The Formalist Picture of Cognition

Towards a Total Demystification

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Abstract. This paper represents a philosophical experiment inspired by the formalist philosophy of mathematics.

In the formalist picture of cognition, the principal act of knowledge generation is represented as *tentative postulation* – as introduction of a new knowledge construct followed by exploration of the consequences that can be derived from it. Depending on the result, the new construct may be accepted as normative, rejected, modified etc. Languages and means of reasoning are generated and selected in a similar process.

In the formalist picture, all kinds of "truth" are detected intra-theoretically. Some knowledge construct may be considered as "*true*", if it is accepted in a particular normative knowledge system. Some knowledge construct may be considered as *persistently true*, if it remains *invariant* during the evolution of some knowledge system for a sufficiently long time. And, if you wish, you may consider some knowledge construct as *absolutely true*, if you do not intend abandoning it in your knowledge system.

And finally, in the formalist picture, all kinds of ontologies generated by humans can be demystified by reconstructing them within the basic solipsist ontology simply as hypothetical branches of it.

Key words: truth, persistent truth, absolute truth, formalism, pragmatism, constructivism, solipsism, knowledge construct, tentative postulation, ontology, coherence, wrong knowledge, cognition.

1. Introduction

This paper represents a philosophical experiment inspired by the formalist philosophy of mathematics and by the pluralism of formal languages and ontologies modeled and meta-modeled by computer scientists. From the formalist point of view, any knowlegde system can be best understood as a more or less definite "engine of reasoning" governed by the language "syntax", a set of assumptions and means of reasoning. And, from the computer science point of view, any vocabulary, taxonomy, conceptual model etc. may be considered, in a sense, as an ontology.

From these points of view, *solipsism* represents an ontology that is based on a minimum of metaphysical assumptions. Thus, solipsism represents, in a sense, *the most fundamental ontology*. If so, couldn't *all* the other kinds of ontology be reconstructed within solipsism simply as hypothetical branches of it?

The idea of some ontologies being more fundamental than other ones is not completely new. For example, Riegler (2005: 62) concludes: "Therefore, the EE perspective is a subset of RC." (EE stands for evolutionary epistemology, RC – for radical constructivism) Similarly: "Thus realism becomes a special case of constructivism, which tries to absolutize its own construction of reality by setting it equal with an independent reality." (Mitterer 2008: 160).

However, Russell (2004: 729) argued for the opposite thesis: “James' doctrine is an attempt to build a superstructure of belief upon a foundation of skepticism, and like all such attempts it is dependent on fallacies.”

But let's try once more, nevertheless...

2. “Wrong” Knowledge and Knowledge Constructs

According to Plato's famous and still fascinating formulation, knowledge is “justified true belief”. But, as I'm trying to argue in (Podnieks, 2009b: 5), it's not a good idea, 2300 years after Plato, to start philosophy of cognition from such a complicated notion as “justified true belief”. Mainly, people don't know in advance (sometimes – for centuries), which parts of a particular piece of knowledge are, in fact, “true”, and which aren't. Hence, the somewhat paradoxical term – “wrong knowledge”. For any philosophy of cognition, "wrong" knowledge should be as prominent a subject as "true" knowledge. Therefore, when speaking about knowledge, I mean also such “overthrown” (but nonetheless, prominent) pieces of it as, for example, Aristotelian mechanics or Ptolemy’s theory of epicycles.

The widely spread obsession with “truth” and the rejection of solipsism, pragmatism, formalism and constructivism is caused, I think, by a poor understanding of the knowledge *structure*. Many people understand knowledge as an unordered, unconnected heap of separate propositions and beliefs that possess separate “meanings” and that are believed to be “true” or “ false” separately. But even our everyday knowledge includes *structures* – propositions are related via (imperfect!) reasoning – to say the least. Much more important units of knowledge are not reducible to sets of propositions: “adequate” and “wrong” models, “successful” and “overthrown” theories, ontologies, methods, means of reasoning, paradigms, languages, etc.

To capture the situation in an adequate way, a more general notion is needed covering all the above-mentioned ones. I would propose “*knowledge construct*” as a general term for all kinds of knowledge elements, structures, methods, means of reasoning, languages, hypotheses etc. For a similar purpose, Glasersfeld (2001:31) is using the term “conceptual construct”.

The body of human knowledge generated during thousands of years does not represent an arbitrary heap of unordered, unconnected fragments. There are remarkable signs of order, connection, inference, evolution, convergence and success in it. Some of the knowledge constructs were used only temporary: celestial spheres, Aristotelian mechanics, Ptolemy’s epicycles, phlogiston, caloric, aether, etc. But some other (perfect and less perfect, stable and evolving) constructs are still used in many of the successful parts of knowledge: heliocentric planetary systems, stars, galaxies, molecules, atoms, photons, cells, DNA, neurons, etc. Should we ignore large parts of our intellectual heritage, or should we try understanding all of them – to improve the cognition process?

3. The Formalist Philosophy of Mathematics

Let's consider the prototype of the proposed philosophical experiment – constructing and exploring of axiom systems in mathematics.

Some people think that formalist philosophy of mathematics was discarded as “ridiculous” many years ago. However, this was “achieved” by replacing a real philosophy by its caricature – “formalism representing mathematics as a meaningless game with symbols”. Of course, this caricature was provoked by an extremely naive idea that the opponents of formalism are obsessed with – by the idea of each word possessing a separate independent “meaning”. By using a similar “method” one could easily reduce to the most naive Platonism even the most “subtle” versions of

"mathematical realism".

According to the (*real*) formalist philosophy of mathematics, in principle, *one may postulate any axioms that make sense* (whatever it means), and explore the consequences that can be derived from these axioms (by applying of some accepted explicit means of reasoning, i.e. of some logic). Sometimes, the exploration takes many years. Of course, the axioms can't be justified ("proved") in the mystical absolute sense many people are awaiting. But, nevertheless, during the years of exploration, the axioms *may be (and are!)* treated by mathematicians not as mere hypotheses, but as "7x24 true" statements, i.e. not as attempted descriptions of some external "world", but as the "world" itself. In mathematics, such a "devoted" way of exploration ("believing axioms") has shown as very efficient (Podnieks, 1992: Chapter 1).

For humans, a "devoted" (in fact, Platonist) thinking is the best way of working with imagined (postulated etc.) structures. As put by Hersh (1979: 32): "... the typical working mathematician is a Platonist on weekdays and a formalist on Sundays." My interpretation: I'm *Platonist on working days* - when I'm doing mathematics (otherwise, my "doing" will be inefficient), and I'm *Formalist on weekends* - when I'm thinking "about" mathematics (otherwise, I will end up in mysticism). Thus, as a technical tip, Platonist thinking is extremely useful.

According to the formalist interpretation of Gödel's incompleteness theorem (Podnieks, 1992: Chapter 6), if the axiom system is universal enough, then its exploration leads inevitably either to contradictions or to unsolvable problems. Assume, this moment has arrived. Should additional axioms be introduced to enable solving of the otherwise unsolvable problems? Or, to avoid contradictions, some of the axioms should be dropped, modified or replaced? Which ones? Should we, in order to avoid the contradictions, first, try dropping the hypotheses that were adopted as axioms *later* than the other ones? Or, in fact, contradictions are caused by some of the earlier axioms that, for many years, are believed to be "more fundamental"? Or even, contradictions are caused by the accepted means of reasoning?

4. Tentative Postulation and the Formalist Picture of Cognition

Let's try applying of the above formalist model of mathematics to the whole of cognition.

In this way, we will obtain the *formalist picture of cognition,* in which cognition consists of generating and adopting assumptions and exploring of their consequences. Namely, in the formalist picture, the main act of knowledge generation is represented as *tentative postulation* – as introduction of a new knowledge construct followed by exploration of the consequences that can be derived from it (by applying of some accepted means of reasoning). Depending on the result, the new construct may be accepted as normative, rejected, modified etc. Languages and means of reasoning themselves are generated and selected, of course, in a similar process.

Thus, if some knowledge construct appears to be successful (or, at least, worth of consideration), one can try *accepting it as normative* and explore the consequences. Of course, usually (but not always entirely), such a newly adopted construct must fit somehow into the system of constructs already accepted. During the period of exploration, from the point of view of the involved group of "devoted" researchers, the new construct may be considered as "true", i.e. not as an attempted description of some external "world", but as the "world" itself. If you wish – as "direct representation of reality (ADR)" – the term used by Weisberg (2007).

But if the accepted (or attempted) system of knowledge constructs (*knowledge system*) starts causing problems (incompleteness, anomalies etc.), then it may be impossible to retain it as it is. Should additional constructs be introduced to overcome incompleteness? Or, to manage anomalies,

some of the accepted constructs should be dropped, modified or replaced? Which ones? The latest ones? Or, in fact, the problems are caused by the constructs that are believed to be "more fundamental" and are counted already as "background knowledge"? Or, even, the problem is caused by the accepted means of reasoning or other "first principles" so beloved? Or, by the language used to express them? Thus, a kind of Kuhnian scientific revolution may be necessary...

Of course, the idea of knowledge being generated by means of tentative postulation isn't completely new. It can be traced back to Berkeley, Hume, Kant, Mach and Einstein – to mention only the most prominent names. Pragmatism and constructivism are based on similar ideas. The difference? Formalism rejects implicit knowledge constructs completely.

Sometimes, people are fighting each other by means of "thought experiments", by referring to "unavoidable intuitions" etc. From the formalist point of view, any kind of such arguments is, in fact, an application of some *background knowledge* that is not formulated explicitly. Any background knowledge is, in fact, some implicit ontology or theory that is considered to be more fundamental than the ideas to be justified or refuted. Formalists would advice to invest more effort in formulating the background knowledge explicitly.

5. Building the Traditional Scientific Ontology within Solipsism

Consider the "the body of human knowledge generated during thousands of years", about which I can read in books, papers, on the internet etc. Is it a product of *my* mind only? Or, it is a mystification ("simulated reality") created by some superior civilization playing with me? Or, it was generated by people very much like me? Of course, nobody will ever be able to decide this trilemma in the mystical absolute sense many people are awaiting. But, nevertheless, until now, the third alternative – "human race with me as part of it" – has been much more successful than the first two ones. Isn't it an efficient way of bringing the best possible order into my personal perceptions? Hence, it makes sense to create, within my basic solipsism, a specific hypothetical ontology, in which the knowledge construct "human race with me as part of it" is introduced as normative. The users of this hypothetical ontology are considering the existence of "human race with me as part of it" as an absolutely true "fact", as the "world" itself. But, exploration of alternatives remains allowed, of course...

Similarly "unprovable", but extremely successful has shown the reality construct – "Universe with human race as a temporary part of it". Isn't it an efficient way of bringing even more order into the perceptions of mine and my human fellows? So, let's add this construct as normative to the above-mentioned hypothetical ontology. The users of this ontology will consider the existence of the "Universe with human race as a temporary part of it" as an absolutely true "fact", as the "world" itself. Let's call this ontology the *traditional scientific ontology*. But, exploration of alternatives remains allowed, of course...

Isn't this approach a kind of "hypothetical realism" rejected by radical constructivists (Riegler, 2005: 60)?

I agree that the naive idea of "human knowledge approaching reality" should be applied with care. There are no purely extra-theoretical ways of "measuring the distance" between some theory T and reality. To test predictions of models generated by T, we need, at least, some background theory governing our experiments.

For example, to "measure the accuracy" of Newtonian mechanics, plain everyday background knowledge will not help. Instead, we must use some theory allowing observation of objects moving at speeds comparable to speed of light. Or, some theory allowing observation of subtle effects like

as perihelion precession of Mercury. But the best explanation of the success and limitations of Newtonian mechanics is, of course, its successor theory – Einstein's relativity theory. More on this – in Sections 7-9.

6. Building the "Santa Claus Ontology"

For a child, the "Santa Claus hypothesis" represents a simple and natural explanation of various happenings around Christmas. Thus, for a child, it makes sense to create a specific hypothetical ontology, in which the knowledge construct "Santa Claus" is accepted as normative.

However, as time goes on, belief in the existence of Santa Claus starts causing unsolvable problems – "experiential surprises and disappointments" – as put by Hookway (2008). At this moment, people change their ontology. The "Santa Claus hypothesis" is replaced by a less romantic explanation. Sadly enough, but for a child who dies before that moment, the "Santa Claus ontology" remains undestroyed, and the existence of Santa Claus remains forever an absolutely true "fact", as the "world" itself.

Thus, aren't the cognitive mechanisms generating the "Santa Claus ontology", the various religious ontologies, the traditional scientific ontology, and all the other kinds of ontologies generated by humans, in a sense, identical?

7. Knowledge Systems and Truth

Following this formalistic route, what should happen with the notion of "truth"?

Of course, at the level of the fundamental ontology, as put by Heinz von Foerster: "Truth is the invention of a liar".

But, if we start building more specific ontologies and theories by adopting some knowledge constructs as normative? Then, should't we define truth intra-theoretically – *with respect to a particular normative knowledge system*? As put by Putnam (1979: 236): "... for a strong anti-realist truth makes no sense except as an intra-theoretic notion."

Thus, our definition of "truth" could be as trivial as follows: *some knowledge construct may be considered as "true", if it is accepted in a particular normative knowledge system* (i.e. it is postulated or can be derived by using the means of reasoning accepted in that system). "Normative" might mean here normative for me, for a research project, for some group of researchers, for some larger community etc.

The idea of defining truth intra-theoretically can be traced back to the so-called *coherence theory of truth*, which "... states that the truth of any (true) proposition consists in its coherence with some specified set of propositions" – as put by Young (2008). However, for a formalist, it looks strange that the selection of languages and means of reasoning is left out here. How could "cohere" propositions in an unstructured heap of them? Or, (the so-called "natural") language and means of reasoning are taken for granted and perfect?

8. Evolution of Knowledge and Persistent Truth

Let us return to Putnam (1979: 236) again: "... he [antirealist – K.P.] tends to be skeptical about the idea of "convergence" in science – he does not think our theory is a better description of the same entities that Archimedes was describing."

Indeed, we would get into trouble, if we would stop at our trivial intra-theoretical notion of truth, and would ignore the *evolution of knowledge* and the remarkable signs of convergence in it. But shouldn't we better to continue following our intra-theoretical route, and try *detecting this convergence intra-theoretically*? As time goes on, new theories are replacing the old ones, but during this process, don't some of the knowledge constructs remain *invariant*? Should we ignore this fact, or should we try using it to improve the cognition process?

For example, what kind of "evidence" do have physicists in favor of the "existence" of quarks? According to the actual theory, quarks can't be observed even in principle. "For the current purposes, this construct works fine, but will this situation continue in the future? If not, quarks will be removed from the picture like as phlogiston and aether were removed. But what if quarks will be retained as a construct in *all* future physical theories? Do physicists need more than this kind of *invariance* to claim the "real existence" of quarks and believe in having a "direct representation" of them?" (Podnieks, 2009a: 4)

The idea that a really useful notion of truth can be achieved only by taking into account the evolution of knowledge can be traced back to James (1975: 106): something is true, if it is not only convenient for the moment, but if it is "expedient in the long run... and on the whole".

Or, as put by Rorty (1982: XXVIII): "... pragmatist refused to accept the Philosophical distinction between first rate truth-by-correspondence-to-reality and second rate truth-as-what-is-it-good-to-believe. ... Pragmatism denies the possibility of getting beyond the Sellarsian notion of "seeing how things hang together" – which, for the bookish intellectual of recent times, means seeing how all the various vocabularies of all the various epochs and cultures hang together."

Thus, people of "various epochs and cultures" aren't simply playing with their truths-as-what-is-it-good-to-believe as an unstructured heap. Since centuries, people are trying to construct "various vocabularies", i.e. (ignoring Russell warning) "superstructures of belief upon a foundation" of their truths-as-what-is-it-good-to-believe. And sometimes, they are trying to make the most successful of their "vocabularies" normative.

Thus, we could extend our intra-theoretical definition of truth as follows: *some knowledge construct may be considered as persistently true, if it remains invariant during the evolution of some knowledge system for a sufficiently long time*.

How long exactly? It may depend... The real thing is the very phenomenon of invariance, and not the way how people categorize it – as "truth" or otherwise.

9. Absolute Truth

As put by Josef Mitterer: "Views are true because and as long as we adopt them." (see Gadenne, 2008: 159). Or, by James (1975: 106): "The 'absolutely" true, meaning what no farther experience will ever alter, ..."

Thus, if you wish, you may consider *some knowledge construct as absolutely true, if you do not intend abandoning it in your knowledge system*.

For example, let's ask the following question: *do atoms exist*? "Atom" is a common name of knowledge constructs appearing in various theories: "philosophical atoms" (Democritus), ..., "chemical atoms" (Dalton), ..., "planetary atoms" (Rutherford), "Bohr atoms", ..., modern "nuclear atoms", etc. What do have all these model atoms in common? Are there the same "real atoms" behind all these model atoms? One may reasonably believe it, but it can't be "proved" in the

mystical absolute sense many people are awaiting. The real phenomenon we have here is the *invariance* of atom as a knowledge construct in successive theories. If you don't intend abandoning atoms in your theory, you may continue believing in their existence as in an absolutely true "fact", as the "world" itself.

10. Thagard and Barrett

To my best knowledge, the idea of detecting scientific truth intra-theoretically and with respect to knowledge evolution appears for the first time as the "Deepening Maxim" in the work of Thagard (2007: 41): "If a theory not only maximizes explanatory coherence, but also broadens its evidence base over time and is deepened by explanations of why the theory's proposed mechanism works, then we can reasonably conclude that the theory is at least approximately true."

And, it seems, independently, this idea appears as "Descriptive Nesting" in the work of Barrett (2008: 213) – as "a notion of local probable approximate truth in terms of descriptive nesting relations between current and subsequent theories".

Thus, the best proof of Newtonian mechanics' being approximately true is the explanation of its success and limitations provided by the successor theory – Einstein's relativity theory. Of course, having a successful successor theory – it's a happy situation available only from time to time....

10. Conclusion

For an overview of the main results of our philosophical experiment – see Abstract.

Among the other lessons that could be learned during the experiment the following should be mentioned.

For a formalist, it looks strange that the selection of languages and means of reasoning is left out of a serious philosophical analysis. It seems, usually, the so-called "natural" language and means of reasoning are taken for granted, good enough and even containing "hidden treasures" that may be discovered by means of introspection... In fact, however, languages and means of reasoning are generated and selected in the same tentative postulation process as any other knowledge constructs. I would advice also to invest more effort in formulating the background knowledge explicitly.

So, let's try discovering as precisely as possible the "axiomatic basis" of each kind of ontology that appeared during the history of human knowledge. I.e. let's try building axiomatic models of Plato? Aristotle? Galileo? Descartes? Newton? Kant? Laplace? Hegel? Engels? James? Einstein? Carnap? Popper? Wittgenstein? Putnam at various stages of his philosophical development? For example, is there any *definite* logic in the means of reasoning used by Wittgenstein in his "Tractatus Logico-Philosophicus"?

And, first of all, aren't the cognitive mechanisms generating the "Santa Claus ontology", the various religious ontologies, the traditional scientific ontology, and all the other kinds of ontologies generated by humans, in a sense, identical? I.e. independently of the size of ambitions, isn't "all that" mere tentative postulation?

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