

Emergent Monism And Final Causality: A Field-Oriented Approach

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ABSTRACT Key Words: entelechy, final causality, morphogenetic field, society as structured field of activity, actual occasion, common element of form, Alfred North Whitehead, Michael Polanyi, Rupert Sheldrake.

Polanyi's vision of the cosmic process as undergirded by a logic of emergence common to both the mental life of human beings and the processes of non-human nature can be vindicated if one is prepared to make certain adjustments in the notion of morphogenetic fields with an active center or organizing principle. Given the author's field-oriented interpretation of Whiteheadian societies, it should be possible to think of entelechies or final causes in developmental rather than strictly Aristotelian terms. That is, the "common element of form" or organizing principle of a Whiteheadian society depends for its own existence on the spontaneous activity of previous sets of actual occasions and yet serves as the ongoing principle of formal and final causality for the present set of actual occasions and still others to follow it. In Aristotelian language, matter and form thus dialectically condition one another and neither is ontologically superior to the other.

In Part Four of his book *Personal Knowledge*, above all, in the concluding chapter entitled "The Rise of Man," Michael Polanyi endorses the notion of "morphogenetic fields" as the key to the proper understanding of evolution.¹ That is, in contrast to the standard explanation of evolution in terms of Neo-Darwinism, the synthesis of Darwin's principle of natural selection and modern genetics, Polanyi saw the evolution of life-forms through what he called a logic of emergence much akin to the mental process of discovery for human beings. Just as human beings are frequently guided at first only by a hunch as to the solution of some problem and then either achieve success or admit failure, depending upon whether that hunch proves to be correct or not, so within Nature evolution seems to take place when the components of a lower-level system are consciously or for the most part unconsciously drawn into a new higher-level unity and organization in virtue of an implicit organizing principle operative within the system or morphogenetic field of activity to which they all belong.² Polanyi, to be sure, frankly admits that this notion of a morphogenetic field and its immanent organizing principle is finalistic: "It attributes to certain achievements – whether self-centered or aiming at universality – the power to promote their own realization."³ But, he argues, "[b]iology is life reflecting upon itself, and the findings of biology must prove consistent with the claims made by biology for its own findings."⁴ Thus if heuristic fields are clearly operative within the human mind seeking understanding of the world around it, why should there not be morphogenetic fields likewise operative within Nature?

In a recent issue of *Tradition and Discovery*, however, both Philip Clayton and one of his commentators Walter Gulick expressed serious reservations about this feature of Polanyi's philosophy. Clayton argued that Polanyi made a serious mistake in adopting the vitalism associated with the research of Hans Driesch on the regenerative powers of the embryo of sea urchins since he thereby put himself in clear opposition to the working assumptions and the empirical results of most research in contemporary biology.⁵ Gulick agreed, noting that contemporary complexity theory "shows how emergent, stable patterns may spontaneously develop in large, multi-faceted systems; the existence of mysterious pre-existing principles need not be postulated."⁶

Yet this symmetry of being and knowing in terms of a logic of achievement operative in both the human mind and implicitly in all of organic nature seems to be foundational for Polanyi's philosophical scheme as a whole.⁷ Is there a way then in which Polanyi's notion of morphogenetic fields can be usefully employed without reverting to a basically Aristotelian notion of "entelechy" whereby form is ontologically superior to matter since it is its antecedent organizing principle?

Over the last twenty years I have been working on a revision of the philosophy of Alfred North Whitehead with respect to the latter's doctrine of "societies," namely, aggregates of actual occasions (momentary self-constituting subjects of experience) linked together by a "common element of form" or analogous pattern of existence and activity.⁸ My argument has been that Whiteheadian societies, since they for the most part correspond to the relatively stable persons and things of common sense experience, must be more than just aggregates of analogously constituted actual occasions. For, as such, these aggregates would come into and go out of existence as rapidly as their constituent actual occasions, and no metaphysical ground for their ongoing existence and activity would be guaranteed. Hence, I have urged that Whiteheadian societies should instead be treated as structured fields of activity for their constituent actual occasions.⁹ The structure within the field is, to be sure, ontologically dependent upon the interrelated activity of successive actual occasions (or sets of actual occasions in the case of Whiteheadian societies extended in space as well as time). But the field endures as these actual occasions or sets of actual occasions come and go. Furthermore, the structure embedded in the field by reason of the activity of previous actual occasions or sets of actual occasions heavily conditions the self-constituting activity of the present set of actual occasions.

The net effect of this arrangement is that there is indeed a form or organizing principle within every Whiteheadian society at any given moment. But the form is not active as an Aristotelian substantial form or entelechy is active with respect to its material components. Rather, the form is passive, both because it originated in virtue of the self-constituting activity of an antecedent actual occasion or set of actual occasions and because it is simply "prehended" by the next actual occasion or set of actual occasions. Like an Aristotelian substantial form, therefore, it antedates the material components which it here and now "informs." But, unlike an Aristotelian substantial form, it "informs" its components not in virtue of its own substantial activity but simply by being there as an object of prehension or activity on the part of the next actual occasion or set of actual occasions. Furthermore, unlike an Aristotelian substantial form, the form or pattern of existence and activity within a Whiteheadian society is as a result never exactly the same from moment to moment. It undergoes a slow but steady transformation as a result of new actual occasions or new sets of actual occasions constituting themselves in slightly different ways than their predecessors and thus collectively achieving a new "common element of form." It thereby serves as an entelechy or organizing principle for a Whiteheadian society, but it is strictly a developmental entelechy passively dependent upon the activity of its material parts or members, namely, its constituent actual occasions from moment to moment.

As I see it, if one were to apply this revised notion of a Whiteheadian society to Polanyi's notion of a morphogenetic field, then most of the objections raised by Clayton and Gulick would disappear. The morphogenetic field would possess an immanent principle for the organization of its material components at any given moment. But, insofar as this immanent principle would be passive rather than active with respect to its material components, and insofar as this immanent principle would itself be in process of change or development in virtue of the activity of those same material components, then one could not give ontological priority to the immanent principle over the material components as Aristotle gave ontological priority to form over matter. Rather, it would be the field as a whole which would undergo gradual change in virtue of the

interrelated functions of the material components and their immanent principle of organization from moment to moment (in the language of Whitehead's philosophy, actual occasions and their "common element of form"). Furthermore, since the material components, the actual occasions, are by definition self-organizing and thus open to change in various ways (e.g., through external environmental influences and, as we shall see below, through what Whitehead calls "divine initial aims"), this scheme amply provides for "bottom-up" as well as "top-down" causation in the explanation of evolution.

One must admit, of course, that this scheme for the emergence of novel forms within an evolutionary process is not fully consistent with either Polanyi's or Whitehead's metaphysical system. It is a conscious hybrid of both systems. On the one hand, it incorporates the basic insight of Polanyi that the whole is always more than (and to some extent other than) the sum of its functioning parts, an insight which seemed to elude Whitehead in his analysis of actual occasions and the societies into which they aggregate. For, as he admits in *Process and Reality*, "[t]he ultimate metaphysical truth is atomism. The creatures are atomic."¹⁰ On the other hand, this scheme allows for Whitehead's foundational insight into the reality of actual occasions, momentary self-constituting subjects of experience, as "the final real things of which the world is made up."¹¹ Polanyi, on the contrary, limited the functioning of morphogenetic fields together with their organizing principles to organisms, however minuscule. Hence, in terms of this scheme Polanyi would be obliged to extend his logic of achievement in an attenuated form to the world of inanimate things. Not the things themselves, of course, but their ultimate components, namely, actual occasions as momentary self-constituting subjects of experience, would be engaged in a "logic of achievement" within certain limits. This might well seem incredible, of course, until one recollects that easily the longest time-span within the overall cosmic process (at least as it is presently understood) was involved in the gradual growth in complexity from non-life to life rather than in the later progression from plant and animal life to rational life.

Accordingly, even though inanimate things in themselves are clearly not governed by a logic of achievement or a logic of emergence, one can argue that the ultimate components of inanimate things, namely, momentary self-constituting subjects of experience, can be evaluated in terms of success or failure in maintaining a balance between order and novelty proper to their own niche and function within the overall cosmic process. For, as Whitehead notes, too much order in terms of the common element of form for a given set of actual occasions leads to stagnation; too much novelty in terms of that same common element of form leads either to collapse of the order already attained or to the achievement of a still higher level of unity and organization for the society in question.¹² The eventual flourishing of life-forms on this planet eventually happened only because the actual occasions constitutive of some inanimate Whiteheadian societies successfully negotiated the jump from a lower-level to a higher-level form of existence and activity within the cosmic process. The overall stability of the cosmic process, to be sure, demanded (and still demands) that most societies of actual occasions corresponding to the inanimate things of this world not make the jump to primitive living organisms. For they provide the stable infrastructure to the more fragile aggregates of actual occasions found in the world of organisms.¹³ But certainly a logic of achievement governed the slow but sure movement from non-life to life within the cosmic process.¹⁴

In the remainder of this essay, I will cite passages out of works by Polanyi, namely, *The Tacit Dimension* and *Personal Knowledge*, that seem to be compatible with this approach to Whiteheadian societies as structured fields of activity for their constituent actual occasions. Likewise, I will make brief reference to the work of Rupert Sheldrake who in *A New Science of Life* expands upon the notion of morphogenetic fields. In *The Tacit Dimension*, for example, Polanyi notes that "in an act of tacit knowing we attend from something

for attending to something else, namely, from the first term to the second term of the tacit relation. . . . Using the language of anatomy, we may call the first term proximal and the second term distal. It is the proximal term, then, of which we have a knowledge that we may not be able to tell.”¹⁵ As I see it, this “from-to” relation in Polanyi’s scheme bears a notable resemblance to Whitehead’s celebrated description of creativity in *Process and Reality* as the principle whereby “[t]he many become one and are increased by one.”¹⁶ Furthermore, thus understood, Polanyi’s “from-to” relation illuminates both Whitehead’s understanding of the self-constitution of actual occasions and my own hypothesis about the “common element of form” within Whiteheadian societies.

To be specific, a Whiteheadian actual occasion prehends innumerable past actual occasions and integrates them into the unity of its own self-constitution in virtue of an immanent “decision.”¹⁷ In Polanyi’s terms, it recognizes or, perhaps more precisely, creates a Gestalt in terms of which it can become a unified reality among many other such unified realities, neighboring actual occasions. Its awareness of its prehensions is tacit rather than explicit since its implicit focus is on what it is becoming. So this is the application of the “from-to” relation in the sphere of knowing, but the same structure also applies in the sphere of being, namely, the formation of Whiteheadian societies with an objectively prehensible “common element of form.” That is, the many actual occasions co-constituting a Whiteheadian society from moment to moment are likewise an instance of the “from-to” relation or, in Whitehead’s terminology, the many becoming one and being increased by one. For here, too, there is a move from tacit awareness of one another on the part of a set of actual occasions to their explicit recognition or, more precisely, co-creation of an objectively prehensible form. The “common element of form” for a Whiteheadian society, in other words, both is and is not the same as the form constitutive of the self-constitution of the individual actual occasions. It is rather what they have in common, not what each is in particular. As such, it represents in Polanyi’s language their “meaning,” what they are together here and now as the product of their dynamic interrelation.¹⁸ Or, to use another expression from Polanyi’s analysis of tacit knowing, each of the constituent actual occasions in a Whiteheadian society “indwells” the “common element of form,” interiorizes it even as the occasion intuitively recognizes that this same common element of form for the society as a whole is somehow distinct from itself and its own individualized pattern of self-constitution.

Turning now to texts out of *Personal Knowledge*, we find further ways in which Polanyi’s metaphysical insights illuminate what Whitehead means by the self-constitution of an actual occasion and what I have in mind for the organization of a Whiteheadian society. Polanyi, for example, claims that an organism, however minuscule, is different from an inanimate thing because it has a center: “The focus of our comprehension is now something active, that grows, produces meaningful shapes, survives by the rational functioning of its organs.”¹⁹ From a Whiteheadian perspective, one could argue that this is likewise a generic description of an actual occasion as a self-constituting subject of experience. For an actual occasion too is an active center of activity, organizing its physical and conceptual prehensions into the “satisfaction” characteristic of its own completed state of being.²⁰ In its internal process of concrescence it exhibits final causality and in its status as a “superject” capable of prehension by subsequent actual occasions it exercises efficient causality.²¹ In this sense, every actual occasion, even an actual occasion constitutive of an inanimate thing, is an individual entity in Polanyi’s sense. It exists “as an aim in itself,” quite apart from its usefulness for human beings.²²

A few pages later, Polanyi makes the following comments about the notion of “commitment” even at the vegetative level: “it is of the essence of a living organism that each part relies for its function, and for its very meaning as part of the organism, on the presence and functioning of a number of other parts.”²³ Implicitly this is what Whitehead is also claiming in his description of a society as a nexus of actual occasions with a social

order. The actual occasions, says Whitehead, have a “genetic” relation to one another in that only by their interrelated activity vis-à-vis one another do they achieve a “common element of form” and become a society instead of a purely coincidental aggregate of actual occasions which could dissolve in the next moment.²⁴

What I have maintained over against Whitehead is that this common element of form has somehow to stay in existence as the principle of continuity between successive sets of actual occasions. In my judgment, as noted above, it stays in existence as a structured field of activity for those same sets of actual occasions, dependent for its form or structure on the current set of occasions and yet serving as the “ordering principle,” in Polanyi’s terms, for the next set of occasions. As such, it is a morphogenetic field, giving a Gestalt or recognizable shape and pattern of activity to its current members but itself in slow process of evolution toward a goal yet to be realized in its fullness. For, the field is always open to a new pattern to be achieved by future sets of actual occasions even as it provides a direction for the achievement of that goal here and now by its present mode of existence and activity.

As I see it, this is also what Rupert Sheldrake had in mind with his own understanding of morphogenetic fields in *A New Science of Life*. Therein he describes morphogenetic fields as spatial structures which, like electromagnetic and gravitational fields, are “invisible, intangible, inaudible, tasteless and odorless;”²⁵ but also like electromagnetic and gravitational fields they have measurable empirical effects on the entities or systems contained within them. The field determines both the internal structure and the external appearance of those same entities or systems. Moreover, says Sheldrake, morphogenetic fields “are not in themselves energetic; but nevertheless play a causal role in determining the forms of the systems with which they are associated.”²⁶ Restated in terms of Aristotle’s traditional four causes, morphogenetic fields do not exercise efficient causality on their component systems but they do exercise formal and final causality. That is, they “inform” their components here and now but always in anticipation of still further specification of that same form in the future.

These comments by Sheldrake correlate very nicely with my own understanding of Whiteheadian societies as structured fields of activity for their constituent actual occasions. The field is objectively real but does not possess the same kind of actuality as its constituent actual occasions which, as Whitehead notes, are “the final real things of which the world is made up.”²⁷ The field, accordingly, cannot be prehended physically as a contemporary actual occasion prehends its predecessor(s). It can only be prehended conceptually as a pattern or structure of existence and activity. As such, the field exercises no agency in terms of efficient causality since its current structure is simply prehended by newly concreting actual occasions within the field; but it does exercise agency indirectly in terms of formal and final causality. It orders and structures the physical energy coming from predecessor actual occasions and thereby communicates to current actual occasions what Whitehead calls a “subjective form” to which these new occasions must somehow conform so as collectively to achieve “satisfaction” as a society with a specific pattern of existence and activity here and now.²⁸

Subsequently Sheldrake speaks of the need for a “morphogenetic germ” or subsystem within a given morphogenetic field in order to give further order and structure to the field as a whole:

The morphogenetic germ is a part of the system-to-be. Therefore part of the system’s morphogenetic field corresponds to it. However, the rest of the field is not yet ‘occupied’ or ‘filled out’; it contains the virtual form of the final system, which is actualized only when all its material parts have taken up their appropriate places.²⁹

Here, of course, is where Sheldrake (like Polanyi before him) can be rightly accused of importing an outdated Aristotelian understanding of final causality into contemporary biology. For, there is no guarantee that the morphogenetic field as a whole will inevitably take on the form or structure proper to the “morphogenetic germ.” Yet, as I see it, there is a way out of this difficulty if one thinks of Whiteheadian societies as structured fields of activity for their constituent actual occasions.

All that is required is to reconceive in terms of hierarchically ordered fields what Whitehead meant by “structured societies,” that is, more complex societies composed of subsocieties of actual occasions.³⁰ A subsociety of actual occasions or a subfield of activity within a morphogenetic field can undergo a change of form or structure which is initially limited to that subfield and not yet extended to the morphogenetic field as a whole. But there is no inevitability that the change of form or structure within the subfield will spread to the morphogenetic field as a whole. What is inevitable is that the actual occasions within other subfields of activity will “prehend” this change of form or pattern on the part of their neighbors within the overall morphogenetic field. But as self-constituting subjects of experience, these other actual occasions are “free” to incorporate the new pattern of existence and activity into their own process of concrescence in which case the subfield will truly act as a “germ” for the spread of a new form or pattern for the morphogenetic field as a whole. Or they will “decide” (consciously or unconsciously) not to incorporate the new pattern into their individual and collective self-constitution in which case the subfield will sooner or later cease to exist as part of the overall morphogenetic field. There is, accordingly, no way to know in advance how the morphogenetic field as a whole will respond to this perturbation in its current pattern of existence and activity.³¹

This, of course, raises the further question how even a subfield of activity within a broader morphogenetic field could undergo a change of form or structure. On this point Sheldrake concedes that there is no scientific answer: “the question concerns unique and energetically indeterminate events which, ex hypothesi, once they have happened are unrepeatable because they themselves influence all subsequent similar events. Science can only deal with regularities, with things that are repeatable.”³² At the end of his book he lists four possibilities for such an unexpected change of form or pattern within morphogenetic fields: pure chance, the influence of the conscious self on the body and its physical environment, a creativity inherent within the cosmic process or, finally, a transcendent creative agency.³³

While agreeing with Sheldrake that there is no single explanation for the appearance of novelty within the cosmic process, I would maintain that with reference to the possibility of a “transcendent creative agency” Whitehead’s notion of “divine initial aims” provides a plausible explanation of how God can be invisibly at work in the cosmic process. Divine initial aims according to Whitehead are derived from the ongoing integration of the primordial and consequent natures within God and are communicated to individual actual occasions so as to guide their individual processes of concrescence.³⁴ Thus God can “inform” or give direction to the self-constitution of individual actual occasions and to the societies into which they aggregate without interfering with the laws of nature, the normal operation of the cosmic process. God thereby gives order and direction to the cosmic process but always with a view to the spontaneous self-determination of individual actual occasions.

Polanyi’s remarks at the very end of *Personal Knowledge* seem to point in the same direction and could well serve as a conclusion to this essay. In a subsection entitled “First Causes and Ultimate Ends,” Polanyi notes:

[K]nowing belongs to the class of achievements that are comprised by all forms of living, simply because every manifestation of life is a technical achievement and is therefore - like the practice of technology - an applied knowledge of nature. But in order to express correctly this kinship of knowing and living, fields must be interpreted throughout biology in accordance with their finalistic character, as fields of opportunity and of a striving directed toward this opportunity.³⁵

While acknowledging that most biological fields are neither conscious nor deliberate, there is invariably present within them an active center which within the human species achieves the rank of full personhood. This is, as noted above, much akin to Whitehead's notion of structured societies, societies composed of subsocieties of actual occasions, or to my own vision of fields within fields.

Polanyi concludes: "We may envisage then a cosmic field which called forth all these centers by offering them a short-lived, limited hazardous opportunity for making some progress of their own toward an unthinkable consummation. And that is also, I believe, how a Christian is placed when worshipping God."³⁶ Here the affinity with Whitehead's scheme is apparent; according to Whitehead, the world is constantly being incorporated into the consequent nature of God as the sole enduring actual entity.³⁷ But, as I see it, Polanyi's vision of a cosmic field calling forth finite centers of opportunity and achievement is even more dramatically illustrated in my neo-Whiteheadian vision of the God-world relationship. For, as I have made clear in previous publications, the three divine persons of the Christian doctrine of the Trinity can be said to co-constitute the cosmic field of activity into which all the more limited fields of activity proper to the world of creation can be integrated and hierarchically ordered.³⁸ Thus the "unthinkable consummation" to which Polanyi alludes is not just integration into an impersonal cosmic field which is itself of finite duration but rather integration into the divine communitarian life which is on principle endless. Details of how this eschatological consummation will presumably be achieved are available elsewhere.³⁹

The key point to be made in this essay is then that, properly understood, Polanyi's vision of the cosmic process as undergirded by a logic of emergence common to both the mental life of human beings and the processes of non-human nature can be vindicated if one is prepared to make certain adjustments in the notion of morphogenetic fields with an active center or organizing principle. Such a notion does not necessarily imply a commitment to a strictly Aristotelian understanding of final causality in which the entelechy or final cause is conceptually determined in advance of its practical implementation. Rather, as I have tried to make clear with my field-oriented interpretation of Whiteheadian societies, it should be possible to think of entelechies or final causes in developmental terms. That is, the "common element of form" or organizing principle of a Whiteheadian society depends for its own existence on the spontaneous activity of previous sets of actual occasions and yet serves as the ongoing principle of formal and final causality for the present set of actual occasions and still others to follow it. In Aristotelian language, matter and form thus dialectically condition one another. As a result, neither enjoys ontological superiority; both are needed in the service of the total organism as it follows its own inherent logic of emergence or achievement.

Endnotes

¹ See Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (New York: Harper & Row, 1964), pp. 354-59, 398-400.

² *Ibid.*, pp. 383-85, 398-99.

³ *Ibid.*, p. 399.

⁴ *Ibid.*, p. 347.

⁵ See Philip Clayton, "Emergence, Supervenience, and Personal Knowledge," *Tradition and Discovery* XXIX (2002-03), n. 3, pp. 11-12.

⁶ See Walter B. Gulick, "Response to Clayton: Taxonomy of the Types and Orders of Emergence," *Tradition and Discovery* XXIX (2002-03), n. 3, 35.

⁷ See, e.g., Michael Polanyi, *The Tacit Dimension* (New York: Doubleday, 1967), p. 33: "It seems plausible then to assume in all other instances of tacit knowing the correspondence between the structure of comprehension and the structure of the comprehensive entity which is its object. And we would expect then to find the structure of tacit knowing duplicated in the principles which account for the stability and effectiveness of all real comprehensive entities."

⁸ See, e.g., Alfred North Whitehead, *Process and Reality: An Essay in Cosmology*, Corrected Edition, eds. David Ray Griffin and Donald W. Sherburne (New York: Free Press, 1978), pp. 34-35.

⁹ See, e.g., Joseph A. Bracken, *Society and Spirit: A Trinitarian Cosmology* (Cranbury, NJ: Associated University Presses, 1991), pp. 39-56; *The Divine Matrix: Creativity as Link Between East and West* (Maryknoll, NY: Orbis, 1995), pp. 52-69; *The One in the Many: A Contemporary Reconstruction of the God-World Relationship* (Grand Rapids, MI: Eerdmans, 2001), pp. 131-55.

¹⁰ Whitehead, *Process and Reality*, p. 35.

¹¹ *Ibid.*, p. 18.

¹² Whitehead, *Process and Reality*, p. 339.

¹³ *Ibid.*, pp. 99-100.

¹⁴ *Ibid.*, p. 100: "the growth of a complex structured society exemplifies the general purpose pervading nature."

¹⁵ Polanyi, *The Tacit Dimension*, p. 10.

¹⁶ Whitehead, *Process and Reality*, p. 21.

¹⁷ *Ibid.*, p. 28.

¹⁸ Polanyi, *The Tacit Dimension*, pp. 11-13.

¹⁹ Polanyi, *Personal Knowledge*, p. 344.

²⁰ Whitehead, *Process and Reality*, pp. 25-26.

²¹ *Ibid.*, p. 214.

²² Polanyi, *Personal Knowledge*, p. 360.

²³ *Ibid.*, p. 363.

²⁴ Whitehead, *Process and Reality*, pp. 34-35.

²⁵ Rupert Sheldrake, *A New Science of Life: The Hypothesis of Formative Causation* (Los Angeles: J. P. Tarcher, 1981), p. 72.

²⁶ *Ibid.*

²⁷ Whitehead, *Process and Reality*, p. 18.

²⁸ *Ibid.*, pp. 19, 85-86.

²⁹ Sheldrake, *A New Science of Life*, p. 76.

³⁰ Whitehead, *Process and Reality*, pp. 99-100.

³¹ *Ibid.*, pp. 101-02. See also Bracken, *Society and Spirit*, pp. 74-88, where I discuss this same issue in the context of "dissipative structures" as analyzed by Ilya Prigogine and Isabelle Stengers in their book *Order out of Chaos: Man's New Dialogue with Nature* (New York: Bantam Books, 1984).

³² Sheldrake, *A New Science of Life*, p. 93.

³³ *Ibid.*, pp. 200-07.

³⁴ Whitehead, *Process and Reality*, pp. 244-45, 342-51.

³⁵ Polanyi, *Personal Knowledge*, pp. 403-04.

³⁶ *Ibid.*, p. 405.

³⁷ Whitehead, *Process and Reality*, pp. 349-51.

³⁸ See Bracken, *Society and Spirit*, pp. 140-60; *The Divine Matrix*, pp. 52-69; *The One in the Many*, pp. 109-55.

³⁹ See Bracken, *The One in the Many*, pp. 157-78.

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Walt Gulick, Board President of the Polanyi Society, is pleased to participate in this issue's juxtaposition of the thought of Polanyi and Whitehead. He encourages the development of further comparative studies involving Polanyi and contemporary thinkers or movements. Contact <WGulick@msubillings.edu> .