

# Polanyian Biosemiotics and the From-Via-To Dimensions of Meaning

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*A central aim of Michael Polanyi's philosophy is to demonstrate the many ways in which human existence is meaningful to counter the nihilistic and positivistic accounts that contributed to the world wars and totalitarian governments in the twentieth century. Yet Polanyi's references to various sorts of meaning is suggestive rather than systematic and coherent. The objective of this essay is to show the relationship between the different aspects of meaning by viewing their emergence in cosmological perspective beginning with simple forms of life and culminating in the ways signals, perception, and language support human experiences of significance. Emergence, embodiment, and "from-via-to" interpretation are key ingredients in this Polanyian version of biosemiotics.*

Michael Polanyi's last series of lectures, delivered in Chicago and Texas, is entitled "Meaning." In his introductory comments to the lectures, Polanyi states that the basic point of the lecture series is expressed by the titles of the last two lectures, "Meaning Lost" and "Meaning Regained."<sup>1</sup> I believe the notion of meaning regained can be taken not only as the culmination of his last lectures, but as a phrase that summarizes the ultimate point of his entire work in philosophy.<sup>2</sup> Yet the notion of meaning, so crucial to his thought, remains to the end of his writing used in a variety of ways that can be confusing. In this essay, I will set out a view of the different aspects of meaning to which Polanyi alludes and ground them in a semiotic framework that has affinities to the evolutionary scheme that is featured in Part Four of *Personal Knowledge*. I believe that the clarification of the notion of meaning in its different aspects is crucial to the project of ensuring that Polanyi's post-critical philosophy is a living movement that remains responsive to contemporary issues.

Typically, discussion about meaning has centered around two distinct poles. Analytic philosophy and to a large extent post-modern thought have concentrated upon the linguistic aspects of meaning. This discussion has featured such structural notions as syntax, semantics, and pragmatics, and has been littered with such terms as propositions, utterances, morphemes, codes, memes, texts, and illocutionary acts. The second major pole of discussion is related to the notion of significance and has been classically expressed in the question, "What is the meaning of life?" By the end of this essay, I hope answers to the following two questions might be evident: 1. Is there any organic connection between linguistic meaning and meaning as significance such that it makes sense to use the same term, "meaning," to refer both to a result of language usage and to experienced significance? 2. If there is a connection, how is it best understood?

## Polanyi's Usage of the Term "Meaning"

To justify my claim that Polanyi's notion of meaning is multi-faceted and not systematically delineated, let me mention five different ways he uses the term, often without noting the differences in his usage.

- (1) Denotational meaning. Fairly early in *Personal Knowledge* Polanyi refers to “two kinds of wholes and two kinds of meaning” (PK 58). “The more clear-cut cases of meaning are those in which one thing (e.g. a word) means another thing (e.g. an object)” (PK 58). This first type is what is commonly called denotation, but which Polanyi also calls representational meaning (although denotation and representation have somewhat different connotations).
- (2) Existential meaning. The second type of meaning is that which a context contains in itself. “Other kinds of things, like a physiognomy, a tune or a pattern, are manifestly wholes but this time their meaning is somewhat problematic, for though they are clearly not meaningless, they mean something only in themselves” (PK 58).

Before proceeding further, let us notice some ambiguities in this second notion of meaning. Does the meaning of existential meaning lie in the context itself apart from human knowing, or does it only come into existence as a function of human thought? Math and music are cited as mainly having existential meaning, and it would seem that some appreciator of music and some human understanding of mathematical symbols and their largely logical relationships would be needed for these disciplines to be meaningful. But then Polanyi seems to opt for a view of existential meaning apart from human knowers when he goes on to say, “All kinds of order, whether contrived or natural, have existential meaning . . .” (PK 58). But don’t all things, or the great majority of the virtually infinite world of things, have some sort of order? Don’t they fit into some kind of casual network at some level of analysis? To equate existential meaning with all examples of order in the world seems to stretch the term beyond usefulness. Some clarification is needed.

- (3) Subsidiary meaning. Polanyi describes particulars as having meaning insofar as they contribute to and sustain a whole. He says that “when something is seen as subsidiary to a whole, this implies that it participates in sustaining the whole, and we may now regard this function as its *meaning*, within the whole” (PK 58). Although Polanyi makes this comment as a basis for describing denotative and existential meaning, subsidiary meaning seems different from either of them. The shape of a person’s mouth contributes to the recognition and meaning of a physiognomy, but this is not denotative meaning, as the mouth does not mean the face, nor does it seem to be the existential meaning of a context. Elsewhere Polanyi says effort is needed to perceive a meaningful whole (for instance, TD 6), and effort implies that subsidiary meaning comes into being through an act of integration rather than being a mere ordered context like existential meaning.

This third usage of the term “meaning” is crucial to Polanyi’s creative epistemology. At different points Polanyi describes the structures of knowing in terms of two types of awareness, in gestalt terms of part/whole, but most importantly in terms of the subsidiary/focal distinction. The identification of meaningful wholes is a tacit accomplishment in which the parts have a meaning. Polanyi says that “in a gestalt the parts *have* a meaning and the whole which they form *is* their meaning. . . The several moves of a skill *have* their meaning in the successful act which *is* their meaning. Words and sentences *have* a meaning in the message which *is* their meaning.”<sup>3</sup> Note, however, that subsidiaries come in several rather different forms. Skills that contribute to meaningful actions are physiological in nature; dispositions, habits and memories are complex sorts of subsidiaries that influence outcomes; and words are human constructions or conventions.

- (4) Focal meaning. The fourth usage has just been indicated: focal meaning is the product of the integration of parts into a whole. In a broad sense, all consciousness has some content (is intentional in Brentano's terminology) and thus could be said to denote this content. However, in its narrower, more common usage, denotation is understood as a function of linguistic meaning, the uniquely human exemplification of this fourth type of meaning. Words which *have* conventional meanings are integrated via grammatical rules into a phrase or sentence the meaning of which *is* the personally intended focal meaning. Not all linguistic expression is denotative; some uses of language may be simply expressive, interrogative, or unfocused and thus may not denote an intended specific object. So on this narrower, more usual usage, denotative meaning (the first type described above) can be seen as one particular usage of linguistic meaning. Moreover, not all focusing is inherently linguistic in nature. Like other animals, we may simply focus on an image or pattern or signal, not a specific denoted object. Thus focal meaning may occur in a variety of forms.
- (5) Consummational meaning. We still have not discussed the notion of meaning that Polanyi sees as central to his philosophy: meaning lost and regained in society. This is meaning as experienced purposefulness or significance. When experienced, it is manifest in a sense of well-being. When not experienced, it leads to despair. The title of Polanyi's 1970 article, "Why Did We Destroy Europe?" refers to consequences for society resulting from widespread nihilistic loss of meaning in this fifth sense.

How are these five types of meaning related to each other? Or is the use of a common term to refer to these aspects of being a linguistic convenience that is not expressive of any real commonality? I believe that these types not only can be but should be shown to be derived from a common root. My task in what follows is to set forth the systemic perspective that can illuminate a full-fledged theory of meaning. Because of Polanyi's pioneering work, a systemic understanding of meaning can go far beyond the anemic linguistic notions of meaning that seem so important in the analytic tradition of philosophy. Following Polanyi's lead in PK Part Four, a robust, systemic theory of meaning will be set in an evolutionary, emergent, and indeed cosmological framework.

### **Three Orders of Cosmic Emergence**

Meaning is an emergent feature of being carried out by some living being. This is the basic claim I shall seek to substantiate in what follows. In attempting to show how the various meanings of meaning are systematically related, it is helpful to take a genealogical/evolutionary approach in order to see how meaning's many manifestations *emerge* within the structure of the cosmos as a whole. This is in effect the approach Polanyi takes, and in the process he distinguishes between a) the realm of physics and chemistry, b) the emergent realm of living things, and c) the crowning emergence of humanity.<sup>4</sup>

I accept Polanyi's distinction between these three basic ontological domains. Like Polanyi, I don't find it helpful to state that there is meaning or significance in the realm of matter and energy in itself. However, unlike Polanyi, I see the lack of meaning in the cosmos apart from life as consistent with my claim that order apart from purpose does not produce meaning.<sup>5</sup> To explain why I posit meaning as coming into being only

with the rise of life, I will indicate how in each of the three realms a different notion of causality and a different reach of influence has emerged to make each unique as a distinctive ontological order.

**First Order Emergence: Dynamo-Physical World.** This is the realm of matter and energy in their dynamic interaction. The laws of physics and chemistry are inherent in the dynamic structure of this order. There is no evident purpose or meaning in this dynamic realm. Rather the evolution of the dynamo-physical world seems structured by three components: the nature of *matter-energy* itself, somewhat “lumpy” *initial conditions* inherent in the Big Bang, and *constraints* that emerge as the universe expands.<sup>6</sup> Also implicit in this order of being as it expands are tendencies toward the emergence of different ontological levels as guided by processes of self-organization, for instance, as expressed in movement towards states of equilibrium. The Big Bang may be regarded as a basic singularity, whereas the process of cosmic unfolding is essentially dyadic in nature. This order of being is headed to no discernible meaning-endowing climax. It has no controlling center. With expansion from its virtually pinpoint origins, surface, shape, and contiguity have taken on important constructive roles in processes of emergence. From the microcosm to the macrocosm, this order is ruled by various blind types of causality subject to different forces at different levels and scales of complexity. At the level of the atom, the strong force prevails, whereas for us humans, gravity is an important causal force. A chemist may see significance in how a catalyst may cause a certain chemical reaction, but the significance is in the knowing, not in the chemicals themselves. Similarly, recounting “a brief history of time” as Stephen Hawking tells it produces meaning in the form of a causal narrative about cosmic expansion, but the meaning is a function of the telling, not of the process itself. Any reductive theory that seeks to explain the processes of life solely in terms of the dynamo-physical world robs life of meaning and significance, because while the dynamo-physical order has the potential to support the emergence of meaning, in itself it has no meaning.

It will be evident that I reject Polanyi’s notion of existential meaning insofar as he claims it is found wherever order is found. Yes, the dynamo-physical world is replete with order and order-creating processes, but not with meaning.

**Second Order Emergence: Biological World.** Living things can be distinguished from non-living things by the fact that their functioning is self-centered. They are what Polanyi calls active centers (see PK 336, 344, etc.). The many parts of active centers are coordinated in healthy beings in support of the organisms’ survival, both as individuals and species. Their purposeful functioning can be contrasted to the mute centerless unfolding of the dynamo-physical world. The aim of living things is not only to survive, but also to thrive as individuals and through reproduction to pass on that ability to live to descendants. The most primitive living things, the archea and bacteria, are barely more than chemical machines, yet as cells each is a tiny independent being seeking to divide and replicate itself as fast as possible. Indeed, all living things, whether single celled or many celled, plants or animals, possess a degree of autonomy or self-regulation<sup>7</sup> that transcends complete determination by external influences upon surfaces and internal structures. Even such seemingly unified and ordered but inert entities as atoms, crystals or stars may be seen as deterministic resolutions of clashing properties. As Polanyi emphasizes, living beings introduce achievement into the world—success or failure in relation to increasingly complex ends (PK 331, 345; SM 60).

Thus each living being may be seen as a little world set within a vastly larger encompassing world. The workings within this little world are of a different order than the workings of the outer world. Living beings have an inner and an outer. All the impacts coming from the outer world, even those produced by other living things, are leveled off into different types of affordances (to use Gibson’s helpful term).

So is it fitting to speak of meaning within the biological world? Yes indeed. Because living beings have telic features related to their maintenance and survival—purposes such as feeding, reproducing, and countering enemies—they must have inner processes that accomplish these ends. The functions that achieve internal goals are meaningful to the organism. At its most basic level, then, meaning may be equated with teleological functioning. That is, biological processes introduce an additional dimension to physical cause and effect. More specifically, organisms must be able to gather information relevant to their survival and interpret it in terms of actions that ensure survival. Primordial forms of subsidiary and focal meaning are found within the biological world. Further elaboration on meaningful processes in the animal world (upon which I will focus) will be forthcoming after the third emergent order is discussed.

**Third Order Emergence: Human World.** Given the vastly extended scale of increasing complexity and enhanced ability to respond to their niches from single-celled bacteria to the mammals, it may seem ridiculously presumptuous to claim a third order of emergence for humans. What makes us so special? In brief: discursive symbols. I will again insist on the absolutely essential distinction Susanne Langer makes between signal awareness and symbol-produced conception.<sup>8</sup> All animals, including humans, learn to adjust their behavior to the signals our environments provide with respect to the availability of food, the presence of danger, and the opportunities for reproduction. Animals often also develop their own signals to communicate the existence of life enhancing opportunities or threatening dangers. The difference between signals and symbols is one of function. A phrase like “Look out!” can be a signal if it calls forth a reflex action like jumping out of the way of a bicycle or a symbol if it inspires reflection.

The dynamo-physical world is vast and centerless; the biological world contains little centers within this spatio-temporal vastness; the human world contains little human centers that dwell within both dynamo-physical and *cultural* vastness. That is, through language and other symbolic forms, humans can do more than engage their immediate surroundings. Through conception, we can reflect upon past events, project ourselves mentally into other places, plan future events, and in such ways escape the limitations of our spatio-temporal placement in the dynamo-physical world. Through language, we can consider alternative acts and the reasons that favor choosing one action over another. Rational choice is a novel type of causality in the cosmos; it is the essence of freedom. Linguistically based conception grants humans the ability to transcend their own perspective and empathize with the perspective of other humans. This ability is the basis of morality and self-consciousness.<sup>9</sup> Also of great significance is the ability of humans to store memories, insights, predictions, etc. in writing, pictures, diagrams, formulas, etc., thus greatly enlarging the cultural realm in which we dwell. Moreover, the ability to expand our human powers of perception and action through increasingly robust technologies continually alters the external environment in which we dwell. The human world is an emergent phenomenon built upon the biological world which in turn is built upon the properties of the dynamo-physical world.

All five types of meaning in Polanyi’s thought have places within the human world. Subsidiary and focal meaning take on new, rich qualities within human consciousness thanks to the world-forming powers of discursive symbolism. We can denote all sorts of objects within human consciousness; denotative meaning is critical to thought. Even existential meaning can be seen to have a place in the human world if it is treated as an aspect of consciousness rather than as a characteristic of the dynamo-physical world. A picture exhibits what Langer calls presentational symbolism.<sup>10</sup> Picture thinking—holistic (spatial) conception—complements linguistic thinking—discursive (temporally extended) conception. Seeing brings together presentational and discursive symbolism because our vision provides both picture-like context and linguistically infused focal

awareness upon which we can reflect. Finally, consummational meaning, nascent in the drive satisfactions animals experience, attains its mature human form through language because we can reflect upon the quality of our experience, considering the degree to which our values and purposes are lived out or thwarted.

## Formulating a Polanyian Biosemiotics

Now that the qualities of the three emergent orders have been sketched out, it is time to examine the extent to which Polanyi's thought can deepen our understanding of how humans can regain consummational meaning in our time. For Polanyi, the key to regaining meaning is to ensure that we not fall prey to deceptive and fallacious frameworks of thought such as positivism and Marxism, which debunk the validity of the partially tacit values and purposes that are essential to experiences of consummational meaning. He seeks to unmask inappropriate reductionisms of all sorts insofar as they distort the fiduciary, higher level components and processes of all thinking and knowing. At the level of general theory, Polanyi replaces the false ideal of objectivism with a search for plausible philosophical and religious visions that support experiences of consummational meaning. Faith in such visions needs to be sustained by commitment to the practices that allow a person to dwell in purposeful and significant activities. At the level of epistemology, Polanyi reinvigorates the notion of skills that are utilized by persons within a from-to structure of consciousness. Tacit skills of integration and evocation are particularly important to his revision of epistemology.

I have been profoundly influenced by Polanyi's epistemology, but I have increasingly felt that his notions of integration, evocation, and the from-to structure of consciousness are too vague and general to capture important differences within and between the biological and human worlds. As already indicated, his notion of meaning is similarly vague. Perhaps most importantly, these overly vague and idiosyncratic notions tend to place those of us who love Polanyi into an island disconnected from much ongoing academic conversation, whatever the discipline.

So in the balance of this essay I will propose some revisioning of Polanyian epistemology intended to help reconnect Polanyian thought to some insightful strains of contemporary thought as well as increase its rigor. Several intellectual developments overlapping with or complementing Polanyi's interests were taking shape at the same time Polanyi was molding his own thought into its mature philosophical form. The semiotics developed earlier by Charles Peirce was increasingly being recognized as a great and broadly useful system of thought. Several philosophers, including two Hungarians, Ludwig von Bertalanffy and Ervin Laszlo, were developing a systems approach to philosophy. Closely associated with this movement, the notions of cybernetics, self-organizing systems, and by implication emergence were beginning to attract attention. Some biologists, reacting against reductionism and a narrowly defined version of Darwinian evolutionary theory, were searching for superior alternatives. One such person was the Dane, Jesper Hoffmeyer, a biologist with philosophical leanings. His *Signs of Meaning in the Universe* integrates the foregoing developments into a programmatic version of what has become known as biosemiotics. His subsequent work, *Biosemiotics: An Examination into the Signs of Life and the Life of Signs*, further consolidates the field of biosemiotics. Others who have made important contributions to this emerging discipline include Thomas Sebeok, Kalevi Küll,<sup>11</sup> Claus Emmeche, Donald Favareau, and Terrence Deacon (who, as co-author with Ursula Goodenough, contributed an article to *Tradition and Discovery* 30:3).

It will likely be evident from this brief description of the influences shaping biosemiotics that it has much in common with Polanyi's interest in meaning, evolution, systems, emergence, and spontaneous order

as a form of self-organization. Indeed, Polanyi's essay, "Life's Irreducible Structure," influenced one of the early theorists of biosemiotics, Howard Pattee,<sup>12</sup> and the article has been frequently cited in biosemiotic literature. To what extent, then, might Polanyian thought both enrich and be enriched by biosemiotics?

Let me begin to explore an answer to this question by sketching the ways in which a Polanyian biosemiotics is related to the operation of signs that Peirce called semiotics. Going beyond dualistic or dyadic thinking seems crucial in order to account for an organism's bounded freedom and ability to achieve purposes. A theory of causality incorporating higher and lower levels is needed to replace one level dyadic, deterministic cause and effect. Peirce's triadic semiotics can be tailored to fit the bill. Peirce's triads are comprised of an object, a sign, and an interpretant. Polanyi's from-to sounds dyadic, but his notion of "from" includes unspecified elements that can be extricated and set into a triadic scheme. For many years I have argued that it is beneficial to expand his underlying from-to framework into a triadic "from-via-to" conception that helps highlight the nature of the interpretive process.<sup>13</sup> This view introduces an interpretative function existing on a higher level that draws upon lower level energies to activate, integrate, or otherwise transform lower level inert materials. The functional goals involved in such processes introduce the idea of achievement with respect to an organism's activity. Even when the interpretive elements are lifted out of Polanyi's "from," the "from" seems richer and better anchored in the dynamo-physical and biological worlds than Peirce's "object" because it is explicitly rooted in the body and its processes. The "via" in my formulation is closely related to Peirce's "sign"; it is the interpretive element in cognition and action. In terms of cognitive activity, Polanyi's "to" seems clearer than Peirce's "interpretant" in emphasizing the production of focal thought or intended action. Peirce's "interpretant" describes the outcome of the interpretive process, but his triads leave out both the lower level physiological processes that produce the interpretation and the higher level goals and standards that guide the process (in other words, he omits the facilitating body and the responsible person).<sup>14</sup>

In denying that there is meaning in the dynamo-physical world, I explicitly reject Peirce's attempt to articulate a universal theory of signs that includes non-living nature. While Peirce's project is admirable in its intention, my concern is that a universal theory too easily ignores ontological difference between different levels of reality and their distinctive types of causality. His approach is prone to lapse into a form of idealism. I see signs occurring as meaningful functions *within* living beings (what Thomas Sebeok terms "endosemiotics")<sup>15</sup> as well as in a living being's meaningful reading of and relating *to* its external environment.

## **Polanyian Biosemiotics in the Biological World**

How deeply or primordially are triadic relations a necessary interpretive feature of the empirical world? Terrence Deacon tries to trace them back to types of molecular exchange in his analysis of what he calls "autogens."<sup>16</sup> While the processes Deacon explores may contribute to acts of interpretation, molecular activity alone does not cross the threshold into the biological world. I find Jesper Hoffmeyer to be persuasive when he states that "the cell forms the boundary, the lowest level at which it is reasonable to talk of true sign processes."<sup>17</sup> Such basic biological processes below the level of mind as "protein synthesis, metabolism, hormone activity, transmission of nervous impulses, and so on" have been labeled "protosigns" by Giorgio Prodi.<sup>18</sup> These biological events are different from such physical events as precipitation, magma crystallization, or sun flares for an important reason. An impure crystal is just that: an entity having no larger implication for the world, whereas a cancerous cell, toxic chemical in the bloodstream, or inadequate nutrition may result in a functional breakdown, the rise of a disease, or even death of a centered being. From a biosemiotic perspective, protosigns function as mediators in the biological world. "*From*" certain initial conditions calling for response,

protosigns in the “*via*” position provide the interpretative signals that release actions (the “*to*”) allowing the organism as a whole (the higher level) to realize its goals.

There are reductivist thinkers who challenge the claim that life represents an emergent order separating it from the laws of physics and chemistry. A typical claim on the part of reductive thinkers is that a living entity’s genes, in interaction with both its internal and external environment, determine the course of that being’s life. Reductionism treats complex, multilayered reality as if all were on the same level and subject to the same sorts of causal processes. As an alternative, Polanyi’s ontological vision of a many-layered universe is a powerful antidote. Emergence operates at different levels of scope and influence. In addition to the three ontological *orders* of emergence connected to the issues of basic cosmic orientation, there are many higher *levels* of functioning that set boundary conditions (constraints) upon lower levels within the complex structures of living beings. Denis Noble argues that genes, and indeed the whole DNA sequence of a species, are best regarded as codes that higher, emergent levels of physiological functioning may make use of.

In fact, the DNA just sits there, and occasionally the cell reads off from it a sequence that it needs, in order to get some protein produced. This looks very much like my hi-fi equipment reading the digital information on a CD to generate the real ‘action’: the music. So the first stage in the reductionist chain of cause and effect is not a simple causal chain at all. When a sequence is read off, that is an important event, which initiates a whole series of subsequent events. These are physical events. True. But it is the process of reading that matters, as well as the object that is read.<sup>19</sup>

The functioning of the cell, the reading, occurs at a higher level than organelle functioning. Ever higher are the functioning of a tissue, an organ, and the organism as a whole. In stressing the action of higher on lower levels, Noble’s reading is consistent with Polanyi’s earlier insistence that active subjective processes reflective of an organism’s drives or intentions must be added to the automatic, equilibrium-seeking processes characteristic of Gestalt thought. Active, higher level processes make Gestalt useful for understanding what it is to learn and interact intelligently with one’s environment. Polanyi stresses the importance of “our innate sentience and alertness, as manifested already in the lowest animals in exploratory movements and appetitive drives, and at somewhat higher levels in the powers of perception. Here we find self-moving and self-satisfying impulses of both purpose and attention which antedate learning in animals and themselves actuate learning” (PK 96).

Within an organism there is bottom-up as well as single level and top-down varieties of “from-via-to” causality. Pathogens interfering with normal functioning (the “from”) may jointly serve as noxious signals (the “via”) producing feelings of sickness and an interest in a remedy (the “to”). In response to this bottom-up crossing of levels, a person may take pills to fight the disease (a top-down action).

The meaningful functioning within and between levels in the biological world stands in contrast to change in the dynamo-physical world. To the initial conditions, specific configuration of matter-energy, and constraints that guide change in the first order of emergence, organisms in the biological world add meaningful functions maintaining the integrity of the active center’s life and survival. The function achieved is the meaning of each interpretive act. Function and meaning are not, obviously, directly observable in the spatio-temporal world even though they are dependent upon it and act within it. Descartes reified the distinction between materiality and such higher level phenomena as functionality by regarding matter and mind as substances, creating thereby an unbridgeable dualism. Triadic, multi-level analysis is by nature relational and explanatory

of change. Acts of interpretation take place within an embodied active center, the highest level of which may be regarded as the ultimate locus of responsibility for the organism's quality of life and survival. In the human world, that highest level is the person.

As the process of evolution unfolds over time, increasingly complex forms of interpretation develop. Within evolution, simple successful forms of response are retained by more complex beings.

In contrast to the engineer, evolution does not produce innovations from scratch. It works on what already exists, either transforming a system to give it a new function or combining several systems to produce a more complex one. If one wanted to use a comparison, however, one would have to say that this process resembles not engineering but tinkering, *bricolage* we say in French.<sup>20</sup>

So the conservation of successful functions in increasingly complex beings eventuates in the many levels that co-exist in mammals. Humans experience upper levels simultaneously in the experience of multi-tasking.

Protosigns play important roles in human existence at a tacit, autonomic level, carrying out such tasks as adjusting one's irises to the amount of light, regulating one's heartbeat, and keeping one in balance. Signals are the next higher level of signs beyond protosigns. Signals provide significant bits of information about actuality within an individual's *Umwelt* (to use Jakob von Uexküll's term for the aspects of an encompassing environment within which a species dwells given its particular set of receptors and dispositions).<sup>21</sup> There is no clear boundary between a protosign and a signal, for we are speaking here of a spectrum of signs. In general, protosigns are by nature beyond the reach of consciousness, whereas signals are responded to through increasingly sophisticated forms of awareness as one ascends from, say, amoebas to clams to robins to apes. A signal may elicit an innate response (reflex) or may evoke a learned response.

In speaking of signal responsiveness we have broached Polanyi's notion of tacit knowing. He helpfully expands the notion of sign (signal) learning by mentioning how animals also learn how to contrive means to ends (trick learning) and organize their learning in different sorts of mental maps (latent learning)—see PK 70-77. Signals involve animals in a non-conceptual world of time as well as space. To Polanyi's three pre-linguistic forms of learning it is helpful to add Langer's notion of presentational symbols to describe how perceptual information is organized into objects and patterns that can be remembered. To a fox, a certain smell indicates rain is coming, a feeling of wetness on the skin indicates it is currently raining, and puddles indicate to the fox coming out of its den that it has rained. By reading these signals, the fox may be said to understand its *Umwelt*.

The allusion to Langer's notion of presentation symbolism at last gives us a basis for becoming clear about the difference between signals and symbols. Signal responsiveness is immediate and informative but lacks the reflective quality of conception, whereas symbol-based conception makes possible reflection, planning, and other cognitive activities. Signal responsiveness allows an animal to learn environmental patterns and respond intelligently to the world, but the capacity to organize experience via presentational symbolism grants an animal the ability to perceive the world. Human consciousness adds yet another layer to experience through discursive symbolism. Non-human animals do not possess the capacity to learn vocabulary and grammar and apply it intelligently to experience of the world. But that does not mean non-human animals don't have intentions, learn skills, dream, etc. My dog's twitching muscles and rapid eye movement when he

sleeps indicate he also dreams, thus having conceptual experience quite separate from any need to respond to signals. Sometimes my corgi doesn't quite know whether to go outside or stay inside; I can observe him rocking back and forth at the door as he tries to decide between these two alternatives. The fox keeps in mind the rabbit's scent even though it may momentarily lose trace of the spoor it is following. This sort of memory is more than just habit; it is non-discursive conception that only presentational symbols, not signals, can provide. Thus there is a difference between the "from-via-to" of signal responsiveness found among all living beings, the from-via-to of presentational symbols found among more developed animals, and the from-via-to of discursive symbolism found only among humans. And human action will typically rely upon each of these triadic processes.

We have now discussed several factors that are instrumental in forming an animal's Umwelt. First, the sort of receptors an animal has set limits to what information about the environment it may receive. Presumably the animal receives a steady diet of information from these receptors in the form of sensation, the great majority of which is ignored as it is not relevant to the animal's current interests. Second, an animal has innate or learned schemas that resonate to patterns of interest and in a sense designate which sensation is attended to by the animal in a specific context. Such patterns of interest function as signals allowing an animal to respond in innate or learned ways (although subject to error) to phenomena in the animal's environment that bear on its purposes of the moment. Third, the processes of presentational symbolism allow the animal to perceive and/or conceive an objective world that stands over against the essentially subjective processes of itself as a centered being.

## **Polanyian Biosemiotics in the Human World**

Before discussing further the all-important type of symbolism humans alone enjoy, namely language, it is important to consider how much we rely upon lower level functions. Autonomic processes mediated by protosigns at different levels go on continually in our bodies. Our receptors provide ongoing information about the world, although we let almost all this information flow by unobserved. We learn skills that we may utilize without focal attention to what we are doing. What we perceive and learn is indwelt in visceral, spatial, and temporal schemas that constitute the internal mapping Polanyi calls latent learning. Mapping seems the right word, because a key aspect of our remembered experience is organized in the form of presentational symbolism. It is analogical and holistic, whereas language, comprised of words, is basically digital.<sup>22</sup> Because language is so noisily at the forefront of our consciousness, it is easy to overlook what a huge role the analogical, holistic aspect of latent learning plays in human experience.

Usually the gap between our analogical understanding and our digital speaking is not obvious, for they tend to be intertwined in experience. But there are those occasions where we understand something but struggle to find the words to adequately convey our understanding. Then the distinction is obvious. I suspect that the distinction here is what Polanyi is seeking to articulate when he contrasts denotative with existential meaning and describes the latter as contextual, which implies being presentational or analogical in nature.

Hoffmeyer sees the necessity for human existence of both digital codes, such as are embedded in DNA and in vocabularies, and "analogical codes [operating] in ecological space."<sup>23</sup> He speaks of code-duality.<sup>24</sup> However, while the analogue-digital distinction seems really insightful, I find it misleading to speak of an analogical *code* as being present in the action of subjects. Is not the better distinction that of digital code and interpretative or integrative activity resulting in the holistic character of experience? Polanyi's view that

subjects carry out skill-based integrations that are fallible seems more helpful than speaking of analogical codes. Insofar as meaning is experienced and not just stored, it would seem always to be analogical in nature. It would express what Kant termed the unity of experience.<sup>25</sup> Only stored meaning, whether in vocabulary, CD or film, may be digital in nature.

The distinction between presentational symbolism, which is analogical in nature, and discursive symbolism, which in its use of words is largely digital, may help increase our understanding of how scientific discovery works. The foreknowledge that Polanyi claims can guide the process of discovery seems typically to be grounded in the presentational symbolism of perception and its analogical internal mapping. “Perception has this inexhaustible profundity because what we perceive is *an aspect of reality*, and aspects of reality are clues to yet boundless undisclosed and perhaps as yet unthinkable experiences” (KB 79). After intuitively anticipating an otherwise unsuspected coherence in nature, the successful scientist follows a gradient to discovery by finding words or formulas which more and more accurately match or evoke these tacit holistic patterns inscribed in our analogical understanding. Imagination, in which presentational symbolism is typically tethered to discursive symbolism, serves as the mediator between perception and thought in Polanyi’s view. Still, “the imagination alone does not achieve invention or discoveries, but merely evokes a spontaneous, integrative event which brings about the discovery” (SEP 327-328). In discovery, an imagined pattern connected to language or formula coincides with the presentational evidence derived from perception. We then experience the “ah ha” of solution, of coherence, and we concomitantly experience the consummatory meaning that accompanies satisfaction of a quest.

Interpreting scientific discovery as being guided by analogical understanding has more going for it than the psychological, phenomenological account I have just offered. The non-discursive understanding we share with animals is shaped by perceived environmental signals. Environmental signals embed us in empirical reality, and it is empirical reality that science seeks to decipher and explain. Words, on the other hand, are conventional symbols that may or may not be expressive of empirical reality. The process of scientific discovery, then, is an attunement of our language so that it articulates the real order presented in environmental signals (which in modern times often have been amplified through technology).

It is even more crucial to have a triadic interpretation of human consciousness than triadic interpretation in the biological world. Our minds are never failing fountains of symbolizing. Even when we sleep and are essentially disconnected from perceptual information, our minds keep generating dreams of greater or lesser intensity. The “via” of the human “from-via-to” represents both the presentational symbolism we share with at least the primates plus the discursive symbolism that humans alone have. Presentational symbolism supports a kind of picture thinking as its “to;” discursive symbolism represents the almost insuppressible human need to use language in thought and intentional action as its “to.”

The “from” of the human “from-via-to” pattern is thick. It refers indirectly to many lower level “from-via-to” functions involving protosigns and signals. It is also thoroughly temporal in nature. In the ongoing stream of experience what emerges in thought or action is frequently dependent on what we have just been thinking or doing and the social or physical context in which this has occurred. Sometimes what is most important in the “from” dimension is what another person has said or done, sometimes what we gather from a piece of writing or the media, sometimes presentational environmental signals, etc., but typically the “from” builds upon our immediately preceding thoughts.

It is important that a Polanyian biosemiotics avoids the tendency found in many epistemological schemes to atomize moments of knowing. The tendency toward epistemological atomism is exhibited to some degree in Whitehead's great stress on a concreting occasion or in Peirce's emphasis on signs rather than bodies, communities, etc. If one overstresses the subsidiary-focal, tacit-explicit or from-to relations in Polanyi's epistemology, one can be guilty of this sort of atomism. But Polanyi's attention to the influential role of tradition in thinking and acting, to spontaneous processes involving many elements or agents, to the importance of practices, to convivial communities, and the like, place his epistemological concerns properly in the broader spatio-temporal context that a comprehensive philosophy must provide. The "from" dimension can be analyzed in terms of many levels. The biologist can unpack the physiological functions and anatomical structures that make cognition possible; the psychologist can speak of the roles of memory, desire, fear, and such factors in behavior; and the sociologist can root the "from" at a transpersonal level in social mores, status-seeking, ideological beliefs, and the like to make generalizations about group behavior.

Because discursive symbolism is what is uniquely distinctive in human existence, more needs to be said about linguistic meaning. The "via" of language gives rise to human conception. Words used in thought or expression have connotations, that is, a range of associated notions that may be meant by the speaker. The way words are open and can refer to a variety of related objects or ideas is what gives language its scope and power, but which can also lead to misunderstandings. Connotations are then one type of meaning in human consciousness, a type of meaning that is not particularly thematized by Polanyi. A second type of linguistic meaning is denotation, which Polanyi, as we saw, does mention. Words may be used to refer to particular objects which will generally be clear in context. The "from-via-to" of human consciousness always eventuates in connotation, but not always in denotation. Thus one can almost justify talking about a quadratic rather than triadic functioning of some human consciousness: (1) *from* background skills, memories, ideas, and sensation (2) *via* language (3) *to* the connotations of conception (4) *to* reference to some object(s) in some respect. This is a process of *personal* knowing, as the subsidiaries relied upon, the language used, and the interests and intentions guiding the cognitive process are all attributable to the discriminations of a *person*.

The freedoms opened up to humans by language are quite remarkable. The way we cobble together words is governed by proper syntactical rules, and the words we use have fairly narrowly defined meanings. But there is room for personal creativity in both syntactical arrangement and in words chosen. In discursive thought, we can escape from the here and now into rich realms of artistry, history, technology, and the wonder of the world. Some thinkers emphasize that we are born into a pre-existing world of linguistic meaning from which we cannot escape. Polanyi's portrayal of the significance of tacit understanding to the process of thinking is one of many ways of demonstrating shortcomings in restricting thought to linguistic activity. Nevertheless, the role of language and cultural convention is powerful in shaping personality and the way we live, as his contrast between Azande and Western consciousness demonstrates.<sup>26</sup> Because the "via" of language facilitates the emergence of a new cosmic order, the human world, it is best not to lump it together with other subsidiaries as Polanyi does with his too simple "from-to" structure of consciousness.

## Meaning in Biosemiotic Purview

We now have grounds to answer the two questions raised at the beginning of our inquiry. 1. Yes, there is a connection between linguistic meaning and meaning as significance. 2. The linkage is explicated in the evolutionary, biological view of biosemiotics. Using language is one quite powerful way, among many, of expressing significance or purpose. The meaning of language in an evolutionary perspective is a development from the emergence of purpose in the universe with the advent of life. Human meaning is an embodied phenomenon capable of manifestation in all sorts of actions, including thinking, emotional outburst, and intentional actions. Confining the analysis of meaning to linguistic phenomena is a truncated way of dealing with the many levels of human reality.

It is to Polanyi's everlasting credit that he expanded our understanding of meaning beyond its traditional arenas of language and significance. By emphasizing the importance of the tacit dimension, by setting forth his view of anthropogenesis, in his emphasis on embodiment, in his introduction of the importance of "interest" in the construction of meaning in *Meaning*—in such emphases, the overall thrust of Polanyi's thought is implicitly an example of biosemiotics. His notions of subsidiary and focal meaning give functional depth to semiotic discussion. In this essay, I have sought to iron out some of the wrinkles in his thought so it can be explicitly seen to be an attractive version of biosemiotics. And so this exposition leads to two further questions: 1. Will Polyanian biosemiotics be a platform that supports growth in thought?<sup>27</sup> 2. Can it help facilitate the process Polanyi started of regaining consummational meaning in our world?

### Endnotes

<sup>1</sup>“From the Polanyi Archives: The Lecture Series: Meaning Lost and Regained,” *Polanyiana* 15:1-2 (2006), 69.

<sup>2</sup>This is also the tack that Harry Prosch takes in his presentation of Polanyi's philosophy. “I have organized this book on his philosophy around the notion of what he thought ails the modern mind and how he thought it can be cured” (*Michael Polanyi: A Critical Exposition* [Albany: State University of New York Press, 1986], p. 8).

<sup>3</sup>“Meaning Lost and Regained,” 74.

<sup>4</sup>Polanyi's affirmation of these three orders is more typically implied than explicitly stated. As an example, the three orders are inherent in the following quotation, which also supports my claim that there is no meaning in the non-living world. “While the first rise of living individuals overcame the meaninglessness of the universe by establishing in it centres of subjective interests, the rise of human thought in its turn overcame these subjective interests by its universal intent” (PK 389).

<sup>5</sup>Polanyi does not consistently claim that the world of physics and chemistry lacks meaning. Sometimes he is ambiguous regarding the reach of meaning:

We have just shown that living things, individually and in general, are also oriented toward meaning, and it is clear. . .that man's whole cultural framework, including his symbols, his language arts, his fine arts, his rites, his celebrations, and his religions, constitutes a vast complex of efforts—on the whole, successful—at achieving every kind of meaning. We might justifiably claim, therefore, that everything we know is full of meaning, is not absurd at all, although we can sometimes fail to grasp these meanings and fall into absurdities. (*Meaning*, p. 179)

Such passages suggest that sometimes Polanyi affirms what I called “cosmic meaning,” which I defined as

“the processes, structures, and relations that make possible order, purpose, and achievement in the cosmos rather than chaos and perpetual arbitrariness” (“Polanyi and Langer: Toward a Reconfigured Theory of Knowing and Meaning,” *Tradition and Discovery* 36:1 [2009-2010], 27). Cosmic meaning would seem to join the power within the cosmos to produce emergent features with Polanyi’s notion that there is meaning where there is order. On due reflection, however, the phrase “everything we know is full of meaning” in the foregoing quotation is telling: without our knowing them and their consequences, physical processes (as in some yet undiscovered galaxy) are meaningless.

<sup>6</sup>I am indebted to Marcello Barbieri’s “A Short History of Biosemiotics” (*Biosemiotics* 2 [2009], 221-245, especially 224) for this formulation of the basic components of the first emergent order. Interestingly, Howard Pattee, a pioneer in biosemiotics who emphasized the importance of adding constraints to matter-energy as a necessary component of the dynamo-physical world, was influenced by Polanyi’s exposition of boundary conditions—see Barbieri, 224. Thanks to Phil Mullins for giving me access to some of the writings on biosemiotics I rely upon in this article.

<sup>7</sup>Humberto Maturana and Francisco Varela have influentially termed this self-replicating, self-regulating autonomy “autopoiesis”—see their *Autopoiesis and Cognition: The Realization of the Living* (Dordrecht, Netherlands: D. Reidel, 1980). Just as constraints direct the course of cosmic evolution in the dynamo-material order, so new organic constraints emerge to guide the ontogenesis and phylogenesis of life. Eliseo Fernandez puts it this way: “By submitting to more exacting constraints organisms paradoxically enjoy new forms of spontaneity and freedom of action not to be found among inert objects” (“Energy, Semiosis and Emergence—The Place of Biosemiotics in an Evolutionary Conception of Nature” [paper delivered at the Eleventh Annual International Gatherings in Biosemiotics, New York, June 21-26, 2011, 2]).

<sup>8</sup>Susanne K. Langer, *Philosophy in a New Key: A Study in the Symbolism of Reason, Rite, and Art*, 3<sup>rd</sup> ed. (Cambridge, MA: Harvard University Press, 1957), Chapter III.

<sup>9</sup>Jesper Hoffmeyer argues that because language allows a person to take the viewpoint of another individual, it is possible to look back at oneself from that other perspective. Hence the rise of self-consciousness and with it feelings of self-judgment and alienation. In Hoffmeyer’s version of “meaning regained,” an extension of empathy to all life-forms is key to the healing of our various alienations. See Jesper Hoffmeyer, *Signs of Meaning in the Universe*, trans. Barbara J. Haveland (Bloomington, IN: Indiana University Press, 1996), pp. 132-136.

<sup>10</sup>Langer, pp. 96-97.

<sup>11</sup>Küll has made many of his significant articles available on-line at [www.zbi.ee/~kalevi](http://www.zbi.ee/~kalevi). I wish to acknowledge with appreciation his gift to me of some of the resources that I cite in this essay.

<sup>12</sup>In his “Irreducible and Complementary Semiotic Forms” (*Semiotica* 134-1.4 [2001], 343), Howard Pattee states that it was Marjorie Grene who introduced him to Polanyi’s thought in 1966.

<sup>13</sup>Polanyi most closely approaches an explicitly biosemiotic triadic view in his article, “Sense-Giving and Sense-Reading.” He says that “the triad of tacit knowing consists in subsidiary things (B) bearing on a focus (C) by virtue of an integration performed by a person (A)” (KB 182). This formulation properly identifies the need for an agent to be involved in tacit knowing, but it seems to ignore the several levels of integration that are typically involved in knowing. The notion of a person is functionally situated at a level of reflective awareness that is several levels higher than the physiological acts performed in tacit knowing. The autonomic adjusting of one’s eyes when one enters a dark room is not really carried out by a person; it is a biological event, yet it is involved in knowing what is in the room. The recognition that different levels of integration are involved is left unclear in Polanyi’s triad. The simplest idea of a Polanyian biosemiotics promoted in this essay envisions a number of coordinated processes often occurring simultaneously at different levels of embodiment. Each of the three elements in a particular triadic process exists at the same level of embodied

physicality. However, personal knowing is a higher level process which effectively coordinates such lower level events as neuron firings, just as a person's decision to run controls lower level leg muscles and the act of talking activates lower level vocal chords.

<sup>14</sup>Robert Neville argues persuasively that for human interpreters, Peirce's triad needs to be expanded to incorporate a fourth dimension. "An interpretation is an existential act, a way of engaging the object by means of a sign that represents it in a certain respect. If the object is a river, for instance, 'brown' represents it in respect of color, 'southward' in respect of direction of flow, 'in the Midwest of America' in respect of place, and 'Mississippi' in respect of name" (*Realism in Religion: A Pragmatist's Perspective* [Albany: SUNY Press, 2009], p. 180—see also p. 137). The person who takes the object in a certain respect is the presupposed fourth aspect to be added to Peirce's triads.

<sup>15</sup>Thomas Sebeok originated this term in his *Contributions to the Doctrine of Signs* (Lanham, MD: University Press of America, 1976), p. 3.

<sup>16</sup>See Terrence Deacon, *Incomplete Nature: How Mind Emerged from Matter* (New York: Norton, 2012), Chapter 10 and p. 307 in particular.

<sup>17</sup>Hoffmeyer, *Signs of Meaning*, p. 78.

<sup>18</sup>The quotation is from Thomas A. Sebeok, *Global Semiotics* (Bloomington, IN: Indiana University Press, 2001), p. 37.

<sup>19</sup>Denis Noble, *The Music of Life: Biology Beyond Genes* (New York: Oxford University Press, 2006), p. 7.

<sup>20</sup>Francois Jacob, *The Possible and the Actual* (New York: Pantheon, 1982), p. 34, quoted in Eric R. Kandel, *In Search of Memory, : The Emergence of a New Science of Mind* (New York: Norton, 2006), p. 235.

<sup>21</sup>See Jakob von Uexküll, *A Foray into the Worlds of Animals and Humans*, trans. Joseph D. O'Neil (Minneapolis: University of Minnesota Press, 2010 [original 1934]), 44-52, where the Umwelt of a tick is considered.

<sup>22</sup>It is Hoffmeyer who has alerted me to the usefulness of the analogical-digital distinction for analyzing experience. He points out that there is a split between genetic material's digitally coded messages and the analogical nature of subjective responses to information leading to action. He suggests there is a division between "the analogical reality of experiences and the digital reality of language" (*Signs of Meaning*, p. 111).

<sup>23</sup>Jesper Hoffmeyer, "The Swarming Cyberspace of the Body," *Cybernetics and Human Knowing* 3:1 (1995), 17, quoted in Claus Emmeche, Kalevi Küll, Frederik Stjernfelt, *Reading Hoffmeyer; Rethinking Biology* (Tartu, Estonia: Tartu University Press, 2002), 15. Shortly in the essay I question Hoffmeyer's use of the term "code" in speaking of the communicative force of analogue presentations. Codes suggest conventional contrivance. I agree with Hoffmeyer that analogue body language communicates emotions (see *Biosemiotics*, pp. 85-86), but body language seems better understood as a learned kind of signal (emphasizing the need for sensitive interpretation) than as a code. Gregory Bateson's distinction between digital communication as based on conventional signs and analogue communication as involving real magnitudes (*Steps to an Ecology of Mind* [New York: Ballantine Books, 1972], pp. 372-374) is a useful first approximation of the distinction between the digital and the analogical.

<sup>24</sup>Küll argues for code plurality rather than code duality. See his "Biosemiotics and Biophysics—the Fundamental Approaches to the Study of Life" in Marcello Barbieri, ed., *Introduction to Biosemiotics: The New Biological Synthesis* (Berlin: Springer, 2007), pp. 173-174. William Wimsatt also argues for a multi-variant, biological pluralism as the best philosophical avenue to an understanding of reality, a perspective congenial to the Polanyian biosemiotics set forth in this essay:

The rich backwoods of evolution (Darwin's tangled bank) is a heterogeneous, multi-level tropical rainforest, with converging overlapping branches, and patterns of intersecting order, residents, and connections at a variety of levels, but no *single* stable foundational bedrock that anchors everything else. Yet this multiple rootedness need not lead to "anything goes" perspectival relativism, or an anti-naturalist worship of common sense, experience, or language. It yields a kind of multi-perspectival realism anchored in the heterogeneity of "piecewise" complementary approaches common in biology and the study of complex systems." (*Re-Engineering Philosophy for Limited Beings: Piecewise Approximations to Reality* [Cambridge: Harvard University Press, 2007], p. 12)

<sup>25</sup>For Kant, the unity of consciousness is based upon synthesis. "Synthesis of a manifold (be it given empirically or *a priori*) is what first gives rise to knowledge. This knowledge may, indeed, at first, be crude and confused, and therefore in need of analysis. Still the synthesis is that which gathers the elements for knowledge, and unites them to [form] a certain content" (*Critique of Pure Reason* A77, B103). With his emphasis on the integration of parts to form wholes, Polanyi seems to follow Kant in making unity dependent upon conceptual integration. I favor a more nuanced view. We seem to bathe in the input of our various receptors, which gives us information too vast to respond to intelligently. So consciousness is in a sense a tuning out of this vastness to attend, at a given moment of interest, to that which possesses some emotional heat. I find it useful to distinguish between unity and focus. Our experience is seated in a plentitude of information that provides background unity. Focus is provided by pattern recognition and utilization plus integration. Pattern and synthesis work in different ways at different levels of awareness. Signal responsiveness is governed virtually entirely by pattern recognition. Perception involves both pattern recognition and integration. The role of integration in visual perception is especially obvious, as our sense of a three dimensional world requires the integration of information provides by two eyes. Likewise, understanding the meaning of words in a sentence is an integrative activity, but understanding what the meaning refers to is sometimes largely a matter of pattern matching. In sum, Polanyi's appropriate recognition of the importance of integration needs to be supplemented by an appreciation of the importance of schema-based pattern recognition and sensitivity to the different dynamics at different levels of awareness.

<sup>26</sup>It would be a mistake to speak of *the* Western worldview as if there were some one stable perspective. In his book *Mediated: How the Media Shapes Your World and the Way You Live in It* (New York: Bloomsbury, 2005), Thomas de Zengotita argues that movies, Internet, television, and other media form the *via* through which many persons experience the world today, and mediated people perceive that reality and truth are social constructs. The result is that persons in our mediated society see their identities and lifestyles as options, which is quite different than the tradition-based worldview that Polanyi accepted as the norm in the West. So then, is it more appropriate to emphasize the pluralistic nature of worldviews these different lifestyles represent, or is the fact of mediation itself definitive of the Western worldview today? And if the latter, can one really call it Western when as a result of globalization mediation is a worldwide phenomenon? In any case, Zengotita's thesis illustrates the potential for a rich conversation about the *via* within Polanyian biosemiotics.

<sup>27</sup>I allude here to the title of Polanyi's important 1941 article, "The Growth of Thought in Society" (*Economica* 8, 421-456). Nascent within this article are philosophical themes that came to the fore in his subsequent thought.