Emergent Knowledge and Its Challenge to Reductionist Thought

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ABSTRACT Key Words: Michael Polanyi, Tihamér Margitay, emergent knowledge, reductionism, machines, standards.
The title of Tihamér Margitay's recent article "From Epistemology to Ontology" refers to a strong interpretation of Polanyi's correspondence between knowing and being that enables ontological claims on purely epistemic grounds. I accept Margitay's final conclusion which rejects strong correspondence, although on entirely different grounds. In addition, I point out that his treatment of Polanyi's ontological claims about machines is based on yet unfounded assumptions about the nature of physics and technical design.

Introduction

Tihamér Margitay's essay "From Epistemology to Ontology" in the new volume *Knowing and Being: Perspectives on the Philosophy of Michael Polanyi*[1] gives an exceptionally interesting interpretation of Michael Polanyi's views on ontology and emergence. He discusses four central questions in a clear, straightforward, and refreshingly concise fashion. These are: What is the structure of knowledge? What is the structure of reality? What is the connection between the two? Are machines identifiable or fully describable in descriptions focused on standards? Later in my reflections I suggest why Margitay believes this latter question is relevant to the other questions. I think that Margitay's effort to define and address an interesting problem in Polanyi's thought by formulating and addressing these four questions is, in general, a solid and searching effort. However, I find that Margitay imports certain assumptions, sometimes explicitly acknowledged and sometimes unacknowledged, that are not supported by arguments. Margitay's conclusions based on these assumptions therefore do not seem convincing, although this does not diminish his article's thought-provoking character.

The Structure of Knowledge

Let me attempt to summarize what Margitay tells us in the first section of the article. Apparently, he is convinced by Polanyi's account of the structure of knowledge. Accordingly, Margitay contends that what he calls knowledge-like entities (for instance, our understanding of other persons) exist at a higher ontological level than, for example, physical things. In the concluding section of his essay, Margitay reassures us about this position; moreover, he claims that knowledge-like entities contribute to personhood. At the same time, he postulates that communities, truth, and other things that are personal have ontological status that is similar to the status of knowledge-like entities.

The Structure of Reality and Its Correspondence with our Knowing

In sections 2-4 of his essay, Margitay argues that, albeit convincing in itself, Polanyi's account of the structure of knowledge cannot serve as a foundation upon which to base the ontological structure of the world. These sections are underlain by a particular interpretation of Polanyi, according to which the structure of reality corresponds to the way we know it. In Margitay's interpretation, this claim holds for all the things we know as part of reality.

Margitay's interpretation of Polanyi is based on several passages from *The Tacit Dimension*. I do not agree that Margitay's literal reading of this material is what Polanyi intended. Margitay contends that Polanyi was affirming a strong, universal correspondence thesis. If a strong correspondence thesis were provable, it would give enormous power to Polanyi's philosophy. However, Margitay finds this strong claim inconsistent with Polanyi's other claims and ultimately Margitay rejects the strong claim.

First, let us see in detail how Margitay reconstructs Polanyi, based on *The Tacit Dimension*:

- M-P-1) Reality has a hierarchical structure; it consists of ontological levels. There are principles on the lower levels, e.g. physical-chemical laws, but these laws do not govern the structure of all things. There are emergent entities, the structures of which are controlled by higher-level principles within the limits left open by the lower-level principles.
- M-P-2) Polanyi wishes to infer the structure of reality from the structure of knowledge. Recall that Margitay has already accepted Polanyi's claim that knowledge-like entities have higher ontological status than lower level principles.
- M-P-3) There is a correspondence between the structure of knowing and its object.
- M-P-4) Moreover, things in the real world have a certain ontological status that "follows from" the way we know them.

Margitay's main argument against Polanyi's Correspondence Thesis is that Polanyi acknowledges the existence of certain non-emergent entities, like planets, that we know as complete wholes. As completely determined by the laws of physics and chemistry, planets have no higher or lower levels. Yet, the structure of our knowing planets is similar to knowing a scientific theory, for example. This means that, according to M-P-3 and M-P-4, the ontological structure of the planet should be similarly emergent. In this way, Polanyi contradicts himself. Margitay then concludes that in such cases there is no correlation or even a correspondence between the structure of our knowledge and the structure of reality.

But does the conclusion in Margitay's argument necessarily follow from the premises? Contra Polanyi, it could be claimed that the planet as a whole has a higher or different level of control than its parts. In other words, Polanyi may be seen to be wrong about postulating that planets are actually reducible to their parts, while being right about the Correspondence Thesis. Of course, this opens up a different discussion, but we could then directly link this correspondence to Polanyi's notion of grades of increasing "intensity of coherent existence" (*PK* 38). Developing this notion would present a major challenge for Polanyi's philosophy, but it would not be a larger challenge than proving the complete collapse of the Correspondence Thesis. In sum, I do not think Margitay proposed enough arguments about why we should abandon the Correspondence Thesis.

While it is logically possible that entities like planets can be seen as emergent, I do not think myself that this is the best counter to the contradiction postulated in Polanyi by Margitay. I think that "all instances of tacit knowing" in the *TD* passage Margitay quotes always refers to something that is capable of some achievement or performance. In other words, the reference is to what is active and independent. This is also why the word "effectiveness" is used in the next sentence (*TD* 34) following the section Margitay quotes. Thus what Margitay omitted in his Polanyi quotation, Polanyi's subsequent usage of the word "effectiveness," makes no sense if we try to apply it to a cobblestone or a planet. In Polanyi's perspective, "effectiveness" is the property of machine-like things that have functions (and for him these are mainly living organisms whose rationality is understandable by indwelling). Therefore, I think that the Correspondence Thesis definitively linking the

structure of real entities and the structure of our knowledge about them holds for things that are subject to some active principle.

Finally, let me concentrate on M-P-4. There is a certain ambiguity in how Margitay formulates his interpretation ("follows from"). Margitay rejects this "stronger" correspondence. However, it remains unclear what it would mean if this strong correspondence thesis were true. Is the higher ontological status of something *caused* by our knowing? Then, are animals, machines, etc. emergent *because* of the way we know them? And finally, is our personality emergent *because* we exercise the act of knowing ourselves? Truly, it is difficult to imagine how it would be possible that epistemology turns to ontology in this way. This would either mean that everywhere a knower appears, things start to be emergent, or that ontological emergence is not a property of an entity but rather a property of the relation between the knower and the entity.

To sum up, my criticisms of Margitay's treatment of strong correspondence are of several sorts. I think that his conclusion is not well-founded on its premises. Also, one of the arguments—that Polanyi's correspondence holds for every object that we know—seems based on an incorrect interpretation of the Polanyi passage in question. Undoubtedly, the "all other instances of tacit knowing" phrase is misleading, but the expressions in close proximity to the phrase do not support that we should understand it literally. And finally, interpreting the proposed strong correspondence to give epistemology priority over ontology (which Margitay's interpretation could be seen as suggesting) would not fit into Polanyi's scheme in general, in which life itself emerges from a previously inanimate environment at the beginning of evolution.

However, on totally different grounds, I agree with Margitay that correspondence could only be a heuristic device for discovering reality. This also means that Polanyi needs ontological arguments, which he indeed has. But I disagree with Margitay's statement that correspondence with "[the structure of reality] should be justified by *purely ontological arguments,*"(134, italics mine) as the necessity of this is not shown. Polanyi's arguments concerning reality must have *ontological content,* but those arguments are epistemological in nature at the same time.

Ontological Arguments

In section 5 of his article, Margitay reconstructs what he believes are some fundamental ontological claims that Polanyi makes. According to these claims, there are lower level laws, such as physical-chemical principles that—while always being in effect—do not completely determine the shape and structure of everything. Namely, there are emergent entities, some important aspects of which are co-determined by higher level laws operating within the limits left open by lower-level laws. In other words, a description relying on only the most fundamental physical laws will not completely account for all the entities that there are. Margitay counters this claim by postulating what he claims is the general view that physics is complete (135-136). Consequently, if physics is complete, then Polanyi's claim that some higher principle than physics is needed to account for some comprehensive entities cannot be true.

There is not much to say about Margitay's inference. It is absolutely true that if we know for sure that physics is complete, then there is no need for a higher-than-physical law to shape physical properties of objects. I think what is happening here is the clash of two alternative or incompatible ontologies: reductionism versus emergentism. Polanyi's hierarchical ontology only makes sense if we allow that there might be at least some entities that are not completely determined by physics.

Let us examine more closely the details of Margitay's argument in section 5.1. Before he somewhat out of the blue proposes the completeness of physics—again, if this is accepted, that is enough to destroy ontological emergence in itself—he recites Polanyi's affirmation that a reductionistic description of a planet in terms of only physical-chemical laws is adequate. In this argument, Margitay then replaces the planet with a watch ("the particles constituting a particular configuration of solids that we now call my watch" [135]) and asks why the same physical-chemical laws could not also determine the watch's particular particle configuration. However this question is an answer masquerading as a question since he already assumes that the watch as a whole is identical to the set of its particles. Moreover, if I actually traced back how the particular configuration of my wristwatch came into existence, I would soon find that a person designed the structure of the watch. Claiming that the watch is determined as much by fundamental laws of physics as a planet also implies that the human act of designing things (using one's knowledge) is also fully determined by physics. I think this is in contradiction with Margitay's final conclusion about the ontological status of knowledge-like entities, or, at the least, he weakens his case for knowledge-like entities by denying their causal effect on the physical world. I must admit though that had he used the example of a prokaryote instead of a watch, it would have been an entirely different argument, as prokaryotes are not designed.

Identifiability by Standards?

In section 5.2, Margitay recalls the case of statistical thermodynamics to illustrate how a higher-level theory (TH) can be reduced to a lower-level theory (TL). Then he goes on to consider technical standards, which in his view are able to fully identify machines. I think this is the least convincing part of his article. True, it might be logically possible that a standard is able to completely describe a machine, but in general, this is not the case. Moreover, exhaustive "physical" description is not even the goal, but only a side effect of standardization. It is only commonplace with certain types of machines that Margitay uses as examples—basically machines that have no moving parts. The goal of standardization in general is to enable technical collaboration and prevent vendor monopoly. Therefore, a standard should leave as many properties indeterminate as possible without breaking the functionality, so that a standard-compliant artifact can be manufactured in multiple ways and by multiple manufacturers. This is why testing and certification usually are important aspects of standard documents. And indeed, telecommunications standards like GSM or energy management standards like ISO 50001 are almost completely functional so that a variety of mobile phones or new kinds of energy efficient technical artifacts can be realized. Finally, Polanyi's remarks on destructive analysis, especially those that concern his industrial experiences with the Tungsram light bulb factory (PK 52) where he helped to develop a standard technology for krypton gas manufacturing, suggest that technical descriptions were known to him However, he simply did not attribute to them as much identification capability as Margitay does.

The matter of the scope of identity capability provided by standards is not my real problem with Margitay's arguments. He could argue that there are many machines that are identifiable by standards or their blueprints, regardless of the fact that many standards are function-oriented. My real problem is that he makes the standard description of a nut or bolt appear to be a matter of a *physical-only* description. The standard of a bolt is mainly based on a blueprint that depicts the object from left, right, top, cross-section, etc. True, physical-chemical parameters are also described, like width, height, composition; however, claiming that a full or exhaustive description is *all-physical* without any further explanation is turning physics into a *super-physics* that would include non-natural shapes and specific arrangements, which in my opinion occurs all-too-often in reductionist arguments.

This becomes more evident if one looks at the blueprint of a watch. Here, not only are shapes and dimensions depicted, but also relations, movement paths, rotation directions, and other complex matters. A proper reduction to physics would mean that all these parts are reduced to sets of particles, just as when the shape of crystals is reduced to molecule arrangements or thermodynamic effects are reduced to statistical particle positions. For instance, a rotating gear-wheel should be reduced to a particular set of particles that are moving together around a certain axis. Their movement is maintained by meshing with another similar particle set. In short, if we wish to really reduce technical descriptions, and not merely *merge* them into physics, we should think more along the lines of the *Laplacean daemon*. Of course, my argument here does not hold for coloring agents, food grade salt, etc. It is true that such elements are standardized, but this does not make them machines. I also admit that there are borderline cases, like bolts or complex medicine with enteric coating, but this does not change the status of machines in general. In my opinion, Polanyi's plan with discussion of machines in general was intended only to establish a category. Polanyi's machines as human designed purposive devices really are fundamentally akin to living organisms ("living mechanisms are classed with machines" [KB 226]). Our attention then should be directed towards the challenges associated with the reductive analysis of, for example, an amoeba. It is not a fixed set of particles, as it constantly replaces matter by metabolism. If we allow physics to talk about places or positions in an arrangement—that actual particles that come and go can fill—that still doesn't help, as the arrangement itself is constantly changing. Still, humans can quite easily keep track of a particular amoeba under a microscope and not get puzzled by the fact that the matter the animal is built from is constantly changing. In Polanyi's view, this is because the amoeba is truly irreducible to its parts. According to reductionists, the reduction of these kinds and other machines—while indeed challenging—could be done some day, just as it was possible to reduce crystals and thermodynamic effects. One could assume a waiting position to see whether an emergentist or reductionist ontology will have more evidence in the long run. Therefore, Margitay's statement that "the lack of [higher level] concepts [on the lower level] is not enough to show the impossibility of identification and to establish ontological differences thereby" (138) seems to be true. While the structure of our knowing of such machines is multi-leveled, that can be an illusion, and they might actually be simple physical-chemical things. *Yet, as long as the reduction is not done, we cannot establish this ontological position either.*

Conclusion

In the concluding part of his article, Margitay states that Polanyi cogently argues for the ontological emergence of knowledge-like entities. However, we can deduce from the way Margitay uses the watch as an example, that in his view these entities cannot co-determine the shape of simpler objects; in other words, there is no downward causation. Otherwise, he would have to accept that shapes of machines are co-determined by an emergent person who is irreducible to the physical-chemical laws. On his view, while knowledge-like entities are emergent, they are also detached from the physical world, and the person's actions are completely determined by the physical-chemical laws only. I think refuting that actions are determined by human knowledge is the main challenge that Margitay's view of emergent knowledge in an otherwise reducible world has to face.

Another issue that remains open is whether all living organisms—in Polanyi's system there is a gradual evolution of personhood, which began with the simplest life forms (PK 383-390) —also represent different levels of emergence. This, despite all the counter arguments Margitay provides, would result in a hierarchical ontology that is very similar to Polanyi's own system. Otherwise, we will get a dualistic worldview in that there will be a contrast between the emergent human person and the rest of the physical and biological order.

Although I think Margitay's arguments suffer from some internal inconsistencies and were shaped by preliminary assumptions that determined the outcome of his investigations regardless of Polanyi's arguments, I really enjoyed reading his paper. I am sure his clear and concise position is a very good start for a fruitful debate that will unfold interesting details of both the emergentist and the reductionist worldviews.

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Endnotes

[1] Tihamér Margitay, "From Epistemology to Ontology," *Knowing and Being: Perspectives on the Philosophy of Michael Polanyi* Tihamér Margitay (ed.) (Newcastle upon Tyne: Cambridge Scholars Press, 2010), 128-140. Subsequent quotations from this essay are simply noted by page in parenthesis in the text.

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Tihamér Margitay (margitay@filozofia.bme.hu) is Chairperson of the Department of Philosophy and the History of Science at the Budapest University of Technology and Economics. His essay "From Epistemology to Ontology: Polanyi's Arguments for the Layered Ontology" in *Knowing and Being: Perspectives on the Philosophy of Michael Polanyi* (Tihamér Margitay, ed. [Newcastle upon Tyne: Cambridge Scholars Publishing, 2010], pp. 128-1400), is the centerpiece for discussion in the six essays by other scholars in this issue of TAD.

Kyle Takaki (ktakaki@hawaii.edu) is an independent scholar interested in complexity and its relations to the continuum of tacit knowing. He continues to struggle with aligning this personalist project with the pursuit of sophia, amidst the fractures of modern philosophy.