intervention. We ascertained then that the notion of "half-truth" is often considered as a third alethic value, situated between "true" and "false", thus contributing to the establishment and substantiation of the trivalent logic.

2. The referential dimension of truth

In the study *Dimensiunile adevărului (The Dimensions of Truth)*[4] Petre Botezatu, referring to the *referential dimensions* of truth for deepening the *theme of correspondence*, noted that even the well-known paradigm of Tarski: *If and only if the snow is white, the sentence „The snow is white" is true* expresses a partial truth, at least within the factual sciences, being known, in the above-mentioned case, that the snow is not always white, due to climatic, atmospheric incidents etc. This is why Petre Botezatu proposed the acceptance of the ideas of *partial correspondence* and *partial truth* formulated by Mario Bunge, as follows also from the above-mentioned example.

In a later paper, Mario Bunge suggested the use of the notion of *degrees of truth* within the modern semantics[5]. In the same paper, he noted that this notion, as well as that of *approximate truth*, is also used in applied mathematics: the only approximate knowledge of most given functions of the non-algebraic functions (*log*, *sin*). In the social and human sciences, most of the sentences are approximate; therefore the laws are considered „empirical generalizations". Using an important number of examples, from various fields, Mario Bunge reached the conclusion that *the partial truth is not a probable truth*. In other words, the degrees of truth cannot receive a probabilistic interpretation, as Lukasiewicz, in 1913, or Reichenbach, in 1949, would have proceeded.

What about the perspective of the *certitude*, which is another dimension of truth and cannot be evaluated through the alethic criterion of correspondence? The degrees of correspondence are not degrees of certitude, therefore, a partial truth can be certain or probable and a probable truth can be total or partial[6]. These interferences lead to the conclusion that when we are saying that a proposition is probable, this means that it has a *certain (indubitable) value of truth*, that its alethic value *may* be proved by means of demonstration or factual testing. On the contrary, when we are saying that a proposition is partially true, this means that it is *true within the limits of a certain degree of error*, let us call it *i*. By means of this evaluation, Dana Scott set forth the project of the *logic of fallacies*[7]. In this system, a proposition can be *true within the limit of a certain degree of error i*. Thus, degrees of error (or of truth) appear, but they are not ordered within the rational interval [1,0] but within the integers interval [1,*n*][8].

---

[4] Botezatu P., (1981), *Dimensiunile adevărului*, in *idem* (coord.), *Adevăruri despre adevăr*, Iaşi, Junimea Publishing House, pp. 5-11.

[5] Bunge M., (1974), *Treatise on Basic Philosophy*, vol. 2: *Semantics II: Interpretation and Truth*, Dordrech-Holland, ch. 8.

[6] Botezatu, P., *op. cit.*, p. 6.

[7] Scott, D., (1976), "Does Many-Valued Logic Have Any Use?", în St. Körner (ed.), *Philosophy of Logic*, Oxford, pp. 64-74.

[8] Cf. P. Botezatu, *op. cit.*, p.7.

In our intervention from 1983, we have explained[9] that the probabilistic theories of truth use the term "probable" in its non-technical acceptation of "uncertain" or "corrigible", applying to it one or another variant of the probability theory. In other words, the degree of truth of a sentence is identified with its probability. But the assignation of probability to a sentence does not have a procedure of its own, therefore we need to have recourse, by analogy, to the construction of stochastic models: for instance, an urn model, as if the sentences would be arbitrary facts. The logicians of science have noticed that "this procedure is not effective in the case of scientific sentences, at least because these ones are not randomly selected; they are not extracted from an urn full of white (true) and black (false) sentences"[10]. Consequently, we must not identify the epistemological term "probable" (= uncertain) with the semantic term "partial" or "approximately" true.

3. Mario Bunge's proposal

Using a function of continuous revalorization, able to give quantitative assignations to the idea of truth, Mario Bunge set the following model, in which p and q symbolize propositions, and ε asserts a certain value within the interval from 1 to 0:

p is true
p is approximately true
p is true within the limit $\varepsilon > 0$
p is partially true
p is false within the limit $\varepsilon > 0$
p is almost false
p is false
p is more true than q
p and q accord within the limit $\varepsilon > 0$
p and q do not accord within the limit $\varepsilon > 0$

For instance, the statement "It always rains on Saturdays" is false in its universality, but from it true consequences can also be derived, because sometimes it rains on Saturdays. Using the model of Mario Bunge, we may say that "The proposition *It always rains on Saturdays* (p) is false within the limit $\varepsilon > 0$." Particularizing the example, we find that, because at the Tropics it rains every day, the proposition p is true within the limit $\varepsilon > 0$, where ε is equal with 1, and in the Saharan desert, the proposition p is false within the limit $\varepsilon > 0$, where ε is almost equal with 0.

In the model proposed by Bunge, considerations can be made relating to the *degree of truth of the scientific theories*; this one can be expressed by the composition of the truth values of the initial suppositions, on the condition that these ones are mutually independent. Petre Botezatu noted that Mario Bunge admitted that this procedure clarified the notion of degree of truth of a certain theory, but could not calculate this degree.[11]

4. Karl R. Popper and the degrees of verisimilitude

Turning back to the truth value of propositions, we must accept that a proposition possesses, in virtue of its content, a certain degree of expressing its truth or falsity, which Popper called *degrees of verisimilitude*, different from the *degrees of probability*. "This confusion is frequent because both notions are associated with the idea of truth and both of them imply the idea of a gradual approach of truth. But logical probability denotes an approach to the logical certitude, which is the tautological truth, proceeding by

[9] Dima, T., *op. cit.*, p. 3.
[10] Bunge, M., *op. cit.*, ch. 8.
[11] Botezatu, P., *op. cit.*, p. 7.

eliminating the informational content, while verisimilitude expresses an approach to the comprehensive truth. The verisimilitude associates truth with content, while probability associates truth with the absence of content."[12]

In order to logically approach *verisimilitude*, Popper combined two notions introduced by Tarski. He considered that any proposition possesses a *logical content* as well as a *truth value*. The content is composed by the class of all the consequences implied by the proposition. Synthesizing, Popper created the concepts of *truth content*: the class of all true consequences which derive from a proposition, and of *falsehood content*: the class of all false consequences which derive from a proposition.

We will sustain, therefore, that speaking in terms of the relation of *material implication*, if a proposition is true, then its consequences are true; according to Popper, *the truth content of the proposition* is maximum: ***from truth derives only truth***; in exchange, if a proposition is false, then its *falsehood content* is variable, as it has been stated above, where we interpreted the example referring to the sentence "It always rains on Saturdays"; in other words, ***from false derives anything***, as the science of logic maintains.

Popper applied for the first time its conception to scientific theories; if progresses are to be made in the scientific knowledge, this means we must accept that we can approach more or less the truth, that a theory can correspond better to the facts than another one, that there are degrees of truth. He described several typical cases in which the claim that a theory t_2 concords better in a certain sense, with the facts than t_1, is legitimate:

(1) t_2 makes more precise statements than t_1 and they are capable of more precise tests;

(2) t_2 explains the facts better than t_1;

(3) t_2 describes or explains the facts more thoroughly than t_1;

(4) t_2 succeeded in tests insurmountable for t_1;

(5) t_2 suggested more tests, and successfully got through them;

(6) t_2 succeeded in unifying problems which seemed disparate.

Petre Botezatu argued that "the idea of verisimilitude and Popper`s interpretation are simple and seducing"[13]. Observations regarding some inacceptable consequences of Popper`s interpretations were also formulated. Thus, Susan Haack demonstrated that, if theory t_2 is closer to the truth than theory t_1, then the falsehood content of t_2 becomes null[14].

5. Nicholas Rescher – degrees of plausibility

From the perspective given by the concepts of "degrees of truth" and "verisimilitude" we can also approach Nicholas Rescher`s analysis of *plausibility* and *degrees of plausibility*[15]. This one, separating from other authors (G. Polya, W.C. Salmon, C.L. Hamblin) who considered that the notion of plausibility refers to particular aspects of probability, understood: "our epistemic assent towards propositions. (...) To say that a proposition is relatively plausible is *not* to say that it is true, but only that its epistemic claims are to be viewed as relatively strong: that if it were to be true this would

---

[12] Popper, K., R., (1968), *Conjectures and Refutations*, New York, ch. 10: *Truth, Rationality, and the Growth of Scientific Knowledge*, p. 237.

[13] Botezatu, P., *op. cit.*, p. 9.

[14] Haack, S., (1974), *Deviant Logic*, Cambridge University Press, London, p. 64.

[15] Rescher, N., (1973), *The Coherence Theory of Truth*, Oxford, At the Clarendon Press, pp. 114-131, and *Appendix E: Plausibility Indexing and Modal Categories*, pp. 347-348; *Appendix F: Hamblin`s Concept of "Plausibility" and Shackle`s "Potential Surprise"*, pp. 349-352; *The Uniqueness of a Derived Full-Scale Plausibility Indexing*, pp. 353-355.

not surprise us, but would be something that we should welcome (from the epistemic point of view – not necessarily from others). Plausibility is a sort of potential commitment: if we regard a statement as highly plausible we are saying that *if* we were to accept it as true, then we should be prepared to give it a very comfortable and secure place among the truths. And the more plausible the statement, the more deeply we should commit ourselves to accepting it as true if we did in fact so accept it. The allocation of plausibility – index values to a group of statements is thus a reflection of our relative degree of attachment to these statements – be it actual attachment or hypothetical attachment in the context of a certain analysis. In giving one statement a better plausibility classification than another we are saying that if in the last resort we *had* to make a choice between them, we should refer the more plausible statement"[16].

In conclusion, a proposition or a theory can approach the truth trough successive approximations, as well as it can drift away through successive errors. In this line of thought, Popper gave the following example: the intuitive comparability of the contents of Newton's theory (*N*) and Einstein's (*E*) can be established as follows: (a) to every question to which Newton's theory has an answer, Einstein's theory has an answer which is at least as precise; this makes (the measure of) the content, in a slightly wider sense than Tarski`s of *N* less than or equal to that of *E*; (b) there are questions to which Einstein's theory *E* can give a (non-tautological) answer while Newton's theory *N* does not; this makes the content of *N* definitely smaller than that of *E*[17].

REFERENCES

[1] Botezatu P., (1981), *Dimensiunile adevărului*, in *idem* (coord.), *Adevăruri despre adevăr*, Iaşi, Junimea Publishing House, pp. 5-11.

[2] Bunge, M., (1967), *Scientific Research II: The Search for Truth*, Springer-Verlag Berlin Heidelberg New York, pp. 14-15.

[3] Bunge M., (1974), *Treatise on Basic Philosophy*, vol. 2, *Semantics II: Interpretation and Truth*, Dordrech-Holland, ch. 8.

[4] Dima, T., *Explicaţie şi înţelegere*, vol. 1, Bucureşti, Ed. Ştiinţifică şi Enciclopedică, pp. 97-98.

[5 Dima, T., (coord.), (1983), *Întemeieri raţionale în filosofia ştiinţei*, Iaşi, Junimea Publishing House, pp. 1-91.

[6] Haack, S., (1974), *Deviant Logic*, Cambridge University Press, London, p. 64.

[7] Popper, K., R., (1968), *Conjectures and Refutations*, New York, ch. 10, *Truth, Rationality, and the Growth of Scientific Knowledge*, p. 237.

[8] Popper, K.R., (1973), *Objective Knowledge. An Evolutionary Approach*, Oxford, At the Clarendon Press, pp. 52-53.

[16] *Ibidem*, pp. 116-117.

[17] Karl R., Popper, (1973), *Objective Knowledge*. *An Evolutionary Approach*, Oxford, At the Clarendon Press, pp. 52-53.