# In Defense of Polanyi's Understanding of Evolution: A Response to Walter Gulick[1]

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ABSTRACT Key Words: Polanyi, teleology, emergentism, vitalism, ordering principle, evolution, natural selection, neo-Darwinism.

*In a recent article, Walter Gulick interprets Polanyi's teleology as the consequence of an unacceptable vitalism and his ordering principle of evolution as something which threatens his vision of the multileveled hierarchical reality of living beings. I argue that Polanyi's account of teleology entails no unacceptable vitalism. Moreover, his teleology is as necessary as his higher level ordering principle of evolution to explain the emergence of multileveled hierarchical living beings: Polanyi argues that from "primordial inanimate matter"*(PK 404) *shaped by the mechanical principles of physics and chemistry and neo-Darwinian principles of "evolution" no development and no multileveled hierarchical living being could come into existence. Polanyi is not a vitalist philosopher but a true emergentist, one of the best, and this is at the core of his philosophy.*

## Preface

In a recent *TAD* essay,[2] Walter Gulick, following Marjorie Grene, sharply criticizes Michael Polanyi's understanding of evolution.[3] He argues that central to Polanyi's misunderstanding of evolution is the "simplistic dichotomy [that] he offers as apparently the only basis for explaining evolutionary emergence: the laws of physics and chemistry versus his higher 'active' (vitalistic) explanation" (Gulick 48). Gulick contends that "this richness [of the multileveled hierarchical structure of life] cannot be reduced to a simple opposition between the laws of physics and chemistry and *vitalistic* impulses of an individual or a process" (Gulick 48, my emphasis).

Gulick's (and Grene's) fundamental inference is correct: vitalistic processes and principles are not acceptable in evolutionary theory after Darwin. But there are no vitalistic processes or principles in Polanyi's understanding of evolution. Polanyi is an *emergentist*, and not a vitalist at all. He does not assume or claim there are any other substances—such as some kind of Bergsonian "élan vital"—over and above the physical. He speaks about only the higher, emergent levels of life and an emergent ordering principle (actually, Polanyi posits two such ordering principles, the ordering principle of life's origins and the ordering principle of evolution). That is, the richness of life cannot be reduced to simple mechanical and physical processes of natural selection and genetics as the neo-Darwinians do and as is accepted without criticism by Gulick (and Grene). The whole notion of emergence from John Stuart Mill and the British Emergentists (Samuel Alexander, Lloyd Morgan, C. D. Broad) is designed to provide a *non-vitalistic* alternative to materialism. Polanyi's account of evolution does not deny the Darwinian theory of natural selection as the true vitalistic thinkers do. However, he does, more limitedly, claim that natural selection and genetics are not sufficient to explain the development of living beings and the rise of man. More is needed, Polanyi argues, and that more is an emergent ordering principle of evolution.

Why does Gulick claim (like Grene, Clayton[4] and others) that there are vitalistic processes and principles in Polanyi's understanding of evolution? It is not because Polanyi is incoherent as an emergentist. Instead, I believe that the answer lies in the neo-Darwinian dogma that teleology is something monstrous and is the unambiguous sign of vitalism. The famous neo-Darwinist Ernst Mayr makes such a claim.[5] It is,

of course, possible to equate, in principle, teleology and vitalism, but Polanyi, like Aristotle, does not make this equation. Thus, to properly understand Polanyi's account of evolution one must start with his non-vitalist notion of teleology.

In my discussion below, I first show that Darwinian natural selection itself is also necessarily teleological, however, of course, not in a vitalistic sense but in a Polanyian sense, so, teleology is not something monstrous at all but a necessary notion for Darwinism as well. I then ask why Darwinian evolution does not acknowledge that it is teleological. This is the heart of Polanyi's critique of the notion of Darwinian evolution. I outline Polanyi's solution to the problem of evolution: he posits an emergent ordering principle of evolution. I show how the multileveled hierarchical structure of life (*pace* Gulick) can be "reduced" to a simple opposition between the laws of physics and chemistry and an emergent ordering principle without threatening its hierarchical richness. I conclude, finally, that in the future I hope Polanyi will be recognized as a coherent emergentist without vitalistic flaws.

## 1. The Treacherous Concept of Natural Selection

What is natural selection? Historically, natural selection is a mechanical explanation accounting for the evolving of new species, just as Newton's theory of gravity is a mechanical explanation for the revolution of planets. Newton's account of gravitational force widened the mechanical worldview in his field and so did Darwin's account of natural selection. At first, Newton was accused of adding an occult force into the mechanical philosophy from which a kind of teleological process followed. The accusation had merit because, in a very new sense, the Newtonian gravitational force was an end-directed process (i.e., attracting objects towards the gravitational centre—see the letters of Bentley and Newton in the Turnbull collection of correspondence as well as Thomas Kuhn's discussion, which charts the slow acceptance of the idea that gravity was innate[6]). End-directed processes were in another sense part of Aristotelian philosophy which, of course, was not at that time regarded as incorporating a proper mechanical process. However Newton's views were later accepted as a non-teleological, material account. At first Darwin was accused of offering a teleological account also, an accusation to which he responded with a comparison with the case of Newton: "It has been said that I speak of natural selection as an active power or Deity; but who objects to an author speaking of the attraction of gravity as ruling the movements of the planets?"[7] Darwin's views later were also accepted as a non-teleological, material account describing a mechanical process. The term "teleology" came to be used only to describe *vitalistic* end-directed processes. However, for Polanyi, this restriction is not acceptable because these accusations against Newton and Darwin have merit. Before turning to this matter, however, I must clarify what natural selection actually is.

There are two necessary conditions for the process of natural selection, according to Darwin. First there must be *variants* and second, there must be *insufficient means* for living. When there are insufficient means for living, the variants must compete and an evolving process starts. It is an evolving process in which the quasi-permanent environmental resources (sunlight, nutrition, etc.) *determine* the competing processes between the variants. So, within a required interval, when the environmental factors are not occasional but are relatively constant, natural selection, on its own, moves toward an environmentally determined end; that is, in a sense, it is necessarily teleological, as the famous neo-Darwininst Francisco Ayala[8] makes clear when he says "…the complicated anatomy of the eye like the precise functioning of a kidney are the result of a nonrandom

process—natural selection" (Ayala 35). It *must* be teleological, otherwise it could *not* serve as an explanation for any purposeful things. Darwin himself emphasizes over and over this kind of teleological feature of natural selection when, in connection with his several examples, he talks about how different species, organs and ecological systems are shaped in a specific, directed way, according to given environmental relations (e.g., Darwin 64, 165, 349-50, 401). But, of course, this sense of teleology about which Ayala and Darwin talk is *not* the same sense of teleology found in truly vitalistic philosophies.

Ayala rightly emphasizes that "the over-all process of evolution cannot be said to be teleological in the sense of proceeding towards certain specified goals" (Ayala 42). Why can the overall process not be described as teleological if natural selection is the only fundamental mechanism of Darwinian evolution? The answer is in the nature of natural selection. The second necessary condition of selection, insufficient environmental resources, is, in the long-run case of the over-all evolutionary process, not constant. The continents are moving, the climate is changing, etc. There is an inevitable changing dynamic in the overall process.

Thus natural selection *locally* is necessarily teleological but *globally* it is not. The overall process of evolution is not teleological and thus from the operation of natural selection nothing necessarily follows. As Darwin describes natural selection,

> In some cases variations or individual differences of a favourable nature may never have arisen for natural selection to act on and accumulate. In no case, probably, has time sufficed for the utmost possible amount of development. In some few cases there has been what we must call retrogression of organisation. But the main cause lies in the fact that under very simple conditions of life a high organisation would be of no service—possibly would be of actual disservice, as being of a more delicate nature, and more liable to be put out of order and injured (Darwin 99-100).

Darwin himself did not use the word "evolution" in 1859. He was clearly speaking about something else, as his book's title indicates: *The Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life*.

So, if there is only natural selection as a fundamental principle of an overall process, there is no evolution, only the continuous changing and struggling of species. This is the conclusion one must draw from the neo-Darwinian account of evolution solely in terms of natural selection. It leaves us with the patently absurd view that there is no evolution, but only random *change*. Such change is explained in detail, of course, and in a very scientific (mechanistic) and explicit way. But for Polanyi this account ignores the obvious (in a move to preserve a mechanistic perspective) and is simply insufficient. For him, there *is* apparent non-random evolution from the prokaryotes to vertebrates to human beings. The question only is by what principle.

## 2. The Ordering Principle of Evolution

What is Polanyi's main argument against neo-Darwinian theory? A closer look at his argument will better clarify his understanding of teleology and evolution. Polanyi claims, "Darwinism has diverted attention for a century from the descent of man by investigating the *conditions* of evolution and overlooking its *action*. Evolution can be understood only as a feat of emergence" (*PK* 390).

Contrary to Gulick, who quotes this passage, the passage is not "an epistemological insight" which Polanyi "gained by adding an active component to Gestalt theory" and then "extrapolates to the theory of evolution" (Gulick 48). Polanyi in this passage focuses on ontology, the hierarchical ontology of beings created by evolutionary emergence. Polanyi describes living beings (as well as artifacts like machines) in terms of hierarchical levels which impose or are instantiated within boundary conditions; each higher level configuration operates within boundaries or boundary conditions left open (i.e., possibilities) by the lower level. Each higher level is harnessing and controlling the lower level(s).[9]

Higher level and lower level processes are logically independent. Neither can be deduced from the other. Otherwise, the lower—more fundamental—level processes wholly determine structure or organization and no higher level principles operates independently, thus controlling the possibilities left open by lower level processes. However, since the correlation of the two levels is random, this means that the higher level processes can come into play and harness lower level processes. For example, in a prokaryote cell, the elementary physical and chemical processes are harnessed by a higher level of organization. Thus two essentially different principles are operating, according to Polanyi, and the higher level is not determined by the lower. As discrete principles that are logically independent, one does not descend directly or necessarily from another, but emerges as a possibility of stable order that becomes real. From this, Polanyi concludes, "Thus the logical structure of the hierarchy implies that a higher level can come into existence only through a process not manifest in the lower level, a process which thus qualifies as an emergence" (*TD* 45).

An ordering principle of evolution operating above the laws of physics and chemistry is a necessary condition, because higher levels cannot otherwise come into existence from lower levels. It is simply logically impossible, according to Polanyi. Thus, the (non-teleological) mechanical processes and principles of the fundamental material level cannot explain the hierarchical and purposeful richness of life; a higher level emergent principle is needed which directs the teleological maturation processes.

Gulick asserts that "The flow of Part IV of PK could be purged of its teleology and progressivism without damaging its vision of an increasingly complex world of biologically-based achievement…" (Gulick 49). For Polanyi, however, the teleology of the last Part of PK is the necessary consequence of the ordering principle operating above the laws of physics and chemistry which does not "violate" or "damage" his vision of "an increasingly complex world of biologically-based achievement" (of emergent levels). On the contrary, it is the necessary condition and source of it.

Polanyi's comment in *Personal Knowledge* on randomness is important: "Randomness alone can never produce a significant pattern, for it consists in the absence of any such pattern" (*PK* 37). As noted in the previous section, the overall process of neo-Darwinian "evolution" is a random changing process, because in the long run, the two conditions of its only fundamental principle (variants and insufficient environmental resources) are random and are determined by the occasional processes and principles of the fundamental material level (mutations and sunlight, continental drift, climate change, etc.). Polanyi argues that "random impacts can *release* the functions of an ordering principle and suitable physico-chemical conditions can *sustain* its continued operation; but the *action* which *generates* the embodiment of a novel ordering principle always lies in this principle itself" (*PK* 401).[10]

For Polanyi, Darwinian natural selection is the fundamental mechanical and material process of evolution, a necessary *condition* for evolution, but "evolution can be understood only as a feat of emergence,"

that is, as an *action* of a higher level ordering principle. This action has to be teleological because it is not a random mechanical process but a culminating development which creates purposeful, sentient beings, that is, higher level emergent principles harnessing the lower levels.

So, for Polanyi there is a simple *dichotomy* between *random* and *teleological* processes. From random processes such as the mechanical process of overall "evolution" no development follows but only *change* follows. Whatever development follows only from a teleological process. There is always necessarily present/involved in development a higher level ordering principle. This ordering principle, however, can be construed as a *vitalistic* force or substance like Bergson's élan vital, or as an *emergent* principle like Polanyi, or as Aristotle's *form*, or as something else. Presumably, there are several logical possibilities. But with different ordering principles, the development—that is, the teleological process—will be *essentially* different. Thus to conclude there is unacceptable vitalism in Polanyi's teleology is, I believe, a mistake. I am not suggesting that it is impossible to argue against Polanyi's understanding of evolution and teleology, but that to do so one has to focus not on vitalism and teleology in a narrow sense but one must argue against his concept of boundary conditions, emergence, and teleology and their logical consequences.

What in the final analysis is the ordering principle of evolution? Polanyi carefully addresses this question when he says, "And evolution, like life itself, will then be said to have been *originated* by the *action* of an ordering principle…The *ordering principle* which *originated* life [and evolution] is the *potentiality* of a stable open system…" (*PK* 383-4). This means that the laws of physics make possible that a random configuration of matter is given at the beginning, a configuration which can function as a basis for a stable open *evolutionary system*—like the Earth—where the developmental process of emergent evolution can be started. Although Polanyi's theory is not extensively elaborated at this point, he makes clear that his approach to evolution is not in the least vitalist but unambiguously *system theoretical*. Polanyi's views already are not too far from what Gulick calls for using complexity theory. But Polanyi's views entail no teleology conceived in the vitalistic sense as Gulick understands teleology.

## 3. Back to the Past: It is not a Reduction

Gulick, like Grene, suggests that Polanyi misses the mark when he argues for "some additional principle to explain how emergence produces more complex biotic levels" (Gulick 47). Further Gulick contends "the principles guiding the maturation of an individual from an embryonic state to adulthood are not the same as the principles guiding the development of a species as it adapts to changing environmental conditions" (Gulick 48). Thus Polanyi "by using the same notions of maturation and achievement to describe two different levels of reality. . . violates his ontological insight that different levels operate according to different principles and are not reducible one to another" (Gulick 48). Polanyi thus uses the same principles to describe phylogenetic and ontogenetic emergence and these two processes are different levels of reality (Gulick 48). I am not sure on what ground Gulick makes this latter claim, but it is important to emphasize that the phylogenetic and ontogenetic are not two different levels of reality in Polanyi's use of the notion of levels. The different levels of reality for Polanyi are elements of the hierarchical emergent structure of living beings. Clearly, some living beings have a complex ascending series of such cooperating boundary conditions. A prokaryote has fewer such levels than man; this is the reason, according to Polanyi, why man is unquestionably more developed. And this is also a reason why evolution is a feat of emergence and not only a neo-Darwinian changing process where the difference between prokaryotes and man is explained only in material complexity. (If there are no levels,

why are human cells more developed or more complex at the same material level than other being's cells?) Ontogenetic evolution is the temporal developmental process of a given individual being while phylogenetic evolution is the *temporal* developmental process of the hierarchical emergent structure of all living beings (life). Human beings are the multi-level creatures whose highest levels of achievement (i.e., the levels of speech, culture, and science) situates them for now at the end of ontogenetic evolution (but only for now--no one knows the future).

Since it is a finite temporal process, one can ask what was before this evolutionary process. Naturally, it is logically *necessary* that *before* the process the achievements of the process did *not* exist. So, there were no prokaryotes, no men, no single living beings, and, of course, no deity or no "pre-existing design" (Gulick 49). That is, there were *not* any higher emergent levels of reality but only what Polanyi calls "primordial inanimate matter" (*PK* 404). But also logically necessary before the evolutionary process, beyond the principles of "primordial inanimate matter" (laws of physics), there was a higher level ordering principle of evolution which made the emergent evolutionary development *possible.* This is the case, according to Polanyi, because higher emergent levels and principles cannot emerge from "primordial inanimate matter" and by the principles of fundamental physics. This is logically impossible in Polanyi's view. So, there *had to be* at least one higher level ordering principle before the first living beings as well.

However, this travel back into the past is not a reduction of the higher emergent levels of living beings to the fundamental inanimate physical substance at all. Firstly, it is not a non-temporal (synchronic) process as generally reductions are (e.g. thermodynamics to statistical physics or mind to brain processes, etc.). Secondly, it is not an explicit process as is required from reductions, but rather a tacit one. Finally, and this is my most important point, it "reduces" the living things not only into a fundamental physical substance, but *also* into a *higher level* ordering principle, which is fairly strange for a reduction.[11] So this travel back into the past does not "violate his [Polanyi's] ontological insight that different levels operate according to different principles" (Gulick 48). He simply provides a logically necessary explanation for the ordering principle of evolution, showing how evolution could produce the rich, multileveled hierarchical structures of living beings. According to his account, Polanyi also claims that "evolution, like life itself, will then be said to have been *originated* by the *action* of an ordering principle…" (*PK* 384). Unfortunately, Polanyi so little elaborated on this point that it is hard to tell what he was implying when he wrote this.[12]

## Conclusion

"The rise of man can be accounted for only by other principles than those known today to physics and chemistry. If this be vitalism, then vitalism is mere common sense, which can be ignored only by a truculently bigoted mechanistic outlook…" (*PK* 390). As Polanyi wryly notes here, he is not acknowledging that he is a vitalist, but that he dislikes the continuous misinterpretation of his intentions. He is *not* a vitalist because he is an *emergentist*. But materialists and neo-Darwinists always confuse these two essentially different philosophical notions, and, unfortunately, Gulick does too. Polanyi claims that "all physiology is teleological" (*PK* 360), but he understands teleology not in the least in a vitalist sense but in an emergentist way. According to him, if someone accepts the rich, multileveled hierarchy of life, as Gulick does, she must accept the teleological nature of life and evolution too, as well as the logical necessity for a higher level emergent ordering principle at the beginning.

## Endnotes

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[2]"That 'Treacherous Footnote': Assessing Grene's Critique of Polanyi," *TAD* 37:2 (2010-2011): 45-57. This essay is cited hereafter as Gulick by page number in parenthesis.

[3]For a similar discussion, see Gulick's earlier essay "Polanyi on Teleology: A Response to John Apczynski and Richard Gelwick," *Zygon* 40:1 (2005): 89-96.

[4]Philip Clayton, "Emergence, Supervenience, and Personal Knowledge," *TAD* 29:3 (2002-2003): 8-19 and Philip Clayton, *Mind and Emergence. From Quantum to Consciousness* (Oxford: Oxford University Press, 2004).

[5]Ernst Mayr, *Systematics and the Origin of Species* (New York: Columbia University Press, 1942) and Ernst Mayr, *One Long Argument*: *Charles Darwin and the Genesis of Modern Evolutionary Thought* (Cambridge, MA: Harvard University Press, 1991).

[6]*The Correspondence of Isaac Newton*, H. W. Turnbull (ed.), Vol. III, 1688-1694 (London: Cambridge University Press, 1961): 233-256. This correspondence between the cleric Bentley (whose sermons attacking atheism were about to be published and who therefore consulted Newton to see that he was properly interpreting Newton) and Newton makes clear Newton's theism and his skepticism about the hypothesis of innate gravity.- See also Thomas Kuhn's discussion (*The Structure of Scientific Revolutions* [Chicago, London: The University of Chicago Press, 1996]) where he comments: "Gravity, interpreted as an innate attraction between every pair of particles of matter, was an occult quality in the same sense as the scholastics' 'tendency to fall' had been. Therefore, while the standards of corpuscularism remained in effect, the search for a mechanical explanation of gravity was one of the most challenging problems for those who accepted the *Principia* as a paradigm. Newton devoted much attention to it and so did many of his eighteenth-century successors. The only apparent option was to reject Newton's theory for its failure to explain gravity, and that alternative, too, was widely adopted. Yet neither of these views ultimately triumphed. Unable either to practice science without the *Principia* or to make that work conform to the corpuscular standards of the seventeenth century, scientists gradually accepted the view that gravity was innate" (105).

[7]Charles Darwin, *The Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life* (London: John Murray, 1872): 63.

[8]Francisco J. Ayala, "Teleological Explanations in Evolutionary Biology" in *Nature's Purposes: Analyses of Function and Design in Biology*, eds. Colin Allen, Marc Bekoff, George Lauder (Cambridge, MA: MIT Press, 1998): 29-49.

[9]Two late Polanyi essays (originally published in 1967 and 1968) that are available in anthologies of Polanyi material provide his best account of the operation of boundary conditions: "Life's Irreducible Structure" (KB, 225-239) and "Life Transcending Physics and Chemistry" (SEP, 283-299). I cannot here elaborate in detail Polanyi's view but I recommend these important essays since I believe they have not been appropriately recognized as providing the key to Polanyi's criticism of Neo-Darwinism and his alternative account in terms of emergence.

[10] In this approach, the randomness is clearly *only a correlation* between levels. The lower or the higher levels can be regarded as random if *exclusively put in correlation with another level*—in this case with each other—but *not if by itself*. "By saying a factor is *random*, I do not refer to what the factor is in itself, but to the relation it has with the main system" (W. Ron. Ashby, *An Introduction to Cybernetics* (London: Chapman

& Hall LTD, 1957), 259. It follows from this that *the higher level can never be a random consequence of the lower* because, given this, it ought to itself be random too, yet this is not the case. In itself it is entirely deterministic and it *has to be* so, otherwise it could not have meaning, it could not be purposeful and it could neither control nor harness lower level processes. The randomness is only a correlation of the two different structures and the principles governing these levels. If their correlation is not random, it means that the higher level *depends* entirely on the lower; thereby, there is no essential difference between them, and they are determined by *one* – lower level – principle.

[11] Contrary to all of this, I believe it is sensible to call this process a new kind of reduction, *diachronic* reduction. See Daniel Paksi, "Emergence and Reduction in the Philosophy of Michael Polanyi, Part I" *Appraisal* 8:2 (2010b): 34-41, and "Emergence and Reduction in the Philosophy of Michael Polanyi, Part II" *Appraisal* 8:4 (Oct, 2011): 28-42.

[12] Elsewhere I have tried to sketch a possible interpretation of this passage. See Daniel Paksi, "Polanyi and Evolution," *Knowing and Being, Perspectives on the Philosophy of Michael Polanyi*, Tihamer Margitay (ed.) (Newcastle on Tyre: Cambridge Scholars Publishing, 2010): 151-172.

***(continued from p. 39)***

## Notes on Contributors

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