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Is Truth Perspectival in Science? Viability of Pragmatic Account of Scientific Truth for Mixed-Methods Research

Abstract. This paper attempts to assess the viability of M. Frápolli's pragmatic account of scientific truth in the context of moderately pluralistic view of research process. Mixed-methods approach, which embodies the moderately pluralistic view in the social sciences, combines various methods, i.e. quantitative and qualitative, within a single research process in order to cross-validate and integrate the results into a coherent answer to the initial problem. *Prima facie* the pragmatic account of scientific truth squares well with the pragmatic justification of the mixed-methods approach, addressing the objections on content incommensurability or meaning ambiguities. However, as I argue, the pragmatic account of truth may not be able to significantly contribute to resolve the problem of 'institutionalized assertion of falsehood', unless it will accommodate some form of moderately pluralistic view of the research process allowing for cross-validation of tentative assertion of the purported scientific truth.

Keywords: theory of truth, mixed-methods, scientific truth, John Snow, causality, delimiting counterfactuals

Czy prawda w nauce jest względna? Ocena zasadności pragmatycznej koncepcji prawdy naukowej w kontekście metod mieszanych w procesie badawczym

Abstrakt. W artykule podjęto próbę oceny zasadności M. Frápolli pragmatycznej koncepcji prawdy naukowej w kontekście umiarkowanie pluralistycznego ujęcia procesu badawczego. Podejście mieszane, które realizuje to umiarkowanie pluralistyczne stanowisko w naukach społecznych, łączy różne metody, czyli ilościowe i jakościowe, w ramach jednego procesu badawczego w celu walidacji krzyżowej i zintegrowania wyników w spójną odpowiedź na problem badawczy. *Prima facie* koncepcja pragmatyczna prawd naukowych jest zasadniczo zgodna z pragmatycznym uzasadnieniem podejścia mieszanego. Jednak pragmatyczna koncepcja prawdy nie rozwiązuje problemu „zinstytucjonalizowanej asercji fałszu", o ile nie przyjmie jakiejś formy umiarkowanie pluralistycznej wizji procesu badawczego, która umożliwia walidację krzyżową asercji rzekomej prawdy naukowej.

Słowa kluczowe: teoria prawdy, metody mieszane, prawda naukowa, John Snow, przyczynowość, zdania kontrfaktyczne rozgraniczające

1. An Outline of the Pragmatic Account of Truth

The exposition of M. Frápolli's elaboration of a pragmatic account of truth follows her recently published book (Frápolli 2013). Admittedly, far from complete, it will highlight only the elements of the account pertaining to scientific truth.

Frápolli follows S. Haack in her fundamental presupposition "which is often neglected: that although there are multiple truths, truth is unique" (Frápolli 2013, 3).

The major alternative accounts of truth in the literature have become so specialized that they neglect it:

> The situation is like the one depicted in the Indian tale of the Elephant and the Blind Men, in which there are precise and appropriate analyses of partial features while an approach to the whole phenomenon is missing. (Frápolli 2013, 3)

One way to circumvent this deficiency, Frápolli claims, is to propound the view that "the notion of truth performs exactly the same role in each theoretical or practical context in which it appears". Thus, in consequence, the following turns out false: "whether there are different kinds of truth … implies that the notion of truth acquires different features depending on the kind of discipline to which it applies" (Frápolli 2013, 19). This claim makes the pragmatic account of truth not only naturally extendable from ordinary to scientific truths, but also yields a uniform account across different scientific disciplines.

Frápolli's account of truth characteristically focuses on the role of truth ascriptions and their pragmatic roles:

> From a pragmatic point of view, truth ascriptions are means of endorsing contents that have being asserted in a different context. They supply an instrument for stressing that a particular content can be used safely, an instrument for moving contents across contexts and, by so doing, allowing contents to have effects in contexts different from those in which they were asserted for the first time. Besides, they permit the endorsement of indeterminate or even infinite sets of propositional contents and the exhibition of the inferential relations among their members (Frápolli 2013, 12).

Truth ascriptions, given their pragmatic role, allow the users to transfer the content to new contexts:

> Truth always appears in assertive acts in which truth terms have the pragmatic task of making something explicit as opposed to contributing a new component to the expressed content. They make explicit the speaker's involvement in an act of assertion as well as something else. This "something else" that they make explicit is dependent on the particular kind of truth ascription concerned (Frápolli 2013, 71).

Thus, truth ascriptions have the important function of "restricting the available range of interpretations of what is said" (Frápolli 2013, 73). The ability of truth ascriptions to "extend the scope of the act to a new context" Frápolli refers to as their "horizontal role" (Frápolli 2013, 79).

This minimalist account of truth holds that there is no metaphysical account of truth and that: "The expressive character of truth ascriptions, in its negative characterization, implies that the ascription of truth to a proposition doesn't add a new ingredient to the content held to be true" (Frápolli 2013, 76).

In addition to the exhibitive function and their horizontal role, truth ascriptions:

part in acts of assertion, acts in which the agent endorses a content and commits himself to its inferential aspects. An asserted content is one that is ready to be used as settled information. When a content is thus distinguished, the pragmatic significance of the whole act is naturally seen as a way of inserting the content in question into the set of potential premises. This pragmatic function will be dubbed the "vertical role" of truth-ascriptions. (Frápolli 2013, 78)

The pragmatic account of truth is primarily intended for the ordinary use of the notion of truth and its linguistic counterparts. However, in the final chapter of the book Frápolli provides an explicit, although succinct, account of scientific truth (Frápolli 2013, 130–131). She acknowledges that the account is continuous with the one advanced with regard to ordinary use of the notion of truth:

The general procedure for applying truth to scientific theories is exactly the same as the procedure for applying truth to everyday beliefs: in order to be in a position to declare that *p* is true, one has to see, check or prove that *p*. The explicit recognition of truth comes afterwards—the implicit recognition is the act of assertion. (Frápolli 2013, 131)

She uses an example of the statement "Smoking is a risk factor for lung cancer". Prior to its assertion by the scientific community, the statement – Frápolli admits – "has to undergo the appropriate kind of tests" (Frápolli 2013, 130). And then, if successful, can be asserted or presented as true.

In general:

The procedure is then the following: a hypothesis is proposed, it is tested and once it passes the appropriate filters, it becomes accepted. Only then, is it ready to be presented as true or, what amounts to the same thing, to be asserted. (Frápolli 2013, 130)

The conclusion then, regarding the assertion truth of scientific statements is determined by the proceeding of scientific method:

If we are happy with the procedures by means of which the scientific community establishes that a content or a whole theory is safe, then this is all that is needed to understand the role of truth, since it is only applied to some content or theory established by scientific procedures. (Frápolli 2013, 131)

Of course, the verdict of 'scientific procedure' cannot be systematically questioned outside of scientific community. Therefore, once granted by the procedure, the assertion of truth of scientific statements may seem inevitable. Considering the obvious fact that it is the task of scientific community – rather than of an epistemologist – to design the procedure, the pragmatic account of scientific truth becomes indeed minimalist as it seems to relegate the task to the practice of science.

2. Problem for pragmatic account of scientific truth: "institutionalized assertion of falsehood"

Frápolli's pragmatic account of truth is primarily covering natural language utterances. However, as she admits, it naturally extends to capture scientific truths. In the present section I will a pose problem for the pragmatic account of scientific truths, and in the following section I will attempt to formulate some possible ways to alleviate it.

It appears that from both theoretical and practical view one of the major challenges in the surmountingly complex scientific research is the problem of plurality of approaches to the research domain at hand. In my discussion I will use the textbook case study of the 19th century discovery of the cause of cholera by John Snow (Kawalec 2006, ch. 1; Paneth et al. 1998; Paneth 2004)[1]. Because of the severity of cholera epidemics in the 19th century London, the British parliament established a dedicated commission, The Board of Health, whose tasks included identification of the cause of cholera. The task was relegated to the Commission for Scientific Inquiry (CSI hereafter), which consisted of the most prominent scientists of the time. The task was almost insurmountable, as over 30 variables were recognized as relevant and some of the prior studies led to very precise – although, as proven later, spurious – 'laws', in particular – the infamous W. Farr's 'law of mortality'.

Snow, on the other hand, was a physician who at an early stage of his career treated cholera patients in the early 1830's. He observed the relevant symptoms and considered two possible kinds of causes: organic and non-organic. The study of blood samples and also of the process of development of the disease in the host organism led Snow to conclude that the cause was a hypothetical and – at that time, for him – unobservable water-borne parasitic micro-organism. To confirm the hypothesis, he undertook a large-scale natural experiment (described in the next section) and also traced each particular case of cholera contraction to its index case or the origin of the disease[2].

The evidence confirming his hypothesis was overwhelming and he detailed it in a report delivered to CSI in 1855. However, CSI adopted so called 'miasma' theory, according to which the disease is caused by poisonous air, which in an unpredicted manner catalyzes evaporations from decaying organic matter under some unidentified weather conditions[3]. In its long report (almost 400 pages) CSI confirmed this

[1] In my book (Kawalec 2006) I also discuss in some more detail the discovery of the causal dependence between developing lung cancer and smoking, but Snow's case is an analogous, but more perspicuous illustration.

[2] For a detailed description see (Paneth et al. 2005, 1545-1548; Kawalec 2006, 31–61).

[3] Interestingly, James Hassall, who was a member of CSI, in his part of the CSI report provided a drawing of a microscopic observation of a cholera patient's blood sample with – what was later recognized as – *vibrio cholerae*, i.e. the bacteria causing the disease. However, on miasma theory he interpreted the presence of this parasitic organism in blood samples as an effect, rather than a cause, of cholera.

hypothesis as identifying the cause of cholera, and almost totally ignored Snow's report[4].

It took almost next 30 years – and hundreds of thousands of cholera causalities in subsequent outbreaks of cholera – to experimentally confirm by E. Koch that Snow was right.

This leads to a problem for Frápolli's account of scientific truths presented in the previous section. The problem – which I refer to hereafter as 'the problem of institutionalized assertion of falsehood' – is which procedure among the simultaneously used alternatives – i.e. CSI's or Snow's – should be recognized as the one legitimizing truth assertion by the scientific community. Of course, it was CSI that came up with an institutionalized assertion and – given its authority – dominated the opinion of the contemporaneous scientific community. In the next section I outline a solution to this problem on the basis of mixed-methods approach (Kawalec 2014).

In consequence, problem leads to an incoherence between two accounts of truth on the basis of the pragmatic conception arising from the discrepancy between the two institutionalized assertions of truth, namely CSI's and Koch's. CSI tested its hypothesis in the most rigorous manner available and using the most sophisticated scientific instruments. From that perspective – on the pragmatic account of truth – CSI's assertion of the cause of cholera would appear to be a genuine truth assertion. However, as amply evidenced by Snow, and conclusively demonstrated experimentally by Koch, this assertion was plainly wrong. It seems that it is counterintuitive to admit – as apparently Frápolli's account of truth would commit us to – that both CSI statement and Snow-Koch statement regarding the cause of cholera were 'true'. There is a fundamental difference between 'procedurally warranted assertion' and 'scientific truth', as the case illustrates. So, the pragmatic account of truth seems to be presuming an untenable uniqueness of the procedure adopted by scientific community, but it is also lacking a criterion to delineate between institutionalized assertions within scientific community and those which are – at least approximately – true.

3. Moderately pluralistic view of research process with cross-validation

It is not my objective here to elaborate – even a partial – theory of scientific truth. However, as evidenced by the above outlined discussion (Frápolli 2013, 130–131), the pragmatic theory of truth incorporates a general account of how scientific statements are analyzed during the research process in order to be presented as true and asserted by the scientific community.

[4] The only concession to Snow's report was the explicit recognition that water is a contributing – but not the active – factor in cholera epidemics.

Below, I propose an outline of a moderately pluralistic view of the research process which may complement the pragmatic account of scientific truth. However, this description covers only the kind of scientific statements which pertain to the social sciences and in particular to the areas amendable to mixed-methods approaches (the term is explained in what follows).

The description of the research process leading to assertion of scientific truths in (Frápolli 2013, 130–131) seems to presuppose that it is constituted by a linear sequence of steps which ultimately lead to the unique outcome as the solution of the initial research question. In that sense it would juxtapose the traditional 'unity-of-science' view of the research process. The latter constitutes an inherent part of the radical version of scientific monism. In general, scientific (radical) monism is characterized as the view that (Kellert, Stephen H. et al. 2006, x):

1. *the ultimate aim of a science is to establish a single, complete, and comprehensive account of the natural world (or the part of the world investigated by the science) based on a single set of fundamental principles;*
2. *the nature of the world is such that it can, at least in principle, be completely described or explained by such an account;*
3. *there exist, at least in principle, methods of inquiry that if correctly pursued will yield such an account;*
4. *methods of inquiry are to be accepted on the basis of whether they can yield such an account; and*
5. *individual theories and models in science are to be evaluated in large part on the basis of whether they provide (or come close to providing) a comprehensive and complete account based on fundamental principles.*

An opposite position, namely radical pluralism, may straightforwardly be characterized as the outright rejection of the above theses 1.-5. Both positions seem to share serious drawbacks, which make them untenable (Kawalec 2012; 2013).

A more moderate pluralistic position rejects the claim 1., but for any research domain sets it as a desirable outcome "to establish a single, complete, and comprehensive account of … the part of the world investigated by the science", which is based on diversified sets of fundamental principles. It also rejects 2., leaving it as an empirical question whether "the nature of the world is such that it can, at least in principle, be completely described or explained by such an account". And finally, it rejects 3., but endorses search for methods of inquiry which – if pursued correctly – will yield such an account.

For a broad range of research domains within the social sciences a moderately pluralistic methodology is implemented by the mixed-methods approach (Kawalec 2014). Within a single research process it combines both quantitative and qualitative methods, which establish a comprehensive answer to the research question. By

means of meta-inferences (Venkatesh et al. 2013) the results of different methods are cross-validated prior to forming an integrated answer to the research question.

Snow, although not being fully aware of it, also used mixed-methods approach to answer the pervasive question: What causes cholera? He cross-validated his findings by confronting – what is now recognized as – qualitative process tracing for each individual cholera casualty against the results of the quantitative natural experiment and the quasi-experimental intervention preventing the spread of cholera outbreak in the neighborhoods of the Broad Street pump (Snow's methods are succinctly characterized in what follows).

In the preceding section, I outlined the problem of institutionalized assertion of falsehood as a difficulty for the pragmatic account of scientific truth. The problem was to identify a criterion which would differentiate between the process leading to institutionally warranted assertion of falsehood in the case of CSI and the institutionally ignored one in the case of Snow. The failure of the pertinent scientific community to identify a truth-tracking procedure preceding its assertion of a scientific statement constitutes a difficulty for the pragmatic account which identifies the assertion with a warranted truth ascription.

In what follows, I try to address the problem by describing a conception of meta-inferences, which seems to explicate the intuitively obvious difference between the research procedure used by CSI and Snow. They both initially faced the same research question: What causes cholera? However, they conceptualized it against different kinds of theoretical and background knowledge and then subsequently proceeded in accordance with divergent research designs. So, I claim that the difference is mainly due to their different use of *delimiting counterfactuals* (Kawalec 2012). The latter significantly differ from the usual causal counterfactuals[5] which aim at establishing causal dependencies. The delimiting counterfactuals frame the research question and consequently the research design, which then, in turn, is operative in providing the data for inferences using causal counterfactuals. Delimiting counterfactuals serve the purpose of identifying the necessary conditions of the causal dependence at hand and by the same token to eliminate as spurious the kinds of dependencies which do not satisfy the condition[6]. The delimiting counterfactual reasoning allows researchers to narrow down the initial question and to design the research plan accordingly. Let me illustrate it with the case of the discovery of the cause of cholera.

The evidence collected by Snow when treating cholera patients[7] led him to formulate several counterfactuals like "Have the patient contracted cholera, he must

5 'Causal counterfactual' is understood here as defined by (Menzies 2011, 193), namely as a state of affairs *p* is a cause of totally separate state of affairs *s* iff both default and deviant counterfactuals hold for *p* (antecedent) and *s* (consequent).. The definition entails that causal counterfactuals satisfy Mackie's INUS condition.

6 Thus, they are presumed by causal counterfactuals in Menzies's definition (corresponding to a form of 'deviant counterfactuals' on his account).

7 For instance, he observed that all symptoms are related to the digestive system of the patients and that there is an incubation period between disease contraction and observable symptoms (Kawalec 2006, ch. 1).

have had drunk contaminated water". By inspecting blood samples of cholera patients and not being able to identify any toxic substance he rejected as false counterfactuals like "Have the patient contracted cholera, he must have been intoxicated by breathing poisonous air". This delimiting procedure led him to identify necessary conditions for cholera contraction and to reformulate the initial broad question as: Is cholera caused by water-borne parasitic organism? This reformulated research question is specific enough to frame and constraint the remaining stages of the research process (Haig 2014, ch. 6). Therefore, the research question reformulated by means of delimiting counterfactuals is used to design the subsequent stages of the research process, in particular data acquisition and methods of inference. For Snow this resulted in the design of the natural experiment and other data gathering methods, which ultimately provided conclusive evidence confirming the initial hypothesis of cholera being caused by a parasitic water-borne organism. Snow's ingenuity lies in the fact that he – unlike his contemporary Hassall – was not able to observe the bacteria, and nonetheless proved its causal efficacy.

The use of delimiting counterfactuals in reformulating the initial research problem enabled Snow to design mixed methods research plan. Using delimiting counterfactuals he rejected as false the alternative answers to the initial question on the causes of cholera disease. Once left with the specific hypothesis "a parasitic water-borne organism parasitic organism?", his subsequent research was focused to gather and analyze the evidence relevant for the relation between cholera and water contamination[8]. It was mainly Snow's persistence which led him to use every possible opportunity to test the hypothesis. In effect, his endeavors resulted in proceeding which may well be recognized as mixed-methods approach.

There were essentially three kinds of methods he used. First, to each case of a cholera patient Snow applied what is now called "process tracking" (Collier 2011; Mahoney 2012; Bennett 2008), i.e. utilizing the available evidence he used qualitative assessment of the generative process leading to the contraction of cholera for a particular patient. If successful, it either led to the description of a direct contact with some other cholera patient, or the identification of the source of contaminated water (Paneth et al. 2005). In either case, the qualitative process-oriented studies confirmed the hypothesis.

Second, Snow designed the famous natural experiment, where two large groups of inhabitants of the southern district of London were naturally divided between 'treatment' and 'control' group, because of two different private water suppliers. One of the suppliers observed the earlier regulation of the Board of Health and moved the water intake to the northern part of the Thames, which was much more clean than in the case of the other supplier, which retained the old water intake in the

[8] There is not enough space here to elaborate it in detail, however, this part of Snow's research follows J. Mackie's INUS condition for identification of the set of jointly sufficient conditions for causal dependence.

southern part of the river. During the first week of cholera outbreak in this district for every cholera patient Snow recorded the water provider and proved that there was a significant correlation between the quality of water and the ratio of cholera incidence of 9:1 among the users of contaminated water. This is still recognized in epidemiology as a valid large-scale quantitative study (Susser 1973).

Third, Snow stopped the incidence of new cholera contractions around the Broad Street pump by removing the handle of the pump. This quasi-experimental method – using the now called "spot map" – also confirmed Snow's hypothesis (Friedman 1999).

Using mixed methods Snow counterfactually inferred that the minimal active factor satisfying the INUS condition for causal dependence (Mackie 1965) is tantamount to the infection of the host's digestive system with the parasitic organism, which in majority of cases was transmitted through contaminated water.

The conclusion for the pragmatic account of truth might be to modify its presumed view of scientific research along the lines of the propounded here moderately pluralistic view which allows for cross-validation of alternative assertions by the delimiting counterfactual reasoning, illustrated with Snow's proceeding. It marks the key difference between the truth-tracking assertion of Snow and the assertion of CSI, authorized by its institutional legitimacy, but referring to a spurious correlation. Of course, CSI also constrained the initial problem to the form: Is cholera caused by miasma? However, the lack of delimiting counterfactual reasoning in this case is evident in CSI's limitation to purely quantitative methods. Every day it measured over 20 different weather parameters, most of which were related to the Thames, its temperature, humidity in the surrounding areas and the rate of evaporations. It also used the then most sophisticated techniques for measurement of air contamination and microscopic observation techniques, including the analysis of cholera patients' blood samples. So, CSI formulated the modified research question in such a way that it framed its research design to focus exclusively on sufficient (in the sense of INUS) conditions for causal dependence of cholera upon miasma and thus it did not allow for cross-validation. From the perspective of the research design adopted it may seem natural to disregard then as irrelevant any evidence which is contrary to the proposed hypothesis, in particular the kind of evidence brought forward to CSI by Snow's report.

4. Conclusion

Frápolli's account of truth seems to presuppose a linear research process determining a unique assertion of tentative scientific truth by the pertinent scientific community. However, in case of institutionalized assertion of falsehood this will lead to a counterintuitive result, where the pragmatic account will commit us to acknowledge as true the falsehood in virtue of its institutionally and procedurally

legitimized acceptance. The paper presents a possible solution to this problem as a moderately pluralistic view of the research process which allows for cross-validation which precedes the assertion of scientific truth.

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