Polanyi's Scholarly Influence: A Review Article

Walter B. Gulick

ABSTRACT Key Words: Michael Polanyi, Harry Redner, Trevor Pinch, Susan Haack, John Ziman, Israel Scheffler, Peter Dodwell, Eugene Webb, James Loder and W. Jim Neidhardt, Iain Paul, Lothar Schäfer, Ian Barbour, Holmes Rolston, John Brooke and Geoffrey Cantor, John Haught, Randy Barnett.
This essay critically discusses books not previously reviewed in Tradition and Discovery *yet making significant use of Michael Polanyi's thought. These works suggest Polanyi's thought continues to play an important, if limited, role in contemporary scholarship.*

What does the scholarly literature of recent years reveal about the continuing impact of Michael Polanyi's thought? This is an important question for those who believe, as I do, that Polanyi's thought has resources for addressing contemporary issues, resources that seem not yet to have been fully tapped. It would be helpful to know what persons are exploring what issues and continue to cite his thought. Especially interesting would be to see where Polanyi's ideas have contributed to innovative explanations and insights.

One way to survey Polanyi's contemporary influence is by examining the book reviews in this journal. One could reasonably expect that major works dealing explicitly and extensively with Polanyi's thought would be reviewed in *Tradition and Discovery*, but there are many works manifesting a Polanyian influence that slip by unreviewed. The purpose of this article is to call attention to some of the more notable Polanyi-hued fish that have bypassed the net of review. A number of the most relevant and interesting of such works come from ten to twenty years ago. Some of these works are now out of print (cited as OP), but that need not imply that their insights have perished or they are no longer worthy of attention.

The works discussed here have to meet two criteria.
1. They have not been the subject of any *Tradition and Discovery* book review.
2. They make some significant use of Polanyi's thought.

The purpose of this article, then, is not dependent upon a thorough reading of each work cited or an analysis of its unique contributions . Its focus is first upon the Polanyian influence each work manifests and secondarily upon how that influence impacts the course of the work's argumentation.

Harry Redner's *The Ends of Science: An Essay in Scientific Authority* (Boulder: Westview Press, 1987 – OP) is a useful work to begin with because it suggests how Polanyi's thought is situated historically. Redner, influenced by Prigogine and Stengers' *Order Out of Chaos*, postulates the existence of three basic periods in the history of Western science: the ancient-medieval period (encompassing Renaissance science as well), Classical science (commencing with the scientific revolution of Galileo, Descartes, and Newton in the seventeenth century and concluding with Bohr, Heisenberg, and Einstein in the mid-twentieth century), and contemporary World science. In contrast to theories of scientific progression that see relativity theory and especially quantum mechanics as initiating a break with the past, Redner sees the demise of the deterministic dream as an end phase of Classical science, a period marked by the significance of the individual scientist searching "for fundamental laws and unifying schemas" (23). Polanyi indwells the framework of Classical

science. World science blurs the previous distinction between pure and applied science, and "the needs of technology have become a motive force for research and development" (15). In particular, the military-industrial complex has taken over much funding of science. In World science, teams of scientists (rather than outstanding individuals) conduct research attuned to specific purposes. A pragmatic rather than a truth-oriented (or reductionist) approach has become dominant in the scientific Establishment, a process Redner discusses under the rubric of "finalization" (84ff).

It will be evident that Redner's portrayal of World science contrasts starkly with the vision of science Polanyi offers in a work such as *Science, Faith, and Society*. The political considerations intruding upon and shaping World science seem analogous to the Soviet agenda of planned science that Polanyi objected to so strenuously in *The Logic of Liberty* and other writings. And indeed Redner suggests that the new pattern of science has given rise to pathologies that require reform. Redner states that "the authority structure in the multiversity-research institute complex is very different from that previously prevalent in the university" (169). A patron-client relationship has replaced the older master-disciple relationship with the result that those who have attained grants may have their name affixed to papers produced by those employed to carry out research projects even though the patron-funder may know virtually nothing about what has been produced. The patron, to keep the grant money flowing, must cultivate the appearance of success, whether the results warrant such a judgment or not. Journals proliferate to generate the appearance of progress, even though journals often systematically reject genuinely new discoveries or theoretical perspectives (178). And when the funding agencies are corporations, the results of scientific inquiry may be privately exploited rather than enhance public understanding.

Redner brings Polanyi fully into the picture in his discussion of the reform of science. Redner appropriates language from the Protestant Reformation in describing alternative approaches to reforming the scientific Establishment. Polanyi is seen as a "High Church" conservative reformer. Both Low Church (Methodist) and High Church (Catholic) conservatives "wish to call science back to its ideal image as elaborated during the nineteenth-century Classical era of science" (211). Low Church reformers espouse a logic of scientific rationality, the objectivism that Polanyi rejected. High Church reformers, who tend to be practicing scientists, are "averse to scientific method and methodology, regarding them as specious forms of idle philosophizing; instead they advocate an approach to science based on a study of traditions of informal procedures or the art and craft features of practical scientific work" (211). Both types of conservatives adhere to a separation of the pure from the applied sciences and advocate a rational pursuit of truth to grasp an objectively real world. Redner's portrayal of Polanyi as a High Church conservative seems at first glance to be appropriate and adequate.

The moderate (or liberal) position, suggested as analogous to Lutheranism, sees "the history of science as an evolutionary sequence from simpler and lower to complex and higher grades of scientific organization. The Classical sciences figure in their historical scheme as an already superseded epoch made up of the sciences of organized simplicity" (212). The moderates propose two further stages: unorganized and organized complexity. Polanyi's views are quite consistent with these stages as well; his vision has systemic aspects and emphasizes emergence to higher levels of organization.

The scientific radicals (Anabaptists) "see science as inherently value guided and value determined at every stage of its procedure" (213). A social constructivist like Bruno Latour would be an example of such a radical. But again, Polanyi should not be seen as wholly opposed to such a viewpoint. While he would firmly

resist reducing reality to a social construction, his notions of personal knowing and the importance of communal consensus acknowledge the inevitable place of values in scientific work. In sum, it seems too facile to constrict Polanyi to the realm of the High Churchman alone. Part of the power of Polanyi's vision is its ability to encompass compelling aspects of a variety of usually mutually exclusive alternatives.

While generally showing respect for Polanyi's contributions, Redner offers a well-developed critique of his notion of authority in science. Under attack is Polanyi's vision of a republic of science in which mutual supervision is carried out in a series of overlapping neighborhoods of expertise. "Polanyi's republic of science is an utopian vision of an idealized liberal democracy based on a free-market economy of competing individuals. . . .He sets himself against all science policy measures to allocate funds and guide research" (228). Redner, on the other hand, claims there are Establishment power brokers in the realms of resource allocation, article acceptance, and appointment to positions. World science gives rise to an oligarchical struggle for power; it does not support a republic exhibiting shared authority according to a principle of spontaneous order.

Furthermore, Redner sees Polanyi's insistence on science's autonomy from any outside authority as opening the door to the hegemony of the scientific Establishment, a status quo conservatism. Redner believes some sort of authoritative intervention in the Establishment is needed if movement towards Polanyi's utopian view is to be realized. While praising Polanyi's arguments against Low Church methodism (such as Popperian falsification), he claims Polanyi sets up a number of dualisms that he seeks unsuccessfully to hold together, such as realism versus relativism and tradition versus autonomy. That is, Redner questions Polanyi's success in encompassing those contrary positions that earlier I praised as one of the strengths of Polanyi's philosophy of science. In sum, Redner displays a nuanced understanding of Polanyi and raises questions about his thought that deserve a thoughtful response.

Redner's work sets the stage for considering what has become known as the science wars, essentially a conflict between scientific realists and constructivists. Worth mentioning in this regard is *The One Culture? A Conversation about Science*, edited by Jay A. Labinger and Harry Collins (Chicago: University of Chicago Press, 2001). This collection of discussions about the science wars includes as lead essay a piece by Trevor Pinch entitled "Does Science Studies Undermine Science? Wittgenstein, Turing, and Polanyi as Precursors for Science Studies and the Science Wars." Pinch argues that a view of science is needed that avoids the extremes of regarding science as a sacrosanct procedure producing certainty or as merely a form of fraudulent conniving that legitimates political ends. He suggests that science is best regarded as a body of expertise with a human face to it (22). Polanyi's notion of the scientist as one who employs skills and other forms of tacit knowing in the search for understanding is cited as exemplifying the sort of expertise Pinch has in mind. Book knowledge is not the core of science; skill in practice is.

To my ears, Susan Haack offers the most thoughtful response to the turmoil surrounding the interpretation of science in recent decades – turmoil initiated by Kuhn and Feyerabend (and in the eyes of some, Polanyi) and carried through by the "Strong Programme" in sociology of science and by social constructivist theories. Haack's *Defending Science – within Reason: Between Scientism and Cynicism* (Amherst, NY: Prometheus Books, 2003) argues for what Haack terms, after Peirce, "Critical Common-Sensism."

> Critical Common-Sensism acknowledges, like the Old Deferentialism, that there are objective standards of better and worse evidence and of better and worse conducted inquiry; but proposes a more flexible and less formal understanding of what those standards are. Critical Common-Sensism

> acknowledges, like the New Cynicism, that observation and theory are inter-dependent, that scientific vocabulary shifts and changes meaning, and that science is a deeply social enterprise; but sees these, not as obstacles to an understanding of how the sciences have achieved their remarkable successes, but as part of such an understanding. (23)

Haack opposes what she calls "the narrowly logical conception of rationality shared by the Old Deferentialists, both inductivist and deductivist, *and* by the New Cynics" (51), and I want to cheer. Among the philosophers that she sees as relying in inappropriate ways on logic as the sine qua non of scientific progress, are Carnap, Hempel, Popper, Kuhn (who wrote Haack that he never meant to impugn the rationality of science [44]), Hesse, Lakatos, and Quine.

And where does Polanyi fit into her understanding? Unlike Redner, she really appreciates "The Republic of Science" and quotes from it several times. She acknowledges that to many (especially to the New Cynics), "Polanyi may sound old-fashioned, even quaint" (180). But she sees his analysis of scientific authority as being consistent with her "sensible program, that social and evidential aspects of science interlock" (196). She also affirms his appreciation of the tacit skills and connoiseurship that go into finding a good hypothesis or project, although she wishes this view could be stated in less metaphorical terms (144). Thus both Pinch and Haack use Polanyi's notion of tacit knowing, but in support of quite different views of the scientific enterprise.

The next work to be discussed is easily the oldest book to be cited, yet it is so imbued with a Polanyian spirit that it virtually calls out for inclusion. This work is John Ziman's *Reliable Knowledge: An Exploration of the Grounds for Belief in Science* (Cambridge: Cambridge University Press, 1979, reprinted 1991). No doubt Redner would classify Ziman as a High Church exponent like Polanyi, for he honors social practice, the goals of unified scientific understanding, and other aspects of Classical science. However, in attending to the social dimension of science he does not support the role of the individual scientist as is glorified in Classical science. "The objectivity of scientific knowledge resides in its being a social construct, not owing its origins to any particular individual but created cooperatively and communally" (107). Indeed, Ziman (like Haack) accepts Polanyi's characterization of how scientific communities work quite uncritically (135), never suggesting, as does Redner, that it is a utopian construct.

Ziman begins by offering a model of science that provides reasons for regarding it as reliable (not certain or indubitable) knowledge. His book is therefore basically an epistemological exploration in which the role of consensus is highlighted. It articulates the role of belief as the ground of all knowledge (109). It is thus consistently congruent with Polanyi's philosophy of science.

Ziman's model takes math as the ideal language that transcends cultural and linguistic barriers to communication. But he also emphasizes that there are limited realms within which math can be utilized, necessitating the use of models as heuristic aids. He relies upon Polanyi's thought to argue that while there is no necessary correlation between a model and what it refers to, tacit powers rooted in scientific practice help span the gap and render the models useful. At several different points Ziman reverts to a quotation from Polanyi to argue that some tacit or intuitive skill grounded in experience is essential to scientific discovery or practice. Pinch and Haack later make much the same use of Polanyi. All of this is to say that *Reliable Knowledge* functions in many respects like a gloss on *Personal Knowledge* without the depth and detail that Polanyi provides.

Israel Scheffler's *Symbolic Worlds: Art, Science, Language, Ritual* (Cambridge: Cambridge Univer-

sity Press, 1997) also traverses territory covered in Polanyi's writings (especially *Meaning*). In the several pages he devotes to Polanyi's thought, Scheffler quotes with approbation the same material on authority in science that Ziman quotes (PK 163-164 – Scheffler's quotation omits the ellipsis marks that should properly be present). Thus Scheffler does not raise the sorts of questions about Polanyi's thought that Redner does. Scheffler uses Polanyi to make the point that because art is expressive rather than primarily cognitive and denotative as are science and religion, art does not come into systematic conflict with science and religion the way that science and religion sometimes combat each other.

I find Polanyi's way of speaking about the relations between these disciplines (PK 220) less open to possible objections than Scheffler's discussion. Scheffler writes, "Art has no experts or doctrinal authorities to lay down corporate items of belief or make decisions for the community. The community of artists is in fact not a community of belief. Art has styles, to be sure, but these styles do not bind" (124). But is art as individualistic in practice as he makes out? In past centuries, in order to be employed, visual artists had to please patrons. Nowadays in order to be recognized and make a living, visual artists must please such arbiters of taste as gallery owners (what sells), museum curators (what will attract viewers), and art critics writing in such journals as *Art Forum.* In some respects, art, insofar as its organized communities adhere to different standards, functions socially and competitively much like the world of religious denominations. Polanyi acknowledges that competition between artists and their communities is conducive to artistic health (PK 220). Moreover, some religious communities are not creedal, and few are binding to the degree Scheffler suggests. In sum, not all religious communities conflict with science, and some religious communities come into conflict with some artistic communities, as the antagonism of some conservative denominations to the NEA illustrates.

The flavor of Scheffler's book is quite different than that found in *Reliable Knowledge* or any other book considered so far. Scheffler writes out of a perspective that honors above all the American pragmatists and secondarily the analytic tradition. Nelson Goodman's thought is especially engaged. Because Scheffler writes out of a nominalistic viewpoint (6), his sense of the real is narrower than Polanyi's understanding. Yet I find much in Scheffler's writing (such as his notion of mention-selection in Chapter 2) that can be used profitably to supplement and refashion the ways Polanyi treats symbols, metaphor, and art in *Meaning*.

Peter Dodwell assays a rather specialized field of scientific inquiry, cognitive science, in his *Brave New Mind: A Thoughtful Inquiry into the Nature and Meaning of Mental Life* (New York: Oxford University Press, 2000). But one of the burdens of his message is to promote a "widening of the field of cognitive science to include some well-documented features of mental life that have suffered neglect over the past many decades but that are nevertheless valid topics of inquiry. I characterize these as the *drama* of the mind" (vii). When one sees that the drama includes such things as creativity in math, music, and language, and novel ways of understanding the world, it becomes clearer why he draws upon Polanyi's thought. Dodwell does not refer to Polanyi reluctantly, for he states that Polanyi's work, " which has been sadly neglected, is chock full of interesting ideas, compelling descriptions of the nature of deep research creativity, and commentary on the human condition" (217).

As a first step toward broadening the scope of cognitive science, Dodwell sets forth in chapters 2 and 3 what he terms the standard model of the mind. This model

> treats the mind as a product of brain function and of the evolution of that wonderfully complex organ under the demanding priorities of natural selection. All mental activities,

> whether conscious or not, can be understood in principle on that basis, and the job of cognitive science is to find appropriate explanations in those terms. In recent decades the aims and methods have become more and more "computational". . . (59).

After offering a broad survey of leading theorists in psychology and cognitive science to show where the field is at present, Dodwell cites Polanyi approvingly as one who understands the "passionate commitment of scientists to the discovery of the 'hidden world' of ideas and phenomena" (179). He turns to Popper's model of three worlds in order to speculate on where cognitive science might look in order more effectively to embrace the whole drama of life. World three, the social world of ideal forms and ideas, is of special interest to Dodwell. He begins by quoting Roger Penrose's comments concerning the way mathematical forms in world three play a decisive role in understanding the physical laws and properties of world one. Then he turns again to Polanyi, utilizing his distinction between the principles and functions of a machine and the laws of chemistry and physics to suggest that such principles in world three may play a constitutive role in worlds one and two that to date has been mostly ignored. Dodwell particularly affirms that ideals of many sorts have an objective quality that is ignored to the detriment of cognitive science.

Brave New Mind is far more effective as a summons to a broadened vision than as a source for understanding what that vision might look like. Dodwell's pleas would have gained greater traction in my view had he adhered to a yet greater reliance on Polanyi. The quasi-independence of world three is a pretty weak frame upon which to hang new scientific insights. Better to see the terms, laws and principles of world three as symbol-dependent emergent insights constituted by humans, who are influenced not only by the impact of sense data, but also by evolutionary, historical, and social pressures and by a passionate commitment to truth.

Perhaps a book entitled *Philosophers of Consciousness* would prove to be a helpful place to explore if one wants to make progress in the direction Dodwell argues for. The fact that the author of this work was a professor of English would not be a problem for Dodwell but rather consistent with his interest in exploring the drama of life. That author is Eugene Webb, now a Professor Emeritus in the Henry Jackson School of International Studies, and in recent years primarily a teacher of courses in Religious Studies. The subtitle of Webb's book indicates its seminal interest to Polanyians: *Philosophers of Science: Polanyi, Lonergan, Voegelin, Ricoeur, Girard, Kierkegaard* (Seattle: University of Washington Press, 1988 — OP).

It would be misleading to think of Webb's book as having much of anything to do with cognitive science. Webb is interested in "reflective inquiry into what it means to function consciously as an inquirer and as a responsible agent" (3). More specifically, though, Webb is interested in the set of six individuals whose thought he analyzes because "all of them have been in some manner or another closely associated with the tradition of Christian thought and have tried to point directions for its future development, even if in some cases their relation to it has been somewhat problematic from the point of view of the orthodox" (19). Webb's interest in exploring new paths for Christian theology marks a transition in the concerns of the books under consideration in this review; almost all the remaining works exhibit a theological orientation to some degree.

Webb discusses Polanyi first among the six thinkers because he "introduces in a fairly basic and straightforward manner some considerations regarding the way thought and systematic inquiry demand to be understood" (14). Webb's introduction to Polanyi as the only one with the possible exception of Voegelin "to offer anything especially colorful in the way of biographical background" (26) is peculiar, to say the least. The color comes from using Peter Drucker's notoriously unreliable *Adventures of a Bystander* as the source for a

Polanyi family mythology. Fortunately, Webb shows signs of distrusting the source he quotes – but why then begin with Drucker?

Once Webb launches into an exposition of Polanyi's thought, the chapter on Polanyi settles into a productive groove. Webb understands Polanyi well and writes with admirable clarity. Webb helps those not knowing Polanyi's thought avoid seeing him as a subjectivist or irrationalist. "Polanyi was not opposed to objectivity as such, but to what he considered an exaggerated objectivism based on naiveté"(36). His exposition of focal and subsidiary awareness is lucid. In fact, pages 31-46 of *Philosophers of Consciousness* offer as insightful a brief summary of Polanyi's thought as any I know.

Polanyi is criticized by Webb for his failure to elucidate cognitive processes in any detail (47, see also 76). There is merit in such a comment; Polanyi does little to differentiate the different sorts of tacit knowing or varieties of integration. There is indeed, as Webb puts it, "considerable ambiguity in [some of] his basic concepts" (51). Webb quotes from an article by the analytic philosopher Alan Olding in *Religious Studies* 16 (1980) to extend his criticism. Olding accuses Polanyi of confusing ontological with methodological questions. Olding is basically a materialist. He regards as metaphorical any of Polanyi's hierarchical language, such as his comment that a machine's parts are harnessed by its design (49). Here there seems to be an irresolvable clash of basic assumptions: reductionistic-mechanistic versus emergent-hierarchical. I find the Polanyian option far more fruitful – end of discussion.

But to continue this digression on Olding, he also sniffs out traces of vitalism or at least questionable teleology in Polanyi's explication (PK 37; PK 383-384), and here his criticism is more worthy of note. Polanyi says, "Randomness alone can never produce a significant pattern, for it consists in the absence of any such pattern. . ." (PK 37). I'm not sure what Olding goes on to say about this claim, but Polanyi appears to be on shaky ground insofar as he is speaking of an order of existence and not a mathematical ideal. Polanyi believes randomness exists (PK 38), but can it ever exist alone? The cosmos exhibits a mixture of order and disorder. The disorder or randomness Polanyi refers to is thus never "alone," but in a context of some order. In relationship to that order, new stabilities could be expected to emerge out of the randomness. For instance, in a physical environment of randomly distributed living things, the features of the environment would be friendly to certain species and thus function as an environmental niche providing ecological order.

Webb suggests Lonergan's analysis offers Polanyi's thought some conceptuality that can overcome its ambiguity.

> The problem with the language of focal and subsidiary awareness, Lonergan would probably say, is that it connotes an ocular analogy that implies that knowing is a kind of 'look' – which from Lonegan's point of view, of course, would be a fundamental misconception in cognitional theory (77).

Critical analysis is needed before any "look" can claim status as knowledge. The suggested advance in clarity evident in Lonegan's thought seems, however, either to be merely terminological or to represent a step backwards from Polanyi's insights. Webb objects to Polanyi calling tacit processes "knowledge" and approves of Lonergan's designation of that which is tacit or merely apprehended as "experience" in contrast to explicit, critically legitimated "knowledge" (55). But is this not merely to revert to the subjective-objective dichotomy that Polanyi transcended with his notion of personal knowledge?

In the final analysis, despite offering a superb summary of Polanyi's thought and an illuminating discussion of six interesting thinkers, Webb does not get Polanyi quite right in a couple of aspects. Webb writes, "Lonergan shared with Polanyi a conception of consciousness as a dynamic relation between subjective and objective dimensions" (291 – see also 76). But that which is subjective (subsidiary) may be conscious or unconscious, it may be an idea established as "objective" or an embodied skill. That is, the subjective-objective distinction is not entirely isomorphous with Polanyi's subsidiary-focal distinction. Moreover, Webb treats Polanyi as offering an epistemology of the individual much as Lonergan did, and this misses the importance to Polanyi of tradition, of communities of inquiry — their conviviality and their authority structures – and of the role of evolution and emergence in the rise of human cognition. Polanyi is a philosopher of consciousness, but he is far more than that.

No work considered in this essay makes Polanyi's thought more central to its vision than *The Knight's Move: The Relational Logic of the Spirit in Theology and Science* (Colorado Springs: Helmers and Howard, 1992). This challenging work is co-authored by James E. Loder and W. Jim Neidhardt, both now deceased. And in the shadows behind their references to Polanyi one can make out the figure of Thomas Torrance, who is the major contemporary theological influence on this book.

The Knight's Move "is addressed to a wide spectrum of persons with the intention that interrelationships which pertain between theology and science may be brought out of any disciplinary ghetto and put into open dialogue" (xiii). Well, the religion-science dialogue has certainly escaped any ghetto it may have been in, but primary credit must go to Templeton Foundation funding, certainly not to the book at hand. Alas, while the book aspires to great things, its frequently obtuse style and a pervasive lack of clarity about its claims make it a promising but not entirely satisfying work.

The basic aim of the authors is to counter the dualisms of our age with a relational pattern they believe is characteristic both of human-divine and knower-known relations. They term this relationship "the strange loop model of bipolar-relational unity" (56 and elsewhere). Their visual model is the twisted band of the Mobius strip, a figure that has two ends (polar diversity), but only one side and one edge (its unity). Polanyi's notion of personal knowledge is employed to explicate what they mean. "Polanyi views personal knowledge as a differential integration of tacit (informal) knowledge and explicit (formal) knowledge with the latter depending upon, and in turn being molded by, the former; the latter as explicit knowledge controlling what is or is not to be known by others" (41-42). This sentence is typical of the book's syntax and also revelatory of some of its conceptual problems. Is tacit knowledge informal while explicit knowledge is formal? Are the two related by "a differential integration?" Does explicit knowledge control what is to be known by others? Be that as it may, the authors see the asymmetrical relationship between the tacit and the explicit to be an important conceptual alternative to simple dualistic opposition, and in this they have a point, perhaps a very important point.

The Polanyian understanding of knowledge, in which the action of the knower is a necessary concomitant to any object known, informs much of the authors' analysis. Thus Bohr's vision of the universe is seen as superior to Einstein's view because "Einstein did not reason about the universe itself as if the knower *per se* had to be part of the final explanation" (188). Loder and Neidhardt apply the basic Mobius model of reciprocal relationship to Bohr's notion of complementarity, the Kierkegaardian leap of faith, the dialectical exchange between the human spirit and the divine Spirit, Bach's "Musical Offering," indeed to all creative acts of imaginative or intellectual insight. "Our aim cannot be to eliminate how we are implicated in what we know,

but only to make anthropocentrism more inclusive and intelligible and to make knowledge more inclusive of it and its source and ground" (62-63).

Anthropocentrism is made more inclusive and intelligible through the concept of spirit. "[S]pirit refers to *a quality of relationality*, and it is a way to conceptualize the dynamic interactive unity by which two disparate things are held together without loss of their diversity" (10). Is personal knowing then an expression of spirit in this sense? Since one experiencing personal knowledge would be aware, at least in reflection, of both her involvement in the process of knowing and of the object known, it seems that an affirmative answer is called for. The authors phrase it this way: "The generative work of intelligence in such acts of creation and discovery as we have described here provides an analogy for the constructive power of the human spirit in all orders of thought and experience. . ." (230).

There are other indications that *The Knight's Move* projects a spiritualization of a Polanyian framework of thought. Here is an example: "Wonderful ideas are like the miracles of God in their generative spontaneity. In the seeming empty space between the knower and the known, and without conforming to any natural law, they 'just happen'" (226). It should be remembered that such talk of the human spirit has a long philosophical history, even though it might strike some contemporary ears as strange.

But Loder and Neidhardt are interested in much more than the human spirit. They believe the role of the Holy Spirit in human existence must be understood if the full possibilities of that existence are to be realized. "The Holy Spirit apart from the human spirit is intrinsically unknowable; the human spirit apart from the Holy Spirit vitalizes and empowers human perversity. In the profound creative interplay between them lies the core of our discussion" (11).

As in *Philosophers of Consciousness*, the thought of Kierkegaard plays a crucial role in *The Knight's Move*. Seven of the book's thirteen chapters have Kierkegaard's name included in their title. This is because Kierkegaard understood the essential role of the individual chooser as empowering the kinetic connection between Christ and culture, Holy Spirit and human spirit, the eternal and the existential.

> In the *positive* modality of faith, Religiousness B, *coexhaustiveness* means that the eternal and the existential are united in a bipolar unity which Kierkegaard called *transparency*. The person in whom this is accomplished by faith is one whose despairing self-relatedness is transformed into a relatedness "transparently grounded in the Power that posits it [the self]" (100).

The model of the one who in faith relates the existential and the eternal is the knight of faith set forth in *Fear and Trembling*. And here we come to the figure highlighted in the book's title.

> In a game of chess, the knight's move is unique because it alone goes around corners. . . . This meaningful combination of continuity and discontinuity in an otherwise linear set of possibilities has led some to refer to the creative act of discovery in any field of research as a 'knight's move' in intelligence" (2).

Even more important than this Polanyian knight of discovery for the authors is Kierkegaard's knight of faith. This "knight shows how, by existing in faith as a creative act of Christ's Spirit, human existence comes into its own as an expression of the mind of Christ" (2).

Another work traversing similar territory is Iain Paul's *Knowledge of God: Calvin, Einstein, and Polanyi* (Edinburgh: Scottish Academic Press, 1987). The author of two previous books dealing with Einstein and theology, Paul is a minister in the Reformed tradition who accepts Calvin's thought as the standard by which God may be known. Einstein and Polanyi function primarily as figures whose thought is shown to be analogous to Calvin's thought in some key respects. "Einstein's sympathetic knowledge, Polanyi's personal knowledge, and Calvin's persuasive knowledge share the same formal structure' (143-144). In comparing the thought of these three persons, then, Paul in effect seeks to transfer some of the authority of a great scientist and great philosopher of science to a great theologian of five centuries ago in order to justify continuing reliance on his thought.

A reader can gain the essence of the book's 149 pages by reading the 19 pages of the first chapter. In brief, for Calvin ordinary knowing includes both an activity of the heart, cordial knowing, and an activity of the mind, intellective knowing (6). Neither of these alone is sufficient to connect a person meaningfully to the ultimate mystery that is God. Only when the Holy Spirit underlies cordial and intellective knowing and then seals them in persuasive knowledge is the whole person bound up in an existentially vital relation to God. This relationship is not just a matter of believing God exists, but discerning his will toward each believer. That is, the work of the Holy Spirit comes to a climax in an existential faith.

Paul seeks to show that Einstein and Polanyi argue in parallel ways both that a cordial and an intellectual sort of knowing are required for scientific discovery, and that faith supports the scientific enterprise, bringing the mind and the emotions into harmony. Polanyi claims that critical analysis (intellective knowing) can never lead to comprehensive knowledge (2). It must be supplemented by powers of grasping that which is only vaguely foreknown and brought into increasing clarity by personal judgments (10). In relating cordial knowing to Polanyi's world of thought, Paul does not mention intellectual passions by name, but rather discusses tacit knowing, which, it must be said, involves more than reasons of the heart. Even in discussing tacit knowledge, Paul is not always sure-footed. "According to Polanyi, in tacit knowing we always attend from something in order to attend to something else" (11). That would be a satisfactory description of the from-to structure of consciousness, but would confuse readers seeking to comprehend tacit knowing. In any case, it is true that Polanyi believes that rationality and emotional involvement are required not only for scientific discovery but also for any process of knowing.

Both Einstein and Polanyi, Paul states, are alert to the mysterious dimension of the natural order much as Calvin is to the mysterious nature of God. Einstein is said to have claimed that an intuitive link between his reason and the empirical world "mysteriously schools him in the ways of the universe . . . It is readily appreciated that the reality, the rationality, and the intelligibility of the universe cannot be proved. The modern scientist must believe in them to understand the universe" (5). While acknowledging that Einstein and Polanyi would not approve of calling their intuitive powers the witness of the Holy Spirit, and while stating that Calvin finds no common ground with those who seat the power of discovery solely in the scholar or scientist, still Paul stresses that the way each thinker emphasizes the action of a suprarational power in knowing mysteries demonstrates the continuing relevance of Calvin's approach to gaining knowledge (16, 121-122).

There are surely gaps of reasoning separating Einstein and Polanyi from Calvin that Paul overlooks. Yes, it can be said that the reality, rationality, and intelligibility of the universe cannot be proved, but the sort of faith that affirms their existence is different in kind from faith in God the Creator, the saving existence of the

God-man Jesus Christ, or the authority of the Holy Spirit in authenticating truth. Faith in the reality and rationality of the universe is part of the practical worldview of virtually any sane person, Christian or non-Christian. Faith in the persons of the Trinity requires an extra step beyond faith in the external world, a step many persons believe is unwarranted. In particular, one must question Paul's intimation that the persuasive activity of the Holy Spirit is comparable to conviction resulting from rational inquiry and discovery. That the Holy Spirit is needed to produce meaningful conviction is an over-belief that Paul's book asserts in the name of Calvin without any attempt to persuade the skeptic.

Rather than use theology as the basis for interpreting science as Paul does, Lothar Schäfer takes science to be a source of religious and ethical insight, as the subtitle of his book suggests. *In Search of Divine Reality: Science as a Source of Inspiration* (Fayetteville: University of Arkansas Press, 1997) is well grounded in scientific literature – references to Einstein, Heisenberg, Eccles, Monod, Bell, Planck, and Schrödinger are relatively frequent. On the other hand, references to contemporary ethicists and theologians are virtually non-existent. This is not surprising in a work by a physical chemist. However, the imbalance in the sorts of individuals referred to points to a similar imbalance in the amount of authority evident in the scientific content (insofar as it is presented rather than applied) versus the philosophical-humanistic content of the book.

To his credit, Schäfer's work is clearly written and motivated by highly honorable ideals. Simply put, he argues that the value-denying triumph of the mechanistic sciences destroyed the religious worldview that offered many people their sense of meaning in life, but that scientific advances in the past century provide grounds for affirming that the universe is basically mind-like and a reservoir of life-giving values. Polanyi (who would be surprised to learn that he was a biologist) is first cited in an apparently approving way as having "views close to vitalism in a modern way" (58). His view of emergence is mentioned but never taken up into the argument of the book. That is a shame, because the author relies on some pretty weak bases for what turns out to be an impoverished idealism. His basic claim is that ultimate reality is mind-like and thus a plausible dwelling place for the ethical principles and divine realities that bring meaning to existence.

First Schäfer appeals to the transcendental principles of object permanence, induction, and causality as demonstrating that understanding the universe requires more than empirical evidence shaped by reason (19, 23). He then cites quantum phenomena as evidence of transcendent and non-material foundations of physical reality (chapter 2). That there is a difference between 'transcendental' (what is required to explain a state of affairs) and 'transcendent' (that which exists beyond direct empirical evidence) is not noticed. The author states that such information-driven phenomena as suggested by the electron diffraction experiments, the Pauli principle, and other quantum phenomena "convey the impression that the background of reality has **mind-like qualities**" (86). The upshot of his investigation is that he proposes a new covenant between human minds and the mind-like background of the universe (109), a covenant that affirms the existence of purpose and values and the possibility of divinity.

Ian Barbour is among the many thinkers who dismiss the sort of use Schäfer makes of quantum theory as involving a confused conflation of radically different dimensions of existence (see his *Religion and Science: Historical and Contemporary Issues* [HarperSanFrancisco, 1997, p. 187]). This work by Barbour, who is like Haack a self-professed critical realist, combines revised historical material from his *Issues in Science and Religion*, a widely respected standard work in the field, with material from his first series of Gifford Lectures. Here Barbour displays the same respect for Polanyi's accomplishments that mark his previous books. Polanyi's refusal to bifurcate reason and faith, his emphasis on tacit skills in all sorts of knowing, his holding together of

personal responsibility with communal consensus, his application of gestalt ideas to knowing, his stress on the practice of scientists, and his exposition of the role of boundary conditions – these are among that ideas Barbour incorporates from Polanyi in this seminal work.

Holmes Rolston, III, like Polanyi and Barbour a Gifford lecturer, is another who has appropriated aspects of Polanyi's thought. This reliance is not evident in Rolston's Gifford Lectures themselves (*Genes, Genesis and God*), but Rolston makes some use of Polanyi in his *Science and Religion: A Critical Survey* (New York: Random House, 1987). This thoughtful work analyzes central scientific ideas insofar as they intersect with religious ideas. Rolston offers his reasons for believing that religious faith is compatible with the findings of science. Polanyi's discussion of the need for a higher ordering principle to explain evolution (PK 382-387) is cited approvingly.

Reconstructing Nature: The Engagement of Science and Religion (New York and Oxford: Oxford University Press, 2000 [1998]) is yet another work originally delivered as Gifford Lectures. Its authors, John Brooke and Geoffrey Cantor, take an historical approach to explore crucial encounters between particular expressions of science and religion. An emphasis on particularity marks their approach. Like much postmodernist discourse, their work is skeptical of any master narrative, which they believe says more about the perspective of the author of the narrative than of the events themselves.

Polanyi's thought, taken from PK 133-148, is heavily relied upon in a chapter entitled "From Aesthetics to Theology." The authors use Polanyi's notions of indwelling and aesthetic satisfactions in theory development to explore how the Scientific Revolution, Enlightenment thought, and Darwin's notions were influenced by an honoring of beauty wherever it was found. Throughout their discussions, the authors emphasize that neither science nor religion should be seen as essences inextricable from the historical contexts in which they come to expression.

John Haught has focussed in recent years on considering what theology can learn from Darwinian evolution. His work, *God After Darwin*, was reviewed in *Tradition and Discovery* 28:1 (2001-2002), and his plenary address at the 2001 Polanyi Society conference at Loyola Chicago was published in the same issue. A revised version of that address appears as chapter 8 of Haught's most recent work, *Deeper than Darwin: The Prospect for Religion in the Age of Evolution* (Boulder, CO: Westview Press, 2003). At stake in this chapter is the question as to whether impersonal evolutionary theory can give an adequate explanation of the rise of religion. His use of Polanyi can be summarized in this quotation: "The logic of achievement – implying the possibility of success and failure – as Polanyi has consistently attempted (often without success) to get across, is simply inapplicable to impersonal processes" (116). Personal issues must be addressed in discussing the history and development of religion.

This review of Polanyi's contemporary influence would be incomplete without mentioning that many well-known authors, whose works have not been reviewed in this journal, make at least passing reference to Polanyi's ideas. Authors as wildly diverse as Huston Smith, Fritjof Capra, Parker Palmer, and Charles Taylor are among the many who might be cited in this regard. It would also be misleading to end this article leaving the impression that Polanyi's influence is confined to writers in the fields of philosophy of science or science and religion. So the last book I will cite comes from the field of jurisprudence.

Randy E. Barnett's *The Structure of Liberty: Justice and the Rule of Law* (New York and Oxford:

Oxford University Press, 2000 [1998]) begins by asking how liberty might be structured so that it will not lead to license. Freedom and constraint need to be balanced in law so that the problems of knowledge (who has access to what important information?), interest (how should society's goods be distributed so as to be fair yet retain incentives and be complied with?), and power (how can the law be enforced without abuse?) are adequately dealt with. Barnett's sympathies lie closer to Nozick than to Rawls, and he is leery of schemes of redistributing income. That is, Barnett is a classical liberal, appreciative of John Locke, but a contemporary conservative, influenced by Friedrich Hayak and the lesser-known Lon Fuller. Barnett acknowledges the background influence of Polanyi on his mentors as follows: "Both Hayek and Fuller were heavily influenced by Polanyi's treatment of polycentricity, tacit knowledge, and spontaneous order. . ." (257). It will thus come as no surprise that he appropriates Polanyi's notion of polycentricity, contrasting it with a monocentricity that he thinks almost inevitably leads to an abuse of power.

While the array of authors cited in this review article were selected because they evince knowledge and appreciation of at least some aspects of Polanyi's thought, the scope of the sample makes it reasonable to conclude that Michael Polanyi's thought continues to act as a catalytic force among many contemporary thinkers.

Polanyi Society Membership

Tradition and Discovery is distributed to members of the Polanyi Society. An password accessed electronic (pdf) version of issues is available on the Polanyi Society web site (http://www.mwsc.edu/orgs/polanyi/). This periodical supercedes a newsletter and earlier mini-journal published (with some gaps) by the Polanyi Society since the mid seventies. The Polanyi Society has members in thirteen different countries though most live in North America and the United Kingdom. The Society includes those formerly affiliated with the Polanyi group centered in the United Kingdom which published *Convivium: The United Kingdom Review of Post-critical Thought*. There are normally three issues of *TAD* each year.

Annual membership in the Polanyi Society is $25 ($10 for students). The membership cycle follows the academic year; subscriptions are due November 1 to Phil Mullins, Missouri Western State College, St. Joseph, MO 64507 (fax: 816-271-5680, e-mail: mullins@mwsc.edu). Please make checks payable to the Polanyi Society. Dues can be paid by credit card by providing the card holder's name as it appears on the card, the card number and expiration date. Changes of address and inquiries should be sent to Mullins. New members should provide the following subscription information: complete mailing address, telephone (work and home), e-mail address and/or fax number. Institutional members should identify a department to contact for billing. The Polanyi Society attempts to maintain a data base identifying persons interested in or working with Polanyi's philosophical writing. New members can contribute to this effort by writing a short description of their particular interests in Polanyi's work and any publications and /or theses/dissertations related to Polanyi's thought. Please provide complete bibliographic information. Those renewing membership are invited to include information on recent work.