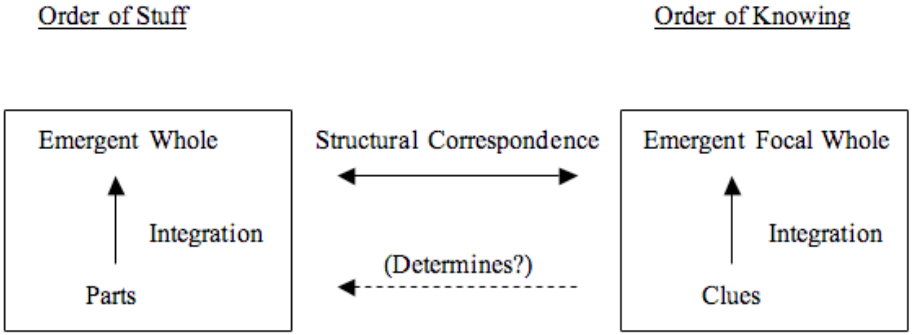
Margitay on Emergence and Ontological Hierarchy

Kyle Takaki

ABSTRACT Key Words: complex-systems thinking, embodied realism, epistemic-ontology, pursuit of truth
Tihamér Margitay makes two key moves against Polanyi's hierarchical ontology in his essay "From Epistemology to Ontology." I address these two moves and defend Polanyi from a complex-systems point of view.

Tihamér Margitay's incisive essay draws out potential problems in Polanyi's hierarchical ontology. In this response piece I address two of Margitay's key points concerning his notion of non-knowledge-like entities, which he claims are not always hierarchical in structure. I first present portions of Margitay's argument, then suggest ways in which a Polanyian could respond by expanding upon Polanyi's hierarchical view.

I think Margitay identifies a tension in Polanyi's thought that I suspect Polanyi grappled with but lacked the conceptual resources to fully address. The tension issues from what Margitay calls the "Correspondence Thesis" (CT), which holds that the structure of tacit knowing maps to the structure of a comprehensive entity that is tacitly being understood. One implication of CT is that since focal objects of knowing are emergent wholes that aren't reducible to their clues, so likewise comprehensive entities are emergent wholes not reducible to their parts. Margitay thinks that CT is remarkable and holds for knowledge-like entities (and certain non-knowledge-like entities as well), but that CT is problematic when applied *in general* to non-knowledge-like entities. The tension that Margitay draws out in Polanyi's writings stems from CT applied to non-knowledge-like entities that are not clearly emergent, contrary to what the mapping for CT indicates. Below is a picture of CT that will provide guidance for addressing Margitay's criticisms:



There are two key moves made by Margitay, both of which I think assume in the background a separation between the order of knowing and the order of stuff. The first move contests the structural mapping, seeking to break CT's link between the structures of knowing and stuff. Keeping in mind that Margitay seems to endorse CT regarding knowledge-like entities, for the remainder of the paper I focus on his notion of non-knowledge-like entities, which I shall just call "stuff." Now since all focal objects of knowing are emergent entities, Margitay asks about certain types of stuff and, granting them emergent status, whether they map to the structure of tacit knowing. In short, his answer is that the mapping is obscure at best. So Polanyi does not show that emergent stuff really has the structure of tacit knowing—if anything, it appears that Polanyi, while offering a number of supporting examples in his writings, largely assumes that stuff has the same structure

but does not actually articulate and defend *systematically* how the mapping works.

The second move contests the emergent status of stuff by way of Polanyi's own discussion of non-emergent stuff. Margitay cites Polanyi's claim that the laws of physics and chemistry completely determine the formation of a planet, and so while a planet is a whole (but a non-knowledge-like whole *qua* planet) it isn't an emergent physical object.[1] The issue Margitay then raises is an important one: if this counts as a case of a non-emergent ontological entity by Polanyi's own reckoning, might cases of putative emergent stuff actually be non-emergent? So while on the knowing side of CT the objects of focal knowing are emergent, there might not be *genuine* emergence in stuff. In sum, given these two moves and the apparent importance CT has for Polanyi's hierarchical view of comprehensive entities, it seems that if Margitay is right, his undercutting of CT ends up casting serious doubt on Polanyi's view of how tacit knowing relates to stuff—on how we get from epistemology to ontology.

I think these moves raise important issues concerning emergence and background frameworks for conceptualizing epistemology and ontology. Before discussing the latter issue, I first concentrate on emergence as it relates to Margitay's two moves. It is my suspicion that Polanyi was groping towards a view of emergence and complex-systems thinking while not being able to fully articulate what he was sensing across seemingly disparate domains of inquiry.[2] I would like to characterize Polanyi as a proto-complex-systems thinker, and in that light defend and expand on his insights in responding to Margitay.

The First Move

In Margitay's first move, he claims that it isn't clear there is a general correspondence between the two orders (the double arrow in the diagram). He first addresses a stronger claim that he attributes to Polanyi (the lower single arrow in the diagram), which holds that the structure of tacit knowing *determines* the structural order of things. Margitay offers a simple example challenging the determinative mapping: he contests the mapping from clues to parts and from an emergent focal object of knowing to the object itself, bringing into relief differences in how parts bear on an object versus how clues bear on the focal object of knowing. After knocking down this strong determinative reading, he then considers a weaker reading of the correspondence relation, namely a heuristic one, which claims that in general, parts bear on wholes merely in similar fashion as clues bear on focal objects of knowing. However Margitay objects that such a weaker reading does not offer any strong evidence that Nature has levels similar to tacit knowing.

I think we can finesse the strong reading by considering the tools by which the "determinative" relation operates. As a kind of realist and a once practicing scientist, it would make little sense for Polanyi to claim that tacit knowing *strongly* determines the order of stuff. A more sensible reading would be that as the practices of various sciences use tools to probe reality, there is an unavoidable need to create models as embodied vehicles for the activities of representing, intervening, reasoning, communicating, and so forth. Tacit knowing primarily "determines" the structure of these models, which then are taken in some capacity to represent aspects of Nature.[3] Since there is no direct access to Nature except by way of our models (theories, data, etc.), the degree to which we peer into the order of things is unavoidably mediated by the quality of the models we employ. Thus what tacit knowing "determines," via *connoisseurship*, are models (theories, etc.) that presumably gain some access to Nature.

As for the weaker reading, I don't think what Polanyi is saying amounts flatly to claiming that ontological parts partially determine ontological wholes, as, for example, a classical Newtonian model of point particles partially determines phenomenological "wholes" concerning temperature and other higher-order thermodynamic notions. I think what Polanyi is struggling to account for is the sense that hierarchical emergence is in some sense real—which one can glean by moving "up" the hierarchy of the sciences—and not merely an artifact of what embodied realism projects by way of scientific models (theories, etc.). For beyond projection lies the radical nature of tacit knowing: a faith invested in a reality that reveals itself in unlimited ways, thereby affectively fueling the pursuit of truth. If I am right in offering the above two interpretations of Polanyi, I suspect what Margitay has brought forth in his insightful criticisms of Polanyi is actually a disclosure of latent (I suspect largely analytic) assumptions that result in a subtle misaligning of what Polanyi is really up to, and why his post-critical philosophy still remains a radical one.

Now let me get to several more specific responses, building off of these general interpretive sensibilities. In the previous paragraph I alluded to statistical mechanics, mainly because Margitay uses this in support of his argument that in general stuff may not be emergent, or at a minimum, that Polanyi has not shown that higher-level concepts cannot be defined by lower-level ones. Margitay cites a standard (analytic) interpretation of statistical mechanics, thought to support inter-theoretic reduction, where higher-level phenomenological thermodynamic notions (heat, temperature, etc.) are claimed to be reduced to the lower-level kinetic theory of gases. However this standard tale, largely influenced by focusing on logical considerations whose coarse-grained approach gives the appearance of successful reduction, has been contested when examined from a more detailed mathematical-philosophical viewpoint.[4] Even stronger, what appears to be the best case for inter-theoretic reduction—statistical mechanics—might actually be better accommodated by a complex-systems approach that takes epistemic emergence seriously.[5] What makes complex-systems thinking appealing is that an epistemic stance towards emergence—which resonates with Polanyi's notions of dual control and a hierarchical epistemic-ontology—can be applied to a very wide range of scientific theories.

Of course, part of the problem is that terms like "reduction" and "emergence" have numerous senses, not all of which are clearly defined. Thus the general tenor of Margitay's critique is well taken, given Polanyi's somewhat case-heavy approach that opens itself to the charge of being insufficiently developed. However, in defense of the hypothesis that Polanyi is a proto-complex-systems thinker, it should be noted that there is no precise, systematic account of how complexity works, other than extrapolating from cases of emergence and complexity that are exhibited across a range of sciences. I suggest that rather than viewing this as a problem, it be viewed as a virtue. The lack of a precise, systematic account might be construed *as* a problem from the standpoint of searching for a set of necessary and sufficient conditions for characterizing complexity, where the use of various tools of conceptual analysis would foreground where complexity and emergence come up short. But for whom would this be a shortcoming? The explosion of interest in complexity in the sciences over the past two decades or so suggests a different attitude be adopted. Thus I propose that instead of focusing on analysis, attention should first be paid to Polanyi's "forward-looking" philosophical vision, which in pragmatic fashion emphasizes the fruits of inquiry—the consequences of inquiry that make a genuine difference.[6] That is, rather than getting tangled in attempting to systematically develop what emergence might be for stuff, I want instead to concentrate on interpreting Polanyi's fiduciary framework in relation to complex-systems thinking.

The Second Move and Polanyi's Fiduciary Program

The second move, recall, is that levels and emergence might not really hold for stuff. In the previous section some responses to the second move were put forth; in particular, that separating ontology from epistemology is a non-starter for Polanyi, precisely because claims about ontology are epistemically embodied. Given that science has no unmediated access to reality, it is the use of models, theories, and so forth that enact what scientists believe when they probe reality. However this still leaves open the question: even if robust models (theories, etc.) epistemically project ontologies via the stratified structure of tacit knowing, do these projected ontologies really exhibit similar stratified levels? We need not worry about the nature of "noumena" to see the force of Margitay's critiques. Even within a Polanyian epistemic-ontology, the same sorts of issues can be raised.

In a previous paper I argued for projected levels and how emergence occurs within an epistemic-ontology.[7] I appropriated a technical rainbow example avoiding the charge that "stuff" might not really have levels; quite to the contrary, for our best working knowledge of rainbows there is no strong separation between the orders of stuff and knowing. Inter-theoretic reduction simply does not work, and if it is objected that Nature still might not have levels—which may after all be true—the point is that this is not known, and offers little comfort in the face of a rather robust account of rainbow phenomena. Moreover the lessons drawn I think also generally apply to other cases such as statistical mechanics (compare Auyang 1998 and Batterman 2002). Keeping this in mind, we can now formulate a version of Margitay's critique from the standpoint of Polanyi's epistemic-ontology: granting that there are cases (let's suppose even very good ones) of stratification within this epistemic-ontology, the question remains, how generalizable is the claim that levels are real?

There are several responses to this question. The first response is that if cases of presumed inter-theoretic reduction actually better support complex-systems thinking (statistical mechanics being the paradigm case), and such thinking has already been successfully applied elsewhere and is an area of active and vigorous investigation, why not inductively project levels to the ever-expanding field of epistemic-ontologies? The objection to this I think is clear: we can offer the counter-inductive sentiment that we simply don't know, and it may be that levels and emergence only work in a number of very interesting cases at the "edge of chaos and order," but that the vast plane of existence might not have levels—that epistemically speaking, they are either too noisy or boring for emergence and stratification. So a revised version of Margitay's critique would still remain.

A second response would be that, pragmatically speaking, we don't know if levels are generalizable, but it looks like a good working hypothesis. So we should adopt the attitude of letting the various research programs investigate complex systems, hopefully revealing in time whether levels generalize to any reasonable degree of scope within our epistemic-ontologies. After all, the fact that complexity and emergence seem to occur across so many domains of inquiry grants some warrant to projecting a generality of levels.[8] Again, this seems sensible enough, but the same sort of objection as above could be raised: we simply don't know just how generalizable complexity is. So it seems we have two positions with good inductive and counter-inductive reasons for stratification and against, respectively. The question is one of scope. How might Polanyi's fiduciary program respond?

I think here is where Polanyi offers something new to the discussion, and why his stratified epistemic-ontology—even if inaccurate in its details—presents a vision worth exploring and taking seriously. For reality is not just "stuff": from a Polanyian viewpoint, reality is a working hypothesis co-defined by inquiry—it is a participatory realism. Polanyi I think is questioning the very philosophical presumption that separates stuff from what is known, thus casting into question the picture suggested by CT. As alluded to previously, embodied realism provides a better fit with tacit knowing, and I think also provides a partial correction to the picture that CT suggests. More importantly, beyond embodied realism lies the consequential dimension of the fiduciary program, where communities of inquirers enact and articulate what reality is. Reading Polanyi through the lens of C.S. Peirce, it could be argued that if truth is that which would be fated to be arrived at by an ideal community of inquirers, then a full-blooded realism can only be projected as an ideal to be striven for—an ideal whose meaning-rich value also affectively enacts that very pursuit of reality, of truth.[9]

From this standpoint, while I can sympathize with the claim that Polanyi presents an underdeveloped view of a stratified ontology, I think we can more charitably argue that his proto-complex-systems approach serves as a speculative probe into a way of viewing reality that marks a radical reconceptualization of how to get "from epistemology to ontology." Firstly, the fiduciary aspect of Polanyi's realism suggests that as there is no hard line between knower and known, we need to invest a faith in what tacit knowing projects (but can never fully establish) to then articulate reality. Since reality informs our (skillful) inquiries in fruitful ways, suggesting ever more significant lines of further inquiry, we should adopt as a working hypothesis the informative nature of our epistemic-ontologies.[10] Secondly, by examining various sciences we can see that projected ontologies appear to have levels, especially so the more complex things get. Thus with regard to the counter-inductive intuitions mentioned above against stratification, we can now briefly respond: we won't know the extent to which reality is stratified unless we engage in the pursuit of that issue (a pursuit already underway and appearing to be quite a significant line of inquiry).

These responses might seem to beg the question against Margitay, as the same type of objection could be raised: even if our epistemic-ontologies appear to have levels, in the long run they might actually not. Perhaps levels are coarse-grained tools that upon refinement in the long run of inquiry will be "reduced" to, say, a single plane of existence. Perhaps. But there is another insight coming from Polanyi suggesting why a complex-systems approach may be a more interesting framework to adopt. From physics to chemistry and beyond, levels arise when our models (theories, etc.) consider many-body systems in the dynamic process of unfolding. Since we need to impose boundary conditions on these systems to have any understanding of what is going on, in the course of doing so we artificially constrain what that dynamism might actually be. It is precisely the imposition of boundaries (which bring systems into being) that induces levels of inquiry for taming dynamics. Counter-Polanyian narratives like inter-theoretic reduction, Cartesian dualities between knower and known, the physical closure of the universe, and so forth obscure just how difficult the general problem of understanding dynamics is in the sciences. Polanyi is one of the few thinkers to take this seriously, and who also constructs a post-critical philosophy respecting the need for a multi-tiered approach to inquiry. I hypothesize that his stratified epistemic-ontology is rooted not in tacit knowing as such, but rather in his tacit estimation that dynamical complexity is where it's at; and inquiry, if it is to be robust, consequential, and informative, needs to start there. I also speculate that this is perhaps the only response that can be offered to Margitay's problem—a problem that by its very nature is and will remain open-ended. If this is a flaw, it could also be the greatest virtue of Polanyi's fiduciary program.

Endnotes

[1]There is evidence that this view isn't quite right, and that the formation of planets involves emergence. See N. L. Kugland et al., "Self-organized electromagnetic field structures in laser-produced counter-streaming plasmas," *Nature Physics* 8 (2012), 809-812. In an interview summarizing their research, Kugland says that they've "created a model for exploring how electromagnetic fields help organize ionized gas or plasma in astrophysical settings, such as in the plasma flows that emerge from young stars. …These fields help shape the flows, and likely play a supporting role alongside gravity in the formation of solar systems, which can eventually lead to the creation of planets like the Earth" (http://phys.org/news/2012-10-lawrence-livermore-illuminate-cosmos.html).

[2]Polanyi suggests as much in his reflections on dynamical order. Phil Mullins observes that "some of Polanyi's examples of dynamical order are interesting since they seem to be drawn straight from the world of a chemist who has spent some years studying crystals. …He emphasizes that by cooling a solution, millions of molecules can be very quickly and cheaply sorted out and stacked in a regular formation. Polanyi draws this general conclusion: '…when very large numbers are to be arranged carefully, this can be achieved only by the spontaneous mutual adjustment of the units; not by specific assignment of the several units to positions in a pre-arranged plan'" (Phil Mullins, "Michael Polanyi's Use of Gestalt Psychology," in *Knowing and Being*, edited by Tihamér Margitay [Newcastle upon Tyne: Cambridge Scholars Publishing, 2010], 15).

[3]See for example Theodore Brown, *Making Truth: Metaphor in Science* (Chicago: University of Chicago Press, 2003), on embodied realism in the sciences. He argues that "we know the world only in terms of [embodied] perceptions, categorizations, and reasoning…grounded in our bodily capacities and life experiences and [are] inherently limited by them" (187).

[4]For a clear presentation of statistical mechanics as a paradigm of inter-theoretic reduction, see Patricia Churchland, *Neurophilosophy* (Cambridge, MA: MIT Press, 1986). For an overview of the philosophy of statistical mechanics—including its interpretive complications and a warning about whether it really supports inter-theoretic reduction—see Lawrence Sklar, "Philosophy of Statistical Mechanics," *The Stanford Encyclopedia of Philosophy (Summer 2009 Edition)*, Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/sum2009/entries/statphys-statmech/>; and *Physics and Chance* (New York: Cambridge University Press, 1993), Chapter 9. Lastly, for a discussion of the shortcomings of inter-theoretic reduction, see Robert Batterman, *The Devil in the Details: Asymptotic Reasoning in Explanation, Reduction, and Emergence* (New York: Oxford University Press, 2002). Batterman argues that standard philosophical territory (inter-theoretic reduction, supervenience, and so forth)—whose views have been used to interpret scientific theories (models, etc.)—does not suffice in capturing the mathematical structures present in some of these very theories (models, etc.). Thus he draws the general lesson that different philosophical concepts are needed, and proceeds to offer some new and interesting concepts that I think can be accommodated within Polanyi's fiduciary program (see fn.7).

[5]For example, see Sunny Auyang, *Foundations of Complex-System Theories* (New York: Cambridge University Press, 1998), whose orientation is akin to that of Polanyi's: a physicist whose experience informs her philosophical theorizing. She discusses how statistical mechanics presents a paradigm case of complex-systems thinking, and why reduction in its various guises only accommodates certain features of statistical mechanics.

[6]In an Aristotelian vein, it is important to discern where to expect precision, and where to apply the relevant tools of analysis. Complex-systems thinking is unusual in its deployment of highly precise tools of mathematical analysis along with epistemically irreducible qualitative concepts. Thus for all the many ways

in which physics is a different type of science from biology, it is commonly argued that both exhibit deeply similar patterns of complexity and emergence. See for example Stuart Kauffman, *The Origins of Order* (New York: Oxford University Press, 1993), and William Wimsatt, "The Ontology of Complex Systems," *Canadian Journal of Philosophy* supp. vol. 20 (1994), 207-274. Wimsatt writes: "Messiness—or at least the right kinds of messiness—is now almost a virtue in many of the sciences, as the recent explosion of interest in complexity seems to attest. Levels, perspectives, and causal thickets are major ontological players in these complex areas—domains with significant implications for how to approach many of philosophy's most refractory problems."

[7]Kyle Takaki, "Enactive Realism," *Tradition and Discovery* 38 (2011-12), nr.1, 43-59.

[8]To put the point in differing terms, Stuart Kauffman has argued that when we look at various mathematical models employed in studying complexity, the bigger problem remains that broadly speaking, we don't even know the initial or boundary conditions of the systems being studied—often these have to be imposed, assumed, or simplified. He most recently argues that things are more complex than complex-systems thinking can even begin to address; so if anything, by studying complexity one comes to glean the very reverse of Margitay's sensibility: that Nature apparently is more stratified, creative, and emergent than what our best epistemologies can ever project. See Kauffman, *Reinventing the Sacred* (New York: Basic Books, 2008), which continues his line of thought from *Investigations* (New York: Oxford University Press, 2000).

[9]Polanyi writes that " new knowledge can never be known at its birth. For it speaks of something real, and to attribute reality to something is to express the belief that its presence will yet show up in an indefinite number of unpredictable ways. …By trying to say something that is true about a reality believed to be existing independently of our knowing it, all assertions of fact necessarily carry *universal intent. Our claim to speak of reality serves thus as the external anchoring of our commitment in making a factual statement*" (PK, 311); see also PK, 315. For a metaphysical development of the pursuit of truth which I think meshes beautifully with Polanyi's fiduciary program, see Ron Bontekoe, "Truth as a Regulative Ideal," *Journal of Speculative Philosophy* 13 (1999), nr.4, 240 – 256.

[10]The informational turn is widely recognized in "higher-order" fields like biology (e.g., Horace Judson, *Eighth Day of Creation* [New York: Simon and Schuster, 1979]), cognitive science (e.g., David Marr, *Vision* [San Francisco: Freeman, 1982]), and philosophy (e.g., Frederick Adams, "The Informational Turn in Philosophy," *Minds and Machines* 13 [2003], 471-501). It is also finding an increasingly vocal audience in physics; see for example John Wheeler, "Information, Physics, Quantum: The Search for Links," in *Complexity, Entropy, and the Physics of Information*, edited by Wojciech Zurek (Redwood City: Addison-Wesley, 1990); Rolf Landauer, "Information is Physical," *Physics Today* 44 (1991), nr.5, 23-9; and Jacob Bekenstein, "Information in the Holographic Universe," *Scientific American* 289 (2003), nr.2, 58-65.

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