Kant and Popper: Two Copernican Revolutions*

Miloš Taliga

Introduction

I regard Kant as one of the greatest philosophers of the 18th century. The significance and contribution of his work lie especially, in my opinion, in what he himself called 'Copernican Revolution' or 'Copernican Turn', i.e. in his idea that '[o]ur intellect does not draw its laws from nature, but imposes its laws upon nature'.[1] This idea (together with D. Hume's critical conclusions) destroys not only all so-called 'inductive inferences', but also 'inductive logics'. It shows that induction, simply, does not exist. This result was also reached by K. R. Popper who lived in 20th century.[2] However, Popper's philosophy is remarkably different from both philosophies – from Kant's in its pervasive fallibilism and from Hume's in its critical rationalism. Accordingly, in this paper I will try to answer two questions. The first is Kant's question 'How is pure natural science possible?'[3] Nevertheless, my answer will not be along Kant's lines but along Popper's. Popper refuses Kant's answer because he does not believe that proof of the truth of any scientific theory is possible.[4] Thanks to this Popper's refusal a second question arises, the question 'Where the rationality of scientific research lies?'. For if it is not possible to establish the truth (or at least high probability) of scientific theories, then, it seems, the whole scientific enterprise is some sort of 'cursed irrational business'. Thus, both questions of my paper may be summed up into one as follows: 'Is *rational natural science* possible if we abandon several great Kant's ideas?'.

On the Possibility of Empirical Science

Popper agrees with Kant that 'the world as we know it is our interpretation of the observable facts in the light of theories that we ourselves invent',[5] i.e. he agrees with his 'Copernican Turn'. However, contrary to Kant, he asserts that 'the fact that we create our theories, and that we attempt to impose them upon the world, [is not] an explanation of their

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1 Quoted from K. R. Popper: *Conjectures and Refutations*. London: Routledge & Kegan Paul, 1963, p. 180.

2 See for example K. R. Popper: *Objective Knowledge*. Oxford: Clarendon Press, 1972, pp. 6-7; K. R. Popper: *Unended Quest. An Intellectual Autobiography*. London: Routledge, 1993, Sections 16 & 32.

3 Quoted from *Conjectures and Refutations*. London: Routledge & Kegan Paul, 1963, p. 94.

4 See for example ibidem, pp. 190-193.

5 Ibidem, p. 191, emphasis suppressed.

success'.[6] In short, Popper maintains that '[w]hen Kant said that our intellect imposes its laws upon nature, he was right – except that he did not notice how often our intellect fails in the attempt: the regularities we try to impose are psychologically a priori, but there is not the slightest reason to assume that they are a priori valid, as Kant thought'.[7] But Popper's counterarguments are even more powerful. Behind his disagreement with Kant lies an anti-justificationist view of science; i.e. his opinion that it is *by no means* possible to establish the truth of scientific theories, not even by Kant's arguments.

The doctrine that scientific theories are unjustifiable is very old, it comes from the ancient Greek school of kynics and skeptics. The argument against the justifiability of the truth of any assertion is very simple: the chain of justification is either infinite or it creates a vicious circle. I suppose that these problems are sufficiently known,[8] so I will proceed directly to the first Kant's question: 'How is pure natural science possible?'. The answer suggested by Popper emerges from his famous *demarcation criterion*, which says that 'the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability'.[9] Thus a theory is scientific *neither if it is proved* (as Kant thought) *nor if it is possible* to prove, verify, or confirm it (as, for example, Carnap thought), but *if it is possible to refute it*. This is the place where Popper made the second 'Copernican Turn'. He advocates a revolutionary opinion that scientific knowledge is possible even if its justification is impossible. Accordingly, scientific knowledge is only hypothetical; scientific theories are conjectures and will remain conjectures forever.[10]

On the Rationality of Empirical Science

The answer to the second question, 'Where the rationality of natural (empirical) science lies?', is produced by the first answer as one of its consequences. Since *it is not possible* to justify the truth of scientific theories, trying to attain it would be irrational. But the refutation or falsification of scientific theories *is possible*. Accordingly, the conclusion is that trying to refute or criticize the scientific theories is rational. My task is to explain why this should be so.

The conclusion may seem indeed as a trivial one, at least at first sight. But it has other far-reaching consequences. Let us look at them a bit closer. As D. Miller (one of the former Popper's co-operators) says, 'neither beliefs nor acts of belief, nor decisions, nor even preferences, are reasonable or rational except in the sense that they are reached by procedures or methods that are reasonable or rational'.[11] A critical rationalist (whether Popper or Miller) is

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6 Ibidem, pp. 95-96.

7 K. R. Popper: *Objective Knowledge*. Oxford: Clarendon Press, 1972, p. 24, emphasis suppressed.

8 If they are not, the Chapter 3 of D. W. Miller: *Critical Rationalism. A Restatement and Defence*. Chicago & La Salle: Open Court Publishing Company, 1994, is recommended for details.

9 K. R. Popper: *Conjectures and Refutations.* London: Routledge & Kegan Paul, 1963, p. 37, emphasis suppressed.

10 See for example ibidem, p. 51; K. R. Popper: *Unended Quest. An Intellectual Autobiography*. London: Routledge, 1993, Section 16.

11 D. W. Miller: 'Induction: a Problem Solved'. In: D. W. Miller: *Out of Error. Further Essays on Critical Rationalism.* Aldershot: Ashgate Publishing Company, 2006, p. 111.

driven to this position by the acceptance of the well-known skeptical Hume's conclusion that 'there can be no good reasons',[12] i.e. *no positive reasons which could guarantee us anything* – whether the truth of a scientific theory or the success of some course of an action etc. This approach leads to the unconventional understanding of the rationality, according to which *there is no longer the traditional equation 'reason = good reasons'*.[13] Our reason cannot provide us good reasons for anything, hence, our knowledge is only conjectural. Nevertheless, 'our conjectural knowledge ... may grow, and ... it may do so by the use of reason: of critical argument'.[14] In the context of the problem of rationality of our knowledge this means that our knowledge (i.e. our scientific or other theories) *is not* rational, only *the way* or *the process* of our knowing *may be* rational. And this process, in its turn, leads neither to warranted or justified knowledge nor is itself warranted or justified. *Rationality in the sense of justifiability simply does not exist* and that is why it is not possible to apply it either to the scientific (or other) theories or to the methods or procedures of our scientific (or other) cognition.

Let us consider the following schematic example. Suppose we have two competing theories A and B, which were exposed to severe criticism. Say that B has passed the critical testing, while A has failed. Then, according to critical rationalism, it is reasonable or rational to prefer B, but not because we would have some good reasons for our preference. The fact is that not only B is as unreliable as A, but also that our preference of B is unreliable. We may be disappointed in the next moment. Our choice or preference may be an unsuccessful one. However, on the other side, we do not need any positive reason for our preference of some B theory to be rational. We need only a negative critical argument against an alternative – i.e. against the A theory. *But this criticism of A does not make our choice (i.e. our decision to 'Prefer B') rational. This criticism itself is rational.* Thus, the conclusion is that no 'entity' (whether a scientific theory or our decision to prefer the B-theory etc.) is rational in the sense that we cannot have a good reason in the favour of our choice or decision, least of all of a theory. Only our critical eliminative activity is rational. In this sense, as Popper reminds us, we stumble upon absolutely different equation, namely 'rational = critical': 'There is no better synonym for "rational" than "critical". (Belief, of course, is never rational: it is rational to *suspend* belief)'.[15]

The End of Good Reasons

Rationality thus lies in *the way* of our scientific research, namely in *the critical method* or in *the empirical testing* which can help us to eliminate some of the competing scientific theories. And the strength of this rationality is based on *the critical arguments* used in our research. So called 'positive arguments' or 'good reasons' are, according to critical rationalism,

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[12] K. R. Popper: *Objective Knowledge*. Oxford: Clarendon Press, 1972, p. 22, italics suppressed.

[13] See for example D. W. Miller: *Critical Rationalism. A Restatement and Defence*. Chicago & La Salle: Open Court Publishing Company, 1994, Chapter 3.

[14] K. R. Popper: *Realism and the Aim of Science*. London: Hutchinson, 1982, p. 21.

[15] K. R. Popper: 'Intellectual Autobiography'. In: *The Philosophy of Karl Popper*. Ed. P. A. Schilpp. La Salle: Open Court Publishing Company, 1974, p. 69.

mere myths. D. Miller explains why this ought to be so[16] by his three-fold attack on good reasons as follows. Good reasons are

a) unobtainable – because of the infinite regress;[17]
b) unusable – i.e. 'even if good reasons could be obtained, they would not serve any purpose';[18]
c) unnecessary – i.e. 'rationality can operate perfectly well without recourse to good reasons; reason nowhere depends on reasons'.[19]

Consequently, all what is needed for *rational* scientific research is the combination of conjectures and refutations; the combination of imagination which helps us to produce all kinds of conjectures (as, for example, scientific hypotheses) and of critical activity which can help us to refute some of the suggested competitors. *Crucial tests* become especially important because they may eliminate at least one of the competing scientific theories without proving, justifying or supporting the rest of those that have not been refuted. This point deserves more attention. Some theory (say B) will be submitted to a test. The B-theory may fail or succeed. If it fails, it is false. But if it succeeds (i.e. if it is corroborated), this does not mean that it is true. Although the status of the corroborated B-theory changes from 'untested' to 'well-tested' (i.e. 'corroborated') it changes neither to 'true' nor to 'more truthlike than previous theories'.[20] Critical rationalism refuses the idea that the status of a scientific theory is raised thanks to its corroboration. On the contrary, even the corroborated B-theory is as unreliable and improbable risky guess as it was before the testing. But, on the other side, nothing in the critical rationalism forbids us to form conjectures about anything. That is, *we can form conjectures about any scientific (or other) theory that it is true*. The point is, however, that we are not able to gain positive arguments or good reasons in the favour of our conjecture and thus all what we can do is to test it. This way we start again from scratch. We can only test our conjecture that the B-theory is true. If it succeeds in tests, then nothing new will happen. We are still conjecturing that the B-theory is true. But, to be sure, this conjecture is neither based on the fact that the B-theory passed the tests (i.e. based on its corroboration) nor it is supported by this fact.

If the B-theory fails in tests, then quite different things will happen. For the refutation of some theory to be complete we have to find some counterexample. And precisely in this *discovery of counterexamples* lies another advantage of critical arguments over so called 'positive' ones. If we succeed in finding a counterexample which eliminates our original conjecture (or, if you like, our original belief), then we are making an important *shift* or *change in our opinions*. We have started with a scientific B-theory (or set of problems) and we are ending with (or, more precisely, proceeding to) utterly different hypothesis *incompatible* with

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[16] D. W. Miller: *Critical Rationalism. A Restatement and Defence*. Chicago & La Salle: Open Court Publishing Company, 1994, Chapter 3.
[17] See ibidem, Chapter 3.3 for details.
[18] See ibidem, Chapter 3.4 for details.
[19] See ibidem, Chapter 3.5 for details.
[20] I cannot treat the problem of verisimilitude or truthlikeness in detail here. For useful comments see K. R. Popper: *Conjectures and Refutations*…, Chapter 10; K. R. Popper: *Objective Knowledge*. Oxford: Clarendon Press, 2nd edition 1979, Appendix 2; D. W. Miller: *Critical Rationalism*…, Chapter 10; D. W. Miller: 'Induction: a Problem Solved'…, Section 4.

the B-theory. This is a significant shift in the problem which enables us to move a little bit further in our scientific research.

These considerations are expressed, though only partially, by the following *modus tollens* from classical logic (which also Popper mentions in his first book:[21]

(MT) $((T \rightarrow q) \,\&\, \sim q) \models \sim T$

It is clear from MT-scheme that we 'start' with a theory *T*; then a discovery of counterexample to *T* emerges (that is, ~ *q*) and we 'end' by the refutation of the original theory (~ *T*).[22] The most important move in this 'falsification-scheme' is perhaps the discovery of a counterexample (represented loosely by ~ *q*) for it leads to *the change* of our point of view; that is, it moves us to *the different opinion*, from *T* to ~ *T*. Note, however, that MT-scheme cannot tell us the whole story how such a discovery emerges, because every discovery of something new transcends the possibility of its logical analysis or reconstruction. Nevertheless, MT-scheme surely expresses something very interesting, namely the fact that *we have learned something new*.

Now let us look at the so called 'positive arguments' a bit closer. First, it is not possible to use them to change our mind or to arrive at a different opinion. This is excluded *ex definitione*. 'Positive argument' should establish something and not ruin it. Consider for example the well known *modus ponens*:

(MP) $((T \rightarrow q) \,\&\, T) \models q$

There is no place in MP-scheme for changing or shifting our opinions about the truth or falsity of *T* or *q*. We regard them as true all the time. Of course, someone could object that this is a very unhappy comparison of (MT) and (MP) because the primary purpose of (MP) is not to change but to justify our beliefs or conjectures. I embrace this suggestion but, unfortunately, this is the second deadlock. For the alleged way of the justifiability of 'positive arguments' is blocked by several insoluble skeptical questions as, for example, 'What item in MP-scheme justifies and what item is justified?'. If we are forced to answer in turn that *T* justifies *q*, then another insoluble skeptical question arises – 'What justifies *T*?'. Or, in other words, 'How do you know that *T* is true?'. Every attempt to give a satisfactory answer to this last question leads to the well known regress *ad infinitum*. And if we simply decide to stop it, then it should be clear that we are not justifying anything. We are only asserting or conjecturing that something (say *T*) is true. Yet, we certainly have no good reasons for such conjectures.

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[21] See K. R. Popper: *The Logic of Scientific Discovery*. London: Hutchinson, 1959, Part II, Chapter III, Section 18. (First published as *Logik der Forschung* in Vienna: Springer, 1934.)

[22] I put the words 'start' and 'end' in quotation marks because, according to Popper, there are no absolute starting and ending points in science – scientific research is in some sense cyclic or unended. See for example K. R. Popper: *Objective Knowledge*. Oxford: Clarendon Press, 1972, pp. 243 ff.; K. R. Popper: *Unended Quest. An Intellectual Autobiography*. London: Routledge, 1993 for details.

These considerations result in a provoking claim: *so called 'positive arguments' are utterly redundant because they are useless or unusable.* On the other hand, *critical arguments are usable and useful*, they can be used to criticize and thus to change our opinions, beliefs or conjectures. To be sure, they are unusable for justifying too, but no one should expect that they should justify anything. This is indeed not their purpose. After all, a critical rationalist no longer bothers about the unusability of 'positive arguments' because he/she has abandoned searching for *any* justifying arguments long time ago. A rationalist – to be a *critical* rationalist – needs only *critical* arguments, and a critical rationalist – to be a *rationalist* – needs only *critical activity*. So called 'guarantees', 'warrants', 'good reasons' or 'positive arguments' etc. are not necessary at all. Neither for his/her criticism nor for his/her rationality. This is the end of poor good reasons.

Conclusion

The following straightforward Popperian answer emerges from the extended Kantian question 'Is rational natural science possible?': 'Rational natural (empirical) science is possible as far as we do not abandon searching for counterexamples to suggested scientific theories'. To be more precise, science is *empirical* because it is *falsifiable* and scientific activity is *rational* because it is a *critical* activity, an attempt to refute or falsify scientific theories. Surely, this activity can assure us *nothing*, our attempts to find counterexamples to scientific theories may fail. But if we succeed, then '[e]very refutation should be regarded as a great success',[23] for the refutation contributes to the discovery of our mistake and '[the] rationality consists in the fact that we learn from our mistakes'.[24] This is indeed all what human rationality requires.

[23] K. R. Popper: *Conjectures and Refutations*. London: Routledge & Kegan Paul, 1963, p. 243.
[24] Ibidem, p. 222.