

# Enactive Realism

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**ABSTRACT** Key Words: boundary, duality, emergence, expression, form, levels/hierarchies. *Polanyi and Merleau-Ponty are often viewed as arguing for philosophical positions that are generally non-Cartesian. Despite their broadly compatible orientations, their overall projects differ at key junctures. What I have called Polanyi's "enactive realism" is an attempt to clarify what is unique about Polanyi's epistemology. It is specifically Polanyi's delineation of the hierarchical, stratified nature of comprehensive entities as brought forth by the structure of tacit knowing (not the hierarchy itself) that marks a key departure from Merleau-Ponty.*

## Introduction<sup>1</sup>

Michael Polanyi and Maurice Merleau-Ponty are often viewed as arguing for philosophical positions that are generally non-Cartesian (and/or non-representational). In a previous paper discussing Polanyi and Merleau-Ponty, I claimed that Polanyi's enactive realism "goes beyond" Merleau-Ponty's view of the primacy of lived perception.<sup>2</sup> I still think this is broadly accurate, but perhaps in being too eager to distinguish Polanyi from Merleau-Ponty, I did not situate their differences in terms of their overall projects. In essence, Polanyi only "goes beyond" Merleau-Ponty insofar as Polanyi's enactive realism offers a non-Cartesian *epistemology*. By contrast, Merleau-Ponty offers a philosophy of "expression"—emphasizing the *lived* dimensions of experience—that isn't properly viewed as rooted in epistemic concerns.<sup>3</sup> I shall argue that while this isn't a difference of kind but of emphasis, their overall projects lead to some perhaps surprising departures.

Both philosophers employ remarkably similar notions concerning the lived body, embodied bases for perceiving and knowing, gestalts, forms of emergence, and levels of experience and reality. In the following paper I shall discuss in greater detail the relations between form, boundaries, and levels. My purpose in continuing a dialogue between Polanyi and Merleau-Ponty is to further unfold enactive realism—what is "enactive" about it, what sort of (participatory) "realism" it concerns, and what sort of non-Cartesian epistemology it offers.

## Polanyi on Boundary Conditions

The notion of boundary conditions is well established in various sciences, perhaps most especially concerning its use in mathematical applications. The physical application of differential equations is a paradigmatic example of the use of boundary conditions, where certain differential equations can be solved analytically given such conditions (as well as initial conditions). Examples include the heat equation, the wave equation in quantum mechanics, and so forth. From a broader conceptual viewpoint, boundary conditions isolate a system under investigation so that its "inner workings" can be controlled and studied. Polanyi recognizes the importance of utilizing boundary conditions in the sciences, since such conditions, brought forth by what he calls "higher-order principles," help to constrain other (lower-level) principles that operate within a system—even stronger, these higher-order principles *enable and structure* the parts of a system.<sup>4</sup>

The notion of higher-order principles is closely related to what Polanyi terms "comprehensive entities" (or achievements). There is actually a web of interrelated notions: (1) *higher-order principles* enable *other*

*principles* operating within a system; (2) the distinction between these two types of principles exhibits the *dual control* of systems seen from two mutually related yet distinguishable levels of operation; and (3) these levels of operation are part of an ongoing hierarchy of *achievements*. In the following sections I shall focus on (1) and (2); I discuss (3) more fully towards the end of the paper.

Polanyi distinguishes between two types of boundary conditions: one that allows us to focus on the “natural processes controlled by the boundaries,” and one that allows us to harness the “effects of boundary conditions” (*KB* 226). Two simple examples of the former type that Polanyi cites are a saucepan (the boundary) in which soup—the focus of attention—is cooked (the “natural process”); and a test-tube that allows for studying certain chemical reactions. I think further examples utilizing this type of boundary condition include: simple models that serve as pedagogic exemplars in the sciences (e.g., population genetic models, ball-and-stick models of atoms, etc.); setting up experiments in controlled laboratory situations; setting up a proper randomized poll (in gathering data and making statistical inferences); and so on. This sort of boundary condition isolates a phenomenon—and thereby also indirectly structures and enacts that very situation—to more fully grasp the nature of the comprehensive entity under study. Since experience can be “diffuse” as it were, this type of boundary condition functions to harness certain potentialities, thus enabling and structuring a comprehensive entity as a meaningful whole.

The other type of boundary condition poses interest in its own right, and does not merely operate as an enabling background condition. That is, unlike when we use a test tube to study the reaction *within*—we are not interested in the test tube itself—the “reverse is true” (*KB* 226) for boundary conditions that enable *effects*. Using chess as an example, Polanyi writes that the “strategy of the player imposes boundaries on the several moves, which follow the laws of chess, but our interest lies in the boundaries—that is, in the strategy, not in the several moves as exemplifications of the laws” (*KB* 226). If the other type of boundary condition is generally about the isolating aspect of boundaries (to then study what is isolated), for this type of boundary condition the reverse is true: a game of chess, as enabled by the rules/laws, is only interesting insofar as these rules project possible strategies of interest within a game. In this case the boundaries have to do with possible constrained foci of tacit knowing that skillfully negotiate various affordances<sup>5</sup> to create achievements (e.g., conjuring a brilliant strategic chess move).

It is important to note that Polanyi labels this boundary condition a “machine type of boundary condition” (*KB* 226). I think caution is required in interpreting Polanyi’s use of the phrase “machine type,” since while indebted to a Cartesian legacy of mechanism, his deployment of various machine metaphors is generally non-Cartesian. It appears that Polanyi’s machine talk is framed by the notion of “dual control,” which has strong affinities with information theory and cybernetics. As I argue later in the paper, dual control (along with boundary conditions of either type) is tied to enactive realism as an *informational* (semiotic) realism.<sup>6</sup> The next section concentrates just on Polanyi’s notion of dual control systems. His appropriation of machine metaphors invokes, not inappropriately, the use of dualistic notions that are explicitly non-Cartesian. On the dualistic side, the notion of dual control appeals to boundary conditions that utilize the two poles of “inner” and “outer,” bringing comprehensive entities (machines or otherwise) into focus. And the non-Cartesian flavor of dual control systems pertains to how these systems share the same logic as that of tacit knowing, and how comprehensive entities are dynamic, integrated wholes.

## The Epistemics of Dual Control

In order to appropriately interpret “dual control,” there first needs to be some clarification as to what “dual” means; for whatever Polanyi’s dual control is about, it is not to be understood as expressing a full-blooded Cartesian dualism. The reason I emphasize this is that there is an outstanding paper on a kind of reconstructed dualism that lies within Polanyi’s thought, to which I am quite sympathetic.<sup>7</sup> In line with such a project (though with a few “reconstructions” of my own) in this section and the next I propose to link an appropriate sense of “dual” with the previous discussion of boundary conditions.

Polanyi writes that “in certain cases the boundary conditions of a principle are in fact subject to control by other principles. These I will call higher principles” (*KB* 217). These higher principles express the recognition, from the standpoint of assessing a system, that comprehensive entities are afforded by lower-level principles, and that these affordances are in turn controlled by higher-order principles that are manifest in those entities’ distinctive operations. Thus Polanyi’s notion of dual control is really about “the stratified structure of comprehensive entities. They embody a combination of two principles, a higher and a lower [embedded in an ascending hierarchy of achievements]” (*KB* 217).

What does it mean for higher-order principles to enable other principles within a (bounded) system? Also what does it mean for lower-level principles to afford other higher-level principles which are not reducible to such lower-level principles? Polanyi writes that the “*higher principles which characterize a comprehensive entity cannot be defined in terms of the laws that apply to its parts in themselves*” (*KB* 217). Yet these higher principles cannot be understood without the notion of dual control. It may appear that this expresses a latent dualism separating higher from lower; however this would be a mistake. Dual control is expressive of an emergentist stance that epistemically recognizes the stratified *yet mutually informed and informing* nature of the parts and levels of comprehensive entities.

Polanyi cites a number of examples in support of dual control from information theory, language production, levels in chemistry and physics, etc. These are all fine examples that illustrate Polanyi’s exposure to many fields of study, which fits with his account of the wide-ranging nature of tacit knowing. However critics may find that the lessons Polanyi draws concerning boundary conditions and dual control are perhaps too diffuse to establish the stratified nature of comprehensive entities as *emergent structures*—structures that have epistemic-ontic import. To counter such a charge, I will appropriate an example from contemporary philosophy of science to serve as an illustration of the hierarchical nature of achievements.

### Robert Batterman’s Rainbow Example: Illustrating an Emergentist Stance

To set the stage for the rainbow example, Robert Batterman<sup>8</sup> first distinguishes between two types of why-question: one that asks for an “explanation of why a given instance of a pattern obtained,” and another that asks “why, in general, patterns of a given type can be expected to obtain” (*DD* 70). The former question can be answered in any number of ways, and to an extent satisfies some explanatory needs. For example, if I am asked why a particular formal derivation has the form that it does, I might respond by appealing to specifics of the conclusion and premises (which may include retracing the steps of the derivation and the rules justifying each step). But if the question is answered according to the second type, I might appeal to a meta-theorem of the system which claims that derivations of a certain pattern arise from the “interaction” of

particular system rules. What is important about the second type of why-question is that there are patterns exhibiting what Batterman calls “universality”:

1. The details of the system (those details that would feature in a complete causal-mechanical explanation of the system’s behavior) are largely irrelevant for describing the behavior of interest.
2. Many different systems with completely different ‘micro’ details will exhibit the identical behavior (*DD 73*).

A particular example of a pattern of universality—a kind of emergent property of a comprehensive entity—concerns the wave-ray account of a rainbow.

Here is a sketch of the rainbow example. (The following discussion is unavoidably semi-technical; the pace is quick. To help digest the material, I flag the key ideas in italics. I also direct the interested reader, via underlined links, to a few websites and to Batterman’s diagrams providing assistance with some of the mathematical concepts.) Suppose we have a spherical raindrop where an incoming ray of light is first refracted at the point of entry, then reflected off of the inner “back wall” of the sphere, and then again refracted when coming out of the raindrop. With a set of parallel incoming rays to this sphere (given the appropriate scattering angle), some of the outputted rays form the primary bow of the rainbow, whose curve is known as a “fold caustic” (imagine, for those incoming parallel rays, a set of outputted lines that form “tangents” to define a curved line; see [Figures 6.1 and 6.2](#), *DD 82-3*). *Key idea: what a geometrical/ray theory of optics gives us is the ability to predict the shape of the bow(s)*. However, this ray theory cannot account for the “presence of so-called supernumerary bows. These are fainter arcs appearing on the lit side of the main rainbow arc. They are visible in the sky at times as faint alternating pink and green arcs [and are different from primary and secondary bows—which ray theory can accommodate; see <http://www.atoptics.co.uk/rainbows/supers.htm>]. Furthermore, since actual rainbows do not exhibit light of infinite intensity, [this] singularity [when on the “fold caustic”—informally, the bowed shape of a rainbow after] predicted by the ray theory cannot be realistic” (*DD 82-3*). To cover the former gap, wave theory employs the “Airy Integral” (along with additional tools from the wave theory of light) which yields the interference patterns that account for supernumerary bows (see <http://www.ams.org/samplings/feature-column/fcarc-rainbows>). So it would seem that ray theory and wave theory are all that is needed. But the question remains, how do ray theory and the Airy Integral interrelate? *Key idea: in providing a proper account of a rainbow, it would be theoretically troublesome to simply patch together theories, appealing to one theory where the other is incomplete in order to cover the phenomena.*

The misleading metaphor that the Airy integral gives “the wave flesh that decorates the ray theoretic bones” (*DD 84*) makes it seem as if in the limit the two theories form a smooth theoretical patchwork. Accordingly, Batterman raises the question, just how much can the wave theory really capture? *Key idea: the answer turns out to be surprising: at the very place in which one would hope that the wave theory transitions smoothly into what the ray theory yields, it actually falls apart.* A qualitative sketch of the idea goes as follows. Take an arbitrary “wavefront” (as a simple illustration, a concentric light-sphere emanating from a candle). The coordinates on the wavefront can then be used to define rays as lines perpendicular to the surface (the light-rays emanating from the candle are perpendicular to the spherical wavefront). Next, take a patch around a ray and project it to get a “ray tube” (also the patch is used to define an energy flux—the rate at which the patch changes). Such a tube can be used to approximate the wave intensity, and the hope is that the tube and the wave intensity will (everywhere) smoothly interrelate to one another (see [Figure 6.7](#), *DD 89*). As this

pertains to the wave-ray account of rainbows, unfortunately what happens is that the energy flux on the light-surface/wavefront and the energy flux at the projected point (on the caustic/bow) don't smoothly interrelate, for when the patch at the focal point shrinks to zero, the function blows up. The "interfering ray sum [which encapsulates the wave-ray patchwork] cannot describe the nature of the wave near and on a caustic. *In other words, it breaks down exactly where we need it most. . .* Caustics and focal points are the primary objects of study in optics, but the interfering ray sum fails exactly at those places" (DD 88). *Key idea: in Polanyian terms, it would be hasty to infer from such a failure that boundaries—such as those between the wave and ray accounts—are merely artifacts of an observer's limitations, are merely heuristic devices, or are merely expressions of limited theoretical machinery; for as it will be argued, the implicit epistemic-ontological issues concerning the status of boundaries occur even in "simple" cases like the wave-ray account of a rainbow.*

A further weakness of the wave-ray patchwork is that one of the functions in the "interfering ray sum" depends on the shape of the raindrop. If raindrops deviate from the spherical shape, different solutions are generated that also deviate from actual rainbow phenomena. But "we observe, as a matter of empirical fact, that despite the fact that raindrops have different shapes, the *patterns* in intensity and in fringe spacings that decorate the caustics are similar. *These patterns are universal*" (DD 90). The structures that capture such universal patterns are the caustics, which (technically) are "catastrophes." A better account is given in order to understand the limiting, asymptotic borderland between the ray and wave theories—namely "catastrophe optics" (see [http://www.phy.bris.ac.uk/people/berry\\_mv/pictures/poster1.pdf](http://www.phy.bris.ac.uk/people/berry_mv/pictures/poster1.pdf)). The central new idea is that a catastrophe defines an "equivalence class" over a range of perturbations (different raindrops), sort of like the way a calculator defines a heterogeneous class of functional "equivalents" (counting on fingers, or using an abacus, or using a digital calculator, etc.). *Key idea: this better account, discussed below, is an instance of what Batterman calls "asymptotic reasoning," which tacitly appeals to boundary conditions and the importance of distinguishing between higher-order principles and the principles within a system.*

In the case of rainbows, asymptotic reasoning occurs in the following way. First, the interfering ray sum is put into a "generalized wave function" form, and then another generalized equation is given for the "fold caustic catastrophe" (the catastrophe type relevant to the shape of rainbows). Finally, a generalized (asymptotic) equation defines a "scaling law" that discloses a (self-similar) pattern which is universal across various perturbations. This scaling law relates the two other generalized equations, one wavelength dependent (and so can give the intensities and fringe spacings needed to account for supernumerary bows) and the other wavelength independent (since it describes the stable shape of the rainbow). Taking the wavelength to zero, the fringes and intensities don't exist at the limit and the caustic takes over (we get a "raw, unadorned bow"); when the wavelength is too large the "noise" drowns the caustic pattern (there is no bow—just "colors"); and if the wavelength is perturbed within certain bounds, both the caustic and the interference patterns yield bowed, colorful rainbow phenomena. *Key idea: the scaling law operates as a higher-order principle that structures the principles operating within the system—in this case, the principles embodied in the wave equation and the ray equation (strictly speaking, what are now the wavelength and caustic elements in catastrophe optics).*

What we have is a mediating law (the scaling law) that does not belong to either the ray or wave theories. The first implication is that the mathematical scaling law is not reducible to its component parts, since in particular the singularity of the caustic is different from the wave approximations. *Key idea: higher-order principles disclose emergent properties that are more than the sum of their parts, as Polanyi generally claims.* The second and most crucial implication is that the scaling law requires higher-level orientations in order to reveal and delimit the equivalence class of microstates captured by the generalized caustic equation.

Specifically, rainbow phenomena are oriented by systems of raindrops and the (scaling) interrelations they have with perception, optics, and wave physics. These systems are only revealed by the higher-level perspectives adopted—perspectives that afford the qualitative distinctions between macrolevels and microlevels. In other words, to understand emergent rainbow phenomena—the relevant objects of *interest*—higher-level perspectives must be adopted. The upshot is that such perspectives are not merely “perspectival”; rather, the systems orientation epistemically adopted enacts ontological structure.

*Summary of key ideas:* Higher-order principles not only structure lower-level principles within a system, but such higher-order principles can epistemically enact a hierarchy of levels of reality (more on this crucial claim at the end of the paper). Furthermore, the notion of dual control requires that the interrelations between lower and higher levels be taken into account to bring properly into relief the nature of comprehensive, stratified entities—e.g., at one hierarchical region concerning the relations between lower-level wave and ray elements and the higher-level scaling law (where the lower level provides affordances for this higher level, but the scaling law cannot be reduced to the lower level); moving up the hierarchy, the relations between the (now) lower-level scaling law and the higher-level systems interrelating perception, raindrops, etc. (where this lower level provides affordances for these higher-level systems, but these higher-level systems cannot be reduced to the scaling law—after all, the scaling law by itself has no direct bearing on perception, systems of raindrops, etc.); and moving up again, the relations between the (now) lower-level systems interrelating perception, raindrops, etc. and the higher phenomenal level concerning actually seeing a beautiful rainbow (where these lower-level systems afford phenomenal seeing, but where such seeing has a “horizon” of its own, as Merleau-Ponty generally argues). To quote from Polanyi, “each level is subject to dual control: (i) control in accordance with the laws that apply to its elements in themselves, and (ii) control in accordance with the laws of the powers that control the comprehensive entity formed by these elements” (*KB* 233).

## The Ontology of Comprehensive Entities and the Logic of Tacit Knowing

Since I shall later more fully discuss comprehensive entities, the purpose of this section is to draw attention to the parallel between comprehensive entities and tacit knowing. This parallel serves as a transition to Merleau-Ponty’s earlier work and his similar use of duality and levels.

Polanyi writes that the “logical structure of tacit knowing covers in every detail the ontological structure of a combined pair of levels [pertaining to dual control]” (*KB* 218). The mapping concerns the four aspects of tacit knowing—the functional (how subsidiaries bear upon a focus), semantic (the meaning of parts as they bear on a whole), phenomenal (the gestalt nature of a whole), and ontological (a whole as a comprehensive entity).<sup>9</sup> To illustrate using the rainbow example, fixing our attention on the scaling law as a whole and its subsidiary wave and ray parts (technically, the generalized wave equation and the fold caustic catastrophe), the *functional* aspect of tacit knowing maps to the manner in which the wave and ray parts are accommodated within the scaling law. Neither of these parts are sufficient to reveal the nature of the scaling law; thus the scaling law operates as a higher principle at work integrating the particular wave and ray parts, where the boundaries concern the structural shapes of rainbows (ray), the colors of rainbows (wave), and the overall delimitation of the interaction of these two. The *semantic* aspect concerns how these parts bear on a whole—the scaling law—since this whole brings into focus the meaning of the parts: wave elements relate to our interest in the colors that rainbows manifest, and ray elements relate to our interest in the shapes of rainbows. The *phenomenal* aspect concerns the emergent scaling law that, *as a whole*, has new properties not found in

the parts themselves (cf. *KB* 218). Lastly the *ontological* aspect pertains to the hierarchy of comprehensive entities—not just at a single perspective of dual control (e.g., at one hierarchical region concentrating on the “lower” scaling law and “higher” systems interrelating optics, perception, etc.), but also at the numerous levels of dynamic interaction.

It may appear that this parallel between tacit knowing and comprehensive entities leaves open key philosophical questions about the exact relation between the two. Is it a coherence relation? A correspondence relation? I suggest that while it contains elements of both, neither suffices, since such proposals obscure the nature of Polanyi’s post-critical philosophy. The relation between the two is an enactive one. While there is “coherence within” and “correspondence between” the two—i.e., the aspects of tacit knowing and comprehensive entities are *integrated* aspects (“coherence”) that share the *exact same* logic (“correspondence”)—what neither of these terms capture is the dynamic nature of Polanyi’s fiduciary program. As I will provide a synthesis at the end of paper to address the nature of “enactive realism,” it is important to keep in mind that the relation between tacit knowing and comprehensive entities is fundamentally transactional and commitment-based.<sup>10</sup>

I previously characterized enactive realism as “a fusion of being-in-the-world with consequential commitments that aim at levels of achievement—levels that include emergent comprehensions of the world, and their related commitments to emergent realities yet to be discovered” (*TAD* 36:2 [2009-2010]: 36). I interpreted being-in-the-world through the lens of Merleau-Ponty and claimed (somewhat hastily) that Polanyi “goes beyond” Merleau-Ponty due to the consequential, committal nature of tacit knowing. As mentioned at the beginning of the paper, I still think this is generally true, but with important caveats. What I did not realize then is that there are far more profound resonances with (and resources within) Merleau-Ponty’s philosophy. In Polanyi’s own words, he thinks the key difference between himself and Merleau-Ponty lies in his development of the logic of tacit knowing and his theory of the ontological stratification of comprehensive entities (*KB* 222). This is not wholly true. In Merleau-Ponty’s earlier works (specifically *Structure of Behavior* and *Phenomenology of Perception*) there are similar resources that he appeals to: levels of reality, something like dual control, the importance of forms and gestalts, and so forth.

The intent in the next two sections isn’t merely to draw suggestive parallels between Polanyi and Merleau-Ponty. Rather the purpose of discussing Merleau-Ponty’s similar resources is to indicate how his development of “being-in-the-world,” whose trajectory is *not* epistemically oriented, leads to a dissolving of the very parallel between tacit knowing and comprehensive entities that Polanyi needs for his epistemological orientation.

## Merleau-Ponty on Form

The notion of form is crucial for Merleau-Ponty since it concerns his interpretation of gestalts and their bearing upon lived being-in-the-world. What Merleau-Ponty has to say about form resonates with the gestalt aspect of tacit knowing and the creation of comprehensive entities: forms “are defined as total processes whose properties are not the sum of those which the isolated parts would possess.”<sup>11</sup> Furthermore, such forms are embedded in a dynamic duality that parallels the subsidiary-focus structure of tacit knowing: “There is always a duality that appears at one level or another: [e.g.,] hunger or thirst prevents thought or feeling. . . This duality is not a simple fact; it is founded in principle—all integration presupposing the normal functioning of subordinated formations, which always demand their own due” (*SB* 210). These subordinated formations are viewable as subsidiary, tacit skills that enable further integrations.

As with tacit knowing, these integrative forms are transactional. Thus this duality is “not a duality of substances” (*SB* 210), but rather, to employ Polanyian language, a duality of the subsidiary-focus structure that is geared towards achievements: “The body in general is an ensemble of paths already traced, of powers already constituted; the body is the acquired dialectical soil upon which higher ‘formation’ is accomplished, and the soul is the meaning which is then established” (*SB* 210). Here “body” and “soul” are understood in a non-Cartesian way; even stronger, the Cartesian order of things is being problematized. Body is always already there, providing a tacit fund for “accomplished formations.” The meaning of the bodily subsidiaries is brought into relief by the very enactments of “minding” (to borrow a useful term from Marjorie Grene)—mind is not a separate substance interacting with body; rather body-“ing” and mind-“ing” are configured-and-configuring modes of lived reality.

An example provided by Merleau-Ponty illustrates these claims. The duals of body and mind are not to be separated, on the one hand, into objects of interest and, on the other hand, into the mind’s ability to grasp such objects via perception. The picture he is offering shifts the Cartesian problem of the relation between knower and known: the relation is not one of coming to know objects; rather the task is to reveal how objects are “lived as realities” (*SB* 168). Using soccer as an example, Merleau-Ponty contests the view of the soccer field as a sort of projected “Cartesian theater,” where the “given” playing field is viewed as circumscribing ensuing games. By contrast, for a “player in action” the soccer field “is pervaded by lines of force (the ‘yard lines’; those which demarcate the ‘penalty area’) and articulated in sectors (for example, the ‘openings’ between adversaries) which call for a certain mode of action and which initiate and guide the action as if the player were unaware of it” (*SB* 168). Merleau-Ponty is not referencing the literal yard lines as such (nor the literal spaces between adversaries), but rather is gesturing towards the skillful modes of action that can dynamically ensue in the course of the game—dynamics that enact creative, lived realities. Thus he goes on to write: “The field itself is not given to [the player], but [is] present as the immanent term of his practical intentions; the player becomes one with it and feels the direction of the ‘goal’, for example, just as immediately as the vertical and the horizontal planes of his own body” (*SB* 168). Put in Polanyian terms, the blind man who skillfully projects his cane as a probe enacts creative, lived realities when negotiating his surroundings.

The notion of “lived realities” suggests that there is no genuine divide between knower and known. Merely emphasizing the interaction between these two poles is not sufficient, since one may import subtle Cartesian assumptions when examining such interrelations. As Merleau-Ponty argues, there is an irreducible “dialectic of action and milieu” for the soccer player and the field: “Each maneuver undertaken by the player modifies the character of the field and establishes in it new lines of force in which the action in turn unfolds and is accomplished, again altering the phenomenological field” (*SB* 169). To guard against the lurking dangers of Cartesianism, I submit that Grene’s notion of *minding* is headed in the right direction: to emphasize the irreducible nature of the dialectic of knower and known, the player’s actions are expressive of “*minding-and-fielding*,” as it were.

Merleau-Ponty, as with Polanyi, utilizes the notions of form, dual levels of interaction, and so forth. And while both emphasize the irreducible nature of the “dialectic” of knower and known, Polanyi claims that what differentiates him from Merleau-Ponty is an explicit *logic* of tacit knowing, and a *theory* of ontological stratification. As I read this difference, I suspect that it stems from differing overall orientations—in particular, Polanyi’s epistemological orientation. For Merleau-Ponty isn’t concerned with providing a “logic” of lived realities; he is concerned rather to “re-awaken [us] to the enigmatic richness of [our] own lived experience.”<sup>12</sup>

As for Polanyi's theory of ontological stratification, while Merleau-Ponty also employs the notion of levels of experience, I suspect likewise that his overall differing orientation leads him away from an inquiry into emergent levels of reality and instead to concentrate on the "enigmatic richness" of lived emergence. To emphasize this focus on lived experience, in the next section I outline what Lawrence Hass calls Merleau-Ponty's "philosophy of expression."

## Merleau-Ponty's Philosophy of Expression

In essence, expression discloses the intertwining of form, duality, and embodied perception. Hass argues that in contrast with Cartesian "re-presentationalism," Merleau-Ponty emphasizes the "presentational" aspects of perception: "Perception is not 'inside' me...but rather emerges *between* my organizing, sensing body and the things of the world. It is a *synergy*, to use Merleau-Ponty's favored term" (MP 36). Thus we might characterize form, duality, and perception as "enfolding" synergies. For example, in the *Structure of Behavior*, Merleau-Ponty holds that behavior is a fundamental category of action that is neither a mere outer object of study nor a mere inner idea; it is a *form* that is a configuration of relations—it is a potency of possible *embodied* interactions between *levels* of experience. This synergy is expressive of the enfolded "working together of body, things, others, and the world [which] is an interactional field that emerges at the nexus of its participants [and that] we call *experience*" (MP 36).

Duality concerns the enabling synergies that are revealed in forms of experience. Examples of this "two-fold dynamic" include: "(1) the habit body and the personal body, (2) the impersonal and the personal, (3) the biological and the individual, (4) the sedimented and the spontaneous, (5) the organic and the existential" (MP 87). These are "dynamic aspects of the same living body" (MP 87), where one level enables a higher level and where the higher level also expresses new degrees of freedom, as its own form. What all of these insights are driving towards is expression—the disclosing of lived experience. Since lived experience involves continually adapting to changing circumstances, it should be no surprise that the core idea of expression is creative transformation that responds to created forms as it moves towards creating novel forms.

Expression is thus illustrated by the inextricably interactive minding-and-fielding relation, "whereby some overwhelming initial form, figure, datum, or image, is creatively transformed and reorganized in a way that radiates new meaning or insight, and which brings a strong feeling of necessity" (MP 160). In other words, some initial form, etc., presents a feeling-vector that is the occasion for creative transfiguration of those materials into a new dynamic form—a form invested with a committal aspect. In such a manner, as Hass says about Merleau-Ponty:

truths are "discovered"; in fact, they are *acquired* through the patient, sometimes frustrating, sometimes delirious labor of expression. Again, the reason such a reorganizing, crystallizing operation is required for knowledge is not because our experience of the world is impoverished, but rather because it is so full of half-hidden forms and figures, overflowing in meaning and possible perspectives (MP 160).

Merleau-Ponty's philosophy of expression, in the larger scheme of things, ends up emphasizing neither synergy as such, nor dynamism, form, embodiment, duality, and so forth. What expression highlights is the fundamental *creativity* present in such synergy, dynamism, etc. As Merleau-Ponty writes, "lived consciousness does not

exhaust the human dialectic. What defines man is not the capacity to create a second nature—economic, social, or cultural—beyond biological nature; it is rather the capacity of going beyond created structures in order to create others” (*SB* 175).

To revisit the earlier image of the soccer player, the player’s relation to the field and other players is one of creative improvisation. In dynamically responding to an opponent in a region of the field, at a crucial period of the game, the player may enact a spectacular play—a play that is an irreducible synergy of “action and milieu.” The irreducible, richly contextual form of this play is a fundamentally expressive, creative form. Thus what expression highlights is the overflowing potency of *living* synergy, *living* dynamism, etc.

As it stands, I think the above claims are not incompatible with Polanyi; however the differing overall projects of Polanyi and Merleau-Ponty lead to differing philosophical inquiries. One place where a difference becomes manifest concerns how form is characterized. For Polanyi, form highlights the emergence of comprehensive entities—e.g., the spectacular play as a novel achievement of the skilled soccer player. Certainly such an achievement is “expressive” of a fundamental creativity, and certainly Polanyi’s hierarchy of achievements is a dynamic—not static—structure. However the emphasis is on the *structures* enacted by tacit knowing’s fiduciary element. By contrast, Merleau-Ponty’s philosophy of expression highlights the overflowing *creativity* of experience, where form ends up being used to disclose the “furious” manner in which creativity is irreducibly intertwined with created structures (similar to a fund of tacit skills) and the activity of creating (similar to tacit knowing’s “thrusting” aspect) (cf. *SB* 47). While there is duality and levels of experience in Merleau-Ponty, there is no preoccupation with working out a hierarchy of achievements (although he does recognize three general “orders”: the physical, the vital, and the human). Similarly, while something like tacit knowing is present in Merleau-Ponty, there is no preoccupation with providing a logic of tacit knowing. These are epistemically driven concerns—which is why Polanyi investigates such matters—requiring some degree of dual-“ism” when stepping back and inquiring into the relations between knower and known. By contrast, Merleau-Ponty concentrates his investigations on the phenomenological dimensions of perception—the disclosure of the grounds for experiencing.

As mentioned earlier, in a previous paper, I argued that enactive realism is “a fusion of being-in-the-world with consequential commitments that aim at levels of achievement,” where being-in-the-world was interpreted through the lens of Merleau-Ponty. I also argued that Merleau-Ponty places emphasis on “going back” to the primacy of perception, whereas Polanyi emphasizes the consequential (and hierarchical) nature of achievements. Given the above discussion, the nuance I would like to add is that Merleau-Ponty is not merely going back to the lived dimensions of experience; he is also drawing our attention to the vital aspects of perception and its continual *re*-invested, *re*-vitalized nature—the nexus of creativity as living and continually expressing. In brief, Merleau-Ponty’s investigations explore the different ways of “singing the world”—Hass’s phrase (taken from the *Phenomenology of Perception*) encapsulating Merleau-Ponty’s philosophy of expression. Thus while levels of achievements appear generally compatible with Merleau-Ponty’s philosophy, if Merleau-Ponty were presented with a *theory* of ontological stratification, I suspect that he would reject it as a distortion and draw attention to the creative synergies enacting such a theory.

A potential problem arises if we assume that Polanyi retains some residual Cartesianism. For as Hass notes, to start with a “problem” of body and mind is to make a split that itself may be the source of its own entrapment; in particular, to try to put body and mind back together may be impossible given the “humpty-

dummy” nature of the fractured starting point (*MP* Ch.3). If Polanyi’s theory of ontological stratification can justly be accused of containing some residual Cartesian dualism (not merely the employment of duality), then Merleau-Ponty would probably reject Polanyi’s logic of tacit knowing and his theory of ontological stratification (but perhaps not the similar resources both employ). I shall argue that there is a way to finesse these issues.

## Enactive Realism, Hierarchies, and Information

Phil Mullins observes that many of the “dualistic conceptual metaphors—mind and matter, subject and world, idealism and materialism—that are deeply embedded in the traditions of modern philosophical thought are not very helpful points of reference for Polanyi’s constructive thought.”<sup>13</sup> In line with this observation, Polanyi’s use of machine metaphors pertaining to dual control—which opens a space for ontological stratification—ought to be given a reading that emphasizes the dynamic, constructive elements of his thought.

The idea that a higher level of achievement controls or structures lower levels (and where lower levels afford a higher level) is an idea stemming from Polanyi’s employment of boundary conditions. For example, Polanyi reflects on how the idea of boundary conditions is utilized by biologists when “explaining living beings by the laws of inanimate nature... what they actually do is to explain certain aspects of life by *machine-like principles*” (*KB* 154). To illustrate, DNA, whose structure can be delineated at physical and chemical levels, still needs a higher-order perspective to reveal why DNA is the stuff of life. This higher-level perspective is an informational one, where the messages contained in DNA are accounted for via an information-processing perspective—the machine-like principles concern the higher-order “algorithmic” nature of DNA that transforms physical and chemical processes into living processes.<sup>14</sup> What I am drawing attention to in Polanyi’s use of boundaries, levels, duality, etc. as they figure in his theory of ontological stratification is the employment of information, broadly speaking: *explaining* done by biologists, the *messages* in DNA that are disclosed via higher-order principles, and more generally the notion of a hierarchy of achievements consisting of *meaningful* wholes.

This insight fits with Polanyi’s epistemological stance, as he primarily views things not from an ontological perspective, but from one that takes the fiduciary element of knowers seriously. Thus Mullins notes that the independence of real entities is “fundamentally an affirmation about the nature of discovery, the public nature of knowledge and the importance of inquiry. The few ontological or metaphysical claims that Polanyi makes grow out of epistemological claims and not vice versa” (*RM* 46). It is a seduction of Cartesianism to problematize the nature of things once the separation between knower and known is made. Polanyi appears to manifest a residual Cartesianism when talking about scientific *discovery*, and it may be asked whether the very epistemic enterprise of scientific discovery cannot help but contain some Cartesian and/or representationalist residue (as Lowney has observed). Polanyi writes: “Discovery, invention—these words have connotations which recall what I have said before about understanding as a search for a hidden reality. One can discover only something that was already there, ready to be discovered” (*SM* 35). But he then goes on to note that the emphasis is not on the “there” of a hidden reality; the emphasis is on the fiduciary element: “you cannot discover or invent anything unless you are convinced that it is there, ready to be found” (*SM* 35).

Terms like “discovery” (and to a lesser extent “invention”) certainly appear to contain a Cartesian residue. However rather than draw attention to such residues which may lie within duality, boundary, and

hierarchy, I think attention ought to be focused on the dynamic aspects of Polanyi's fiduciary program. This focus brings us to what I term Polanyi's "enactive realism." The participation of a knower, as part of a nexus of hierarchical achievements, emphasizes not a residual Cartesianism but rather something else altogether:

the *participation* of the knower in the things he knows *increases steadily* as the objects of knowledge ascend to ever higher levels of existence, and that, correspondingly, the observer also applies *ever higher standards of appreciation* to the things known by him. These two trends will combine to an ever more ample and also more equal *sharing of existence between* the knower and the known, so that when we reach the point at which one man knows another man, the knower so fully dwells in that which he knows, that we can no longer place the two on different logical levels. This is to say that when we arrive at the contemplation of a human being as a responsible person, and we apply to him the same standards as we accept for ourselves, our knowledge of him has definitely *lost the character of an observation* and has become an *encounter* instead [emphases mine] (*SM* 94-5).

Thus I suspect that concentrating on Cartesian residues may encourage an unsafe preoccupation with mind-body relations, losing sight of the trajectory of Polanyi's overall project—a project whose epistemic stance is geared towards a continuum of modes of tacit knowing. Without this perspective, it would be problematic to make sense of why "observation" is not the right term to apply to the higher levels of achievement, and why "encounter" is.<sup>15</sup>

To avoid the Cartesian associations of duality, boundary, hierarchy, and the like, I've opted to interpret Polanyi's realism as an enactive realism: consequential commitments and participation in communities of inquiry enact achievements—achievements that disclose these hidden "realities" at any hierarchical level. As with Merleau-Ponty, to start with a problem of how knower and known relate is to start in the wrong place—it is to try to put "Humpty Dumpty" back together when it should never have been fractured in the first place. Thus the "problem" of how the structure of tacit knowing parallels that of a stratified ontology conjures, I submit, a misleading conceptual framework. This is especially revealed at the higher levels of knowing, where, as quoted above, there is an "ever more ample and also more equal *sharing of existence between* the knower and the known." What kind of existence is this? It is an enactive, fiduciary, participatory one. This answer may not appear entirely satisfactory, since it could be argued that it hides an implicit representationalism. Here is where the idea that enactive realism, as an *informational* realism, gains traction; this "informational turn" attempts to address why enactive realism is non-Cartesian and yet can make legitimate use of notions like duality, levels, and the like.

First, I ought to note that the exact nature of information remains open.<sup>16</sup> In spite of the lack of a precise characterization of what information is (given its many senses), one useful working definition of information provided by Gregory Bateson is that information is a difference that makes a difference.<sup>17</sup> Why information matters is that it is something not reducible to either matter or energy, and apparently has fundamental roles to play in all domains of inquiry.<sup>18</sup> I think that Polanyi implicitly recognizes the fundamental importance of information as it bears upon dual control and the generation of hierarchies of being. Indeed, Polanyi draws a distinction between something like syntactic and semantic information when discussing the difference between mechanical types of processes and comprehensive processes, as they are "interwoven" for living beings:

Living beings function according to two always interwoven principles, namely as machines and by 'regulation'. Machine-like functions operate ideally by fixed structures; the ideal

case of regulation is an equipotential integration of all parts in a joint performance. Both kinds of performances are defined by rules of rightness and these refer in either case to a comprehensive biotic entity. But there is this difference. Machine-like functions are ideally defined by precise operational principles, while the rightness of a regulative achievement can be expressed only in gestalt-like terms. *One's comprehension of a machine is, accordingly, analytical, while one's appraisal of regulation is a purely skillful knowing, a connoisseurship (PK 342).*

On the informational reading I am proposing, the machine-like operations might be cashed out in computational terms (e.g., viewing DNA as a computational process), while regulative achievements require a higher-order account that relates the capacity of a knower—one's connoisseurship—to the objects of study (a signified—e.g., a living, active heart—and a sign—e.g., the physiology of that heart).<sup>19</sup> Each of these levels is informative; furthermore, as the levels dynamically interrelate, they also bring into relief new information (i.e., the levels enable new differences to be seen) about living beings as emergent entities.

Enactive realism is, in brief, an informational realism about emergent entities. The “enactive” dimension concerns information that is always processed within some context: as Evan Thompson writes, a living being “brings forth or enacts meaning in structural coupling with its environment. The meaning of a [living being's] states are formed within the context of the system's dynamics and structural coupling.”<sup>20</sup> Thus I propose the following reconstruction of Polanyi: while it appears that there is a residual dual-ism in Polanyi's thought—perhaps due to his residual employment of certain Cartesian presuppositions—duality (boundaries, hierarchies) need not fall prey to the entrapments of dualism or representationalism. Additionally, the term “representation” receives the following reconstruction by Thompson on his enactive approach:

Representational ‘vehicles’ (the structures or processes that embody meaning) are temporally extended patterns of activity that can crisscross the brain-body-world boundaries, and the meanings or contents they embody are brought forth or enacted in the context of the system's structural coupling with the environment. . . Instead of internally representing an external world in some Cartesian sense, [such systems] enact an environment inseparable from their own structure and actions. In phenomenological language, they constitute (disclose) a world that bears the stamp of their own structure (*ML 59*).

Rather than recasting the Cartesian body-mind problem, an enactive approach allows for a “recasting of this recasting,” as it were. That is, instead of arguing for Polanyi's recasting of the mind-body problem (which apparently ends up ensnaring even Polanyi<sup>21</sup>), an enactive approach proposes a “body-body problem,” which “concerns the relation between one's body as one subjectively lives it and one's body as an organism in the world” (*ML 244*). The “gap is no longer between two radically different ontologies (‘mental’ and ‘physical’) but between two types within one typology of embodiment (subjectively lived body and living body)” (*ML 224*).<sup>22</sup> On this reading, Polanyi's dual control theory and Merleau-Ponty's use of duality are still broadly compatible, as they (differentially) explore the overflowing, embodied ways of “singing the world.”

Enactive realism is an epistemic position that inquires into informational hierarchies of achievements via a two-fold strategy: it investigates each side of a dual to disclose differences that make a difference, specifically the emergent features of achievements (e.g., recall the discussion of duality, boundaries, levels, and emergence in the rainbow example). In other words, an enactive approach to the body-body problem is “best understood not as an attempt to close the comparative explanatory gaps in a reductive sense, but instead

as an attempt to bridge these gaps by deploying new [non-Cartesian] theoretical resources” (ML 255). These gaps between duals still crucially fall within “one typology of embodiment,” whose duals mutually in-form one another.

## Expression, Hierarchies, Rainbows

So wherein lies the difference between Merleau-Ponty’s philosophy of expression and Polanyi’s focus on the logic of tacit knowing and his theory of ontological stratification? My strategy above was to first argue for a reconstruction of Polanyi which preserves his continuum of modes of tacit knowing and avoids the issues of residual Cartesianism and (analytic) representationalism. Given this reconstruction, I argue that while the difference between these two thinkers is one of emphasis, not kind, their overall projects lead them to explore differing aspects of “tacit knowing’s realm,” resulting in some significant departures.

I previously claimed that the major difference between Polanyi and Merleau-Ponty is the former’s emphasis on consequential commitments afforded by tacit knowing’s ontological dimension. This is not quite accurate, since in Merleau-Ponty’s earlier work there is apparently some minimal fiduciary element of inquiry that gestures toward hidden realities (what he calls “eternal significations” [SB 224]). However it still remains that Polanyi presents a more developed account of ontological stratification, which stems mainly from his epistemic concern with understanding comprehensive entities as emergent entities. If anything, Merleau-Ponty appears to take emergence for granted, drawing attention “back” to the rich dimensions of lived experience. The larger trajectory of Merleau-Ponty’s thought actually takes him further away from any potential theory of ontological stratification. His worry about residual dualism in his earlier works and attempt to overcome them in his later phenomenological investigations (using new language such as “flesh,” “*écart*,” and “chiasm”) are prominent features of Merleau-Ponty’s overall philosophy of expression.

The broad compatibility of Polanyi and Merleau-Ponty stems from the continuum of modes of tacit knowing and its overflowing, expressive richness. But given such richness, there are innumerable ways to reveal the inexhaustible dimensions of tacit knowing. Thus Polanyi’s epistemic concerns, one would expect, would lead to inquiries into dimensions of tacit knowing that, while lived and dynamic, emphasize *understanding* (explaining, describing, etc.) such dimensions. In order for understanding (explaining, describing, etc.) to be meaningful to a knower, it has to be *informative*. Using an analogy to clarify this point, consider the use of computer and mathematical models in climate science for understanding aspects of the global climate system. If our models were so rich as to capture the actual global system, we’d apparently have the “thing itself,” but no comprehension since too much information would be present. A crucial component of understanding (explaining, etc.) is that such models streamline information so that they shed light on complex phenomena for situated, embodied knowers.

To revisit the rainbow example, understanding a rainbow’s complex dynamics requires levels of understanding that draw from physics, optics, perception, etc. These levels of achievement are informative to varying degrees, all of which can enact a renewed appreciation of rainbow phenomena. But dwelling in these levels to understand how rainbows work still presupposes an implicit appeal to information that is informative *for an inquirer concerned with a certain level of achievement*. By contrast, as with performing an act that relies on a fund of tacit skills—where when performing the act one does not simultaneously inquire into its subsidiaries—focusing on the “expressive” capacities of rainbow phenomena does not draw attention to the supporting structure of tacit knowing (which would correspond to focusing on its enabling subsidiaries) but

rather on the creative, lived dimensions of experiencing rainbows. In brief, focusing on expression is not about an informative understanding, but is rather about a “surplus” of expressively lived information.

It may be objected that Merleau-Ponty’s concern with reawakening us to the enigmatic richness of experience is a sort of understanding. True enough, but I think it would be inappropriate to think of such “understanding” as geared towards being epistemically informative. It is better characterized as disclosing creativity-in-action, whose capacities express the overflowing vitality of information. Such a reawakening is not about developing a logic of tacit knowing; indeed, drawing attention to such a logic would be an inappropriate “object” of attention for Merleau-Ponty, akin to re-directing attention to the subsidiaries of an act to further understand how that act works. Drawing attention to the multiplicity of ways of dwelling in phenomenological fields is explicitly not to develop a logic of tacit knowing—nor to develop a theory of its parallel stratified ontological structure—but rather to reveal the contextual vitality of information that is always already (creatively) there.

Thus what these two projects foreground reveals their differing trajectories. Polanyi’s enactive realism emphasizes epistemic informativeness, where the informational hierarchies enacted by inquiry are part of an overall philosophical program that departs from Merleau-Ponty’s philosophy of expression. The significant differences pertain to the aspects of information they explore—one epistemically oriented, the other expressively oriented. In brief, Polanyi and Merleau-Ponty are drawing attention to different meaningful wholes that are enacted in lived experience. A rainbow, for example, involves a nexus of relations, and as such it can be understood at numerous hierarchical levels of emergent interest, each of which has meaningful wholes pertaining to these background interests. But this overflowing nexus also presents rich phenomenological possibilities, where there are inexhaustible ways of “singing” rainbows as expressive wholes. These two sorts of dynamism are in the end quite different: one seeks to grasp, while the other presents always half-hidden mysteries.

## Endnotes

<sup>1</sup>Thanks to Mary Tiles for numerous helpful comments on earlier portions of this paper, and to Phil Mullins and three anonymous referees for their insightful feedback.

<sup>2</sup>Kyle Takaki, “Embodied Knowing,” *Tradition and Discovery* 36:2 (2009-10): 26-39.

<sup>3</sup>Lawrence Hass, *Merleau-Ponty’s Philosophy* (Indiana University Press, 2008); referred to as *MP*. See also Gary Madison, *The Phenomenology of Merleau-Ponty* (Chicago University Press, 1981).

<sup>4</sup>Compare Harry Prosch, *Michael Polanyi* (State University of New York Press, 1986), 126.

<sup>5</sup>My use of J.J. Gibson’s notion of “affordances” doesn’t highlight invariant patterns within an optic array; rather I emphasize enactive potentialities that are dynamically enmeshed with the structure of commitments.

<sup>6</sup>The informational account I propose is semiotic in a broad Peircean sense, and is only committed to the minimal triadic dynamical structure of sign, signified, and the capacity in which these two are related. Such an approach appears compatible with any number of accounts of information—whether computational, syntactic, semantic, or causal, for example—although I shall not argue for this claim.

<sup>7</sup>Charles Lowney (with Florentien Verhage), “*Of One Mind? Merleau-Ponty and Polanyi on the Reduction of Mind to Body*” (unpublished manuscript, presented in Nov. 2009 at the Polanyi Society Meeting in Montreal). A referee has offered the following illuminating overview:

In that paper, Lowney showed how a strong dichotomy between matter and spirit or body and mind is undermined by Polanyi’s twin dualisms of a from-to structure of knowing and dual control. Polanyi

presents what Lowney called an “epistemontology” because ultimately knowing cannot cleanly be divided from the discovery or creation of being, but Lowney also showed how Polanyi tacitly retains some residual analytic presuppositions that Merleau-Ponty lacked, primarily (1) the dualistic assumption that underlies representationalism, i.e., that our knowing must re-construct the world and bridge over to reality and (2) the analytic fear that joint comprehensions and hierarchies might dissolve into their atomic components if the unity of wholes are not accounted for. Polanyi sees Merleau-Ponty’s work as a brilliant phenomenology but as theoretically inadequate since, Lowney claims, behaviorist and materialist reductionisms are not safeguarded against as they are by the theoretical structure of tacit knowing and emergent being. Merleau-Ponty, in contrast, ultimately sees our experience of the world as primary; it is always already present and efforts to dissect the ground of how we understand or experience it will tend to distort. Merleau-Ponty thus opts for a plurality of being rather than a hierarchy of being. Lowney concludes that without Polanyi’s assumptions, Merleau-Ponty does not need Polanyi’s safeguards, but if efforts to understand inevitably require that analyses and distinctions be made, it may be better to side with Polanyi and defuse and solve the problem of Cartesian dualisms with his dual dualisms, rather than attempt to dissolve all dualisms. What Takaki seems to emphasize is how analyses and upper level distinctions brought to bear can actually bring reality into focus as a creative discovery (in agreement with Polanyi), rather than as a distortion of primary experience (as Merleau-Ponty might see it). This seems the primary virtue of calling Polanyi’s philosophy an enactive realism.

<sup>8</sup>Robert Batterman, *The Devil in the Details* (Oxford University Press, 2001); referred to as *DD*.

<sup>9</sup>In my earlier (2010) paper, I explore in greater detail the four aspects of tacit knowing; here I focus on the claim that this structure parallels the (enacted) ontological structure of a comprehensive entity.

<sup>10</sup>I should note that I downplay the evaluative/normative element in Polanyi’s fiduciary program—as crucial and central as it is—and emphasize the committal element (within a community of inquirers) since this highlights the dispositional nature of (semiotic) inquiry. In line with my 2010 paper, the inexhaustible nature of inquiry is bound up with Polanyi’s characterization of reality as that which inexhaustibly manifests itself.

<sup>11</sup>Maurice Merleau-Ponty, *The Structure of Behavior*, trans. Alden Fisher (Beacon Press, 1963), 47; referred to as *SB*.

<sup>12</sup>Monika Langer, *Merleau-Ponty’s “Phenomenology of Perception”* (Florida State University Press, 1989), 174.

<sup>13</sup>Phil Mullins, “The Real as Meaningful,” *Tradition and Discovery* 26:3 (1999-2000): 46; referred to as *RM*.

<sup>14</sup>Cf. Prosch, 127-128.

<sup>15</sup>The evaluative/normative dimension of the fiduciary program is especially important here, since engaging another absent certain sensibilities will often fail to rise to the level of an encounter (as a higher-order achievement).

<sup>16</sup>See, for example, Robert Auger, *The Electric Meme* (Free Press, 2002); and Luciano Floridi, “The Method of Levels of Abstraction,” *Minds and Machines*, 18 (2008), nr.3, 303–329.

<sup>17</sup>Marking a difference that makes a difference presupposes a difference between *relata* (*sign* and *signified*, in a broad Peircean sense) and the *capacity* to see in what way such a difference makes a difference—in what way it is informative. For an insightful discussion of Bateson’s definition as applied to numerous levels of investigation—in physics, biology, information science, anthropology, and beyond—see Auger (2002).

<sup>18</sup>For a popular (and ambitious) overview, see Charles Seife, *Decoding the Universe: How the New Science of Information Is Explaining Everything in the Cosmos, from Our Brains to Black Holes* (Viking, 2006).

<sup>19</sup>Note that the minimal Peircean framework I employ is applicable in both cases. For the former case, DNA's algorithmic *capacity* affords processing a specific "sign" (e.g., a specific kind of protein whose structural form acts as a "key") in relation to a "signified" (e.g., a specific binding site—a "lock" whose function is causally interrelated to the key).

<sup>20</sup>Evan Thompson, *Mind in Life* (Harvard University Press, 2007), 58; referred to as *ML*. My use of "enactive" is indebted to numerous sources (e.g., Varela, Rosch, Thompson, Nöe) as well as to dynamical systems approaches more generally. However it seems to me that the uses of "enactive" in cognitive science are perhaps not as radical as what Polanyi presents. Hence enactive realism borrows only certain elements from enactive approaches (in addition to elements from Polanyi, Merleau-Ponty, Peirce, Grene, and Prosch).

<sup>21</sup>See, for example, Grene's late criticisms of Polanyi discussed in Phil Mullins, "Marjorie Grene and *Personal Knowledge*," *Tradition and Discovery* 37:2 (2010-2011): 20-44.

<sup>22</sup>While it may appear that this is precisely what Polanyi uses to solve the mind-body problem, there is a subtle and significant difference. Firstly, to quote from endnote 7 above: "Polanyi tacitly retains some residual analytic presuppositions that Merleau-Ponty lacked, primarily (1) the dualistic assumption that underlies representationalism, i.e., that our knowing must re-construct the world and bridge over to reality." Concerning (1), this would be a non-starter for an enactive approach, as there is no "bridge" to reconstruct. For the body-body problem realigns what it means to speak of "representations," as noted earlier, actually bringing Polanyi closer to Merleau-Ponty—recall that on an enactive approach representational vehicles "enact an environment inseparable from their own structure and actions. In phenomenological language, they constitute (disclose) a world that bears the stamp of their own structure" (emphases mine).

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