Event Ontology, Habit, and Agency

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Abstract

The following is an outline of an emerging foundation for science that begins to explain living forms and their patterns of movement beyond the sphere of mechanistic interactions. Employing an event ontology based on a convergence of quantum physics and Alfred North Whitehead's process philosophy, coupled with the controversial yet promising theory of formative causation, this development will explore possible influences on the outcomes of events beyond any combination of external forces, laws of Nature, and chance. If it turns out there are no such additional influences--beyond mechanistic causes--it is difficult to see how agency or free will could exist. Assuming agency exists, as Whitehead apparently does, while committing to an event ontology in which process is fundamental leads to interesting questions about the natures of any entities that might participate in events. Furthermore, what might the purposes and agendas of such entities be based upon, beyond memory traces or DNA code? This ontological model, recognizing processes as fundamental, leads to a revised cosmology where the trajectory of a series of events may be due to more than rearrangement of material bits according to external forces and where goal-directed, recurring processes and the emergence of mind are not so surprising. Just as special relativity reduces to classical treatment when speeds slow down, this scientific model for a living world reduces to mechanistic materialism whenever conditions are more limited. Though this development is based on a philosophy of process, there are some dissimilarities with respect to Whitehead's particular version.

Introduction

Philosopher of science Denis Walsh claims, “The proper study of organisms requires us to take their agency seriously” (167). Yet progress toward accounting for agency under present mechanistic assumptions has been grudgingly slow. Accounting for any selves--animated physical entities--that both experience the world and affect material processes according to inclinations is a tall task that requires scaling the modernist divide between mind and matter, a divide that has rendered agency difficult to explain. Fortunately, one does not have to reinvent the wheel here, thanks especially to the efforts of Alfred North Whitehead, Rupert Sheldrake, John B. Cobb, Jr., and Michael Epperson, among many others.

The goal in this article is to introduce a philosophical and ontological basis for a scientific model that explicates organisms and agency, creating a pathway toward ecological civilization in the process.[1] Having had many decades to digest Whitehead’s ideas, especially his recognition of processes--particular patterns of physical change and becoming--as most fundamental, it is past time to consolidate and distill a comprehensive scientific model that offers a viable alternative to mechanism so as to account for agency. The challenge is to begin to account for recurring processes and agency by utilizing an approach that does not depend on a divine being, unfathomable complexity, or incomprehensible emergence, and to do so in a way that is straightforward and accessible without introducing excess philosophical baggage or employing idiosyncratic technical terms.

The following is a synthesis of concepts and ideas offering an emerging perspective on biological, organic processes in Nature as more than material movement according to eternal laws. The metaphysical point of departure is a process approach emphasizing change and

becoming over any purely materialist account of distributed matter reacting to external forces. Utilizing an event ontology both suggested by Whitehead's philosophy of process and consistent with the results of quantum mechanics (see Epperson), there will be an effort to consider how Whitehead's conception of actual occasions--"the final real things of which the world is made up" (PR 18)--as well as a nexus or society of such actual occasions might be understood relative to experiences of living organisms making affective choices.[2] Though Whitehead attempted to explicate organisms as coherent societies of occasions, he layered his model with so much complexity that it is hardly accessible to anyone who has not made a serious study of his philosophy.

From the perspective of an event ontology, there are events--fundamental physical occurrences, large and small--which, through their actualization, result in the establishment of facts. Prior to such an event, possibilities emerge as indeterminacy increases regarding the precise values of measurable variables describing a system and its trajectory. Processes that take place over time are comprised of a series of events such as these during which potentiality, always constrained by mechanistic and quantum mechanical factors, is rendered into unequivocal facts necessarily consistent with other interrelated facts throughout the universe. Though an event ontology may represent a promising foundation for an emerging postmodern organicism, it does not necessarily point to any sources of agency or free will.

The present article involves an exploration of an unproven, controversial model that may, if true, provide the missing piece[3] of a postmodern organicism by identifying a potential source of agendas and associated inclinations that are requisite ingredients for authentic agency. In this regard, both John Cobb and David Ray Griffin have supported an open-minded exploration of Sheldrake's hypothesis,[4] with an eye toward integrating it into process thinking. Could it be the

case, however, that even the best process philosophers, along with the majority of informed academics, continue to underestimate the significance of Sheldrake's contribution?

It is comforting to know this article is likely to have an abundance of readers from the process community who may be familiar with Whitehead's philosophy and an emerging event ontology. Yet this particular development adopts a process perspective and an associated event ontology while attempting to avoid "undesirable philosophical baggage and off-putting prose" introduced and employed by Whitehead himself (see Nicholson and Dupre 7). Whitehead's basic ideas about processes and discrete, fact producing events will be employed, but there will be no references to either actual occasions or any primordial nature associated with subjective aims.[5]

Event Ontology

An event ontology--consistent with Whitehead's philosophy and with results of quantum experiments--suggests events and processes of change and becoming involving periods of potentiality are the fundamental constituents of the universe (Epperson xiii). These events and processes, rather than material things and forces that move and rearrange them, are the phenomena deserving theoretical attention. Unfortunately, implicit assumptions buried in our own languages of objectification can make discussions of process challenging.

Quantum mechanics is a well-tested, reliable mathematical model that arguably applies to the evolution of all physical systems in the universe, as long as they can be measured. In the course of some particular measurement of such a system--an act that might well involve someone experiencing something--the previously existing wave function, which, up until the time of measurement accurately described possibilities and likelihoods for the (to-be-measured) state of the system, now becomes irrelevant because it ceases at the point of measurement and

actualization to be an accurate description of the future potential of the system (Malin, Nature, 180-84). A new wave function whose initial state reflects facts established by the measurement immediately takes its place and becomes relevant. In its turn, the evolving state of the system becomes increasingly undetermined as multiple possibilities emerge, but no facts about the state of the system are precisely established, again, until another measurement takes place. In Quantum Mechanics and the Philosophy of Alfred North Whitehead, Michael Epperson sums up the situation: "Actual initial facts give rise to a set of potential facts that evolve to become actual final facts in a quantum mechanical measurement interaction" (xii).

As events and processes are taken as fundamental, reality is understood as coming in two flavors: there is actualization that occurs when a measurement takes place and facts about the state of the system emerge (Epperson xiii). Facts associated with this actuality, once ascertained, will be consistent for all observers and will form the ground for inevitable emergence of succeeding generations of events and their associated facts. Following any event that renders facts, there is an inevitable period of potentiality and indeterminacy as the wave function evolves in time and the system connects to and interacts with the environment. According to an event ontology, physical systems progress and change, lurching from actuality through potentiality, only to become actualized again, and so forth. Epperson says the essence of quantum mechanics "is the evolution itself--an ontology of becoming, where reality is seen to comprise two fundamental species: actuality and potentiality--'first principles' in that each state is incapable of abstraction from the other" (xii).

Consider a pair of electrons that become entangled in the course of interaction. After entanglement occurs, there is a period of increasing potentiality. This interval inevitably involves some connection of the wave function of the pair with other activities in the local encompassing

environment and beyond. Correlations and coherence, having been established, can be maintained by pairs of electrons (and presumably by other material bodies) even when separated to extreme distances. This phenomenon, whereby all is potentially connected to all, was predicted by quantum theorists and has now been established experimentally. It is ultimately due to the fact that there are no closed systems, with the likely exception of the universe itself. The point is that during potentiality there can be connections with other events both near and far and these connections may influence local likelihoods and trajectories in spite of extraordinary, even unlimited, distances (Epperson xiii).

Though quantum physics opens the door to distant connections and entanglements of coherence, thereby essentially connecting all events in the physical world, it does not ascribe any meaning or purpose to such connections nor does it point to any source of agency. That being said, there may one exception: choices made and actions initiated by a measurer of a quantum system, such as what to measure and what apparatus to use in the process, can make a difference in the attributes of a system revealed and substantiated by a measurement interaction. Different attributes revealed likely means different potential futures.[6] So it is that a hint of agency--an ability to change the course of a process in the physical world--may be recognized in quantum theory, at least in the case of a scientist performing a measurement on a quantum system.

An event ontology informs us that multiple possibilities--a superposition of potential states and the trajectories they represent--coexist in potentiality from which one will be realized when a measurement is made. And during potentiality, connections may be established with other developing situations in the universe. But might there be other influences, besides chance and entanglements of contingency, that affect which outcome actually gets selected from among the possibilities? All quantum mechanics can tell us is that an outcome is chosen, according to

probability, from a matrix of possible outcomes. So, at this point, an event ontology does not appear to provide any clues regarding agency (Epperson xi-xii).

Quantum mechanics is arguably applicable to virtually all physical systems in the universe, so if the majority are correct in their belief that only chance determines which outcome is selected from among the possible final states, then it is difficult to see how agency or free will could exist. Yet the essentially undetermined state of a physical system during periods between measurement interactions does potentially provide space for nonmechanistic influences to occur. According to notable quantum physicist Shimon Malin, "The quantum indeterminacy does make room for creativity and free will" ("Whitehead's" 80). Even so, an event ontology, though it may provide space for the intrusion of nonmechanistic influences, does not point to any source of free will (other than scientists making choices in the course of quantum measurements), nor does it explain how agential inclinations might influence action in the physical world.

Potential Influences on Outcomes of Events

It is interesting to focus on the possible influences and constraints, beyond universal laws of Nature and elements of chance, on a yet-to-be determined occasion from the perspectives of modern scientists. Physicists would certainly agree that previously established facts and the physical continuity of momentum (conserved quantities in general) represent constraints on outcome. Otherwise, experimentally established regularities and conservation laws would not always hold. Outcome also appears, to the measurer/experiencer, as a singular, unified result (as opposed to a superposition) as new, unequivocal facts about a system and the larger world are established, essentially for all observers and for all time.[7] Additionally, because the future is fluid and cannot, in principle, be precisely predicted or controlled, there can be no doubt chance

plays a role in determining outcome and shaping process development. This appears to be as far as classical physics can take us, which is not nearly so far as to reveal any source of agency, unless, of course, one is talking about programmed automatons.

A quantum system subjected to a measurement interaction may be entangled in unspecified and essentially unknowable ways with external activities and events, and this represents a possible additional influence on potentiality and, ultimately, on outcome. (Furthermore, Whitehead asserts that every actual occasion has a connection with any and all past events in the universe when he writes that "every actual entity is present in every other actual entity" [PR 50].) Both quantum theory and process philosophy suggest nonlocal influences, either from the external environment or from past occasions, can influence the spectrum of potentiality that exists prior to a measurement interaction.

A modern scientific account recognizes no other influences on outcome in the courses of evolution of physical systems. Yet this combination of factors cannot result in agency and actually rules out free will a priori. In order to have agency and free will, there must be some influence on outcome beyond what physics, chemistry, and currently held universal laws of Nature recognize and predict.

To establish choice as a factor in outcome, it is necessary to suspend disbelief (provisionally) and accept that some material entities (not computers or robots) do recognize opportunity and liability, form inclinations, and influence events according to an agenda. In other words, it is necessary to assume agency does exist, and, by doing so, one also assumes the existence of sources of influence that operate above and beyond mechanism. Any individual source of such agency, in order to be viable, must have both an agenda and a history of experiences from which to draw upon in the course of forming inclinations.

In spite of the desire to have a theory that explicates agents making effective choices in the world, it remains problematic that, under mechanistic science, clarity has not been established in terms of the source of any inclinations, agendas, or aims that might lead to the exercise of free will. Is it possible that inclinations and agendas could be coded in DNA, be imprinted into neural networks, or even be the result of vague, emerging, self-organizing features of complex systems, as most modern scientists might contend? In the final analysis, are we nothing more than subtle, sophisticated drones programmed by our DNA code?

To summarize thus far, reality, in the flavor of actuality, is characterized by some facts about the state of a system being determinate as actualization occurs. Once potentiality ensues, the material system evolves in terms of its possibilities and entanglements until another measurement interaction takes place. During this period of evolution from possibility to actuality, it appears the trajectory of a process and its associated sphere of potentiality may be influenced by (at least) four factors. The first is chance. Second, universal laws of physics and chemistry, along with a requirement for coherence and consistency, constrain possibilities and action. Next, trajectories during potentiality may be influenced in some way by entanglements, presumably involving coherence with other entities in the external environment or through connections with past occasions and processes. Finally, it has been speculated that outcome might be affected by the inclinations of observers with agendas that are present and participating in the action.

Identifying the Entities

It is useful to consider the identities and characteristics of these provisionally assumed entities with agency who apparently experience, measure, and interpret the universe, all while

developing entanglements and inclinations that may influence outcome. Such entities must have an ability to sense conditions in the world. No meaningful choices can be made without information about the imminent physical situation and its trajectory. In order to bring some accumulated knowledge, context, and understanding to an occasion--to interpret data and facts about the world effectively--an entity must have persisted long enough to develop a history. Such persisting entities must self-organize physical presence and embody complex processes both internally and with respect to others in the encompassing environment. Finally, an ability to experience, make sense of this experience, and respond appropriately to circumstances likely requires some kind of informing memory connecting an entity with pertinent events, experiences, and processes that took place in the past.

What organized system of matter-in-motion can possibly embody all these attributes that appear to be required of an agent capable of taking the measure of circumstances and influencing physical outcome? From my perspective, it is organisms themselves (as defined in the following paragraph) that coordinate form, activities, and affect the movement of matter while experiencing and making choices about whether and how to participate. Each organism, catalyzing the rendering of facts through experience while possibly influencing outcome in the course of events in which it participates, must be an embodiment of an evolved type and have a characteristic form: it must have an inherited agenda of form and function. A gecko embodies the same characteristic, recurring processes of growth, regeneration, locomotion, and so on, that its forbears did. By doing so, it renders an increasing accumulation of facts about the world. The same goes for a bacterium, a wolf pack, and perhaps even a planet.

For this model, Whitehead's actual occasions that involve experience and participation are herein reenvisioned as events in the lives of organisms possessing the following properties:

1. Internal coherence resulting in persistence and formation of individual history.

2. Characteristic form, behavior, and habitual tendencies inherited from similar ancestors.

3. A spectrum of sensing abilities.

4. The ability to “re-member” and generate informed reactions by putting facts into context, developing inclinations largely characteristic of type, and influencing outcome accordingly.

Spectrum of Organisms

Many in the process community believe the intertwined web of life, in which organisms coordinate activities and purposes so as to constitute larger organisms, goes down to the level of individual cells and up to communities like orca pods and termite colonies. Even an atom or molecule can persist and develop a history of interactions and entanglements, behave like similar predecessors, and react to (if not sense) electromagnetic fields and chemical gradients--but can it experience? Could Gaia be experiencing and developing a history while being influenced by patterns that evolved on similar planets orbiting other, previously existing suns?

This postmodern scientific model extends the category of organism--those entities who experience events while embodying recurring processes and agency--beyond the limits of recognized biological life-forms, without introducing spiritual influences, multiverses, or any vague emergences from complexity. Accordingly, virtually any material thing, so long as it senses/experiences the world, develops inclinations on the basis of mostly inherited tendencies, and embodies recurring processes and a physical form characteristic of type, may be considered an organism, complete with agency if not consciousness.

Influences on Potentiality and Outcome

This elaboration of an event ontology may be in harmony with basic concepts regarding the fundamental nature of processes and events and also in agreement with results of quantum experiments, but important issues remain in developing a complete, consistent scientific framework that transcends mechanism and begins to explain organisms and their purported capacity for agency. First are questions regarding connections between a particular event and past occasions as well as to the nature of the influences that may be imparted through such connections. An event ontology suggests that the spectrum of potentiality, prior to a measurement interaction, can never be completely independent of any past occurrence, no matter where or when it happened. Epperson notes, "[T]he evolution of any actuality somehow entails relations with all actualities" (9). There is an essential, universal connection among all and a resulting seamless consistency that appears remarkable.

In Whitehead's model of process, connections of influence with, or ingressions by, particular past events or entities can modify the spectrum of potentiality prior to an imminent, fact-producing event. He remarks that "actualities constituting the processes of the world are conceived as exemplifying the ingression (or 'participation') of other things which constitute the potentialities of definiteness for any actual existence" (PR 40), and "a positive prehension is the definite inclusion of that item into positive contribution to the subject's own real internal constitution" (PR 41). He proceeds to assert that "pure mental originality works by the canalization of relevance arising from the primordial nature of God" (PR 108).

Given a potential for ingressions and influences from particular past occasions or preexisting entities, an aptitude for modifying fields of potentiality by intentionally establishing connections with selected entities, past events, or previously existing patterns may represent a

sort of proto-agency whereby the subject has some choice in terms of what influences to invite into an occasion, thereby allowing selected features or tendencies to contribute to the evolving structure of the field of potentiality. But any excitement one feels about Whitehead introducing subjective entities capable of experience and agency into his organic philosophy is dampened as he fails to identify and account for a believable, enduring subject capable of making choices according to an agenda.[8]

Whitehead may not have a completely satisfying identification or explanation of the living subject, yet he provides a good place to start. Much of his innovative process philosophy is valuable as a metaphysical substrate for this version of organicism. He has been instrumental in our collective process of coming to terms with initially startling and confounding implications of quantum physics. Epperson asserts that "the close, concept-by-concept correlation proposed . . . will serve to demonstrate how quantum mechanics, as a fundamental physical exemplification of Whitehead's metaphysical scheme, might be heuristically useful toward a sound understanding of this scheme, and vice versa" (20).

This universal connectedness and potential influence among all events that is revealed by an event ontology begs significant questions: What kind of influence are we talking about? Could the primary nature of the influence be requirements for consistency and coherence with other events and processes? Could it be that some particular past occasions or patterns might be more intensely connected and influential than others? When one is riding a bicycle there are likely to be past experiences of cycling that are more significant than past occasions involving running. Similarly, an ant colony producing tunnels will likely be influenced to a greater extent by experiences of past ant colonies than by any experiences of rabbits digging holes and developing warrens. Presumably there are universal connections among all events, but some past

occasions are more likely than others to be influential in a given situation.

A second important issue concerns inclinations and how they might affect outcome. Up to now, the discussion has been about influences on the sphere of potentiality for a given system. It is one thing to influence the shape of fields of potentiality and quite another to be empowered to participate in choosing a particular outcome from existing possibilities. Epperson notes that "[t]he outcome state yielded by quantum mechanical prediction is not a singular state, but rather a matrix of probable states among which one will become actualized in accord with its probability valuation" (xi-xii). But, one might ask, how is the particular outcome selected from among the possibilities? Could it be, as Einstein famously quipped, that God is rolling dice to determine outcome from potentiality? If decisive actions affecting the selection of outcome can be achieved by an entity, or even if its inclinations have some degree of influence, then it is clear agency must exist. If so, the agent's influence would involve an informed choice that takes place whenever outcome and new facts about the universe are being established through experience. It is the contention here that inclinations of organisms invested in outcome may influence which, among the matrix of probable states, will come into being, and that this is the ultimate source of agency.

A third outstanding issue raised by an event ontology is somewhat related to the first question regarding the details of connections of the present occasion to past events: how does an entity, as it experiences an event, become connected with, or receive influence from, particular occasions involving previously existing, similar others?[9] According to mechanism, such memories supporting inherited tendencies, patterns of growth, and instinctual movements are stored as code in DNA. In order to avoid such mechanistic constructs, the challenge is to provide some idea as to how instinct functions, without resorting to explanations involving genetic

molecules that supposedly encode complex forms and underwrite fantastic abilities.

To reiterate, three important questions still need to be addressed:

What are the criteria for connection with, and what is the nature of influence from, particular, pertinent, past events?

How do inclinations influence selection of outcome from potential?

How do organisms access information received from past experiences of similar others?

In order to shed some light on these questions, it will be necessary to consider the work of a controversial scientist: Rupert Sheldrake.

Waddington and Sheldrake

An important contribution to understanding the characteristics of recurring organic process was made by Waddington, who introduced the concept of homeorhesis to describe the regulatory ability of a system whose trajectory could achieve a dynamic form of stability. He referred to a "chreodic profile" as a branching system of temporal trajectories through which development can be "robustly canalized" and visualized as slopes along a valley. Mathematically, he envisioned "vector fields" that converge on a "time extended attractor" (Waddington 526). Ultimately, he hoped to account for his theory of dynamic stability and goal-directedness in organisms through a combination of dynamic systems theory and epigenetics. Progress was made in 1998 when Rutherford and Lindquist reported that a "chaperone heat-shock protein"--Hsp90--which responds naturally to changes in the environment, could represent a molecular buffering mechanism responsible for Waddington's theory of genetic assimilation, at least in flies and plants (see Rutherford and Lindquist). Unfortunately, Waddington's model rests on the dubious premise that all information necessary for embodiment of intricate, recurring

processes resides in the biochemistry of the gene and its interaction with the environment. It remains to be explained how recurring processes such as the metamorphosis of a caterpillar or the blossoming of a rose come to be, in what state they persist, how the patterned activity is managed, how such processes are connected to appropriate organisms, and how they continue to remain available to future organisms.

In considering the property of organisms by which they inherit form, behavior, and specific patterned processes from similar predecessors, even today one might wonder how this happens. Fortunately, Sheldrake may have provided an answer: recurring patterns of form and processes associated with particular types of organisms may be developed--like habits--through repetition and bequeathed to similar future organisms. Sheldrake says that "a particular resonance with patterns of activity of similar past organisms, and self-resonance from an organism's own past, can be seen as different aspects of the same process" (134). Such an influence--one that inclines toward recurrence under similar conditions--might impact outcome above and beyond predictions of an event ontology of developing potentiality in which outcome is selected only according to probability.

Assuming a tendency for patterns and processes to recur when circumstances are similar leads to a plausible explanation of the essential habit-forming nature of organisms: more repetitions of a given process by similar individuals would result in greater canalization and, in effect, the individual would come into influential resonance with all past similar renditions of the process (Sheldrake 108). Physical embodiment of habit, both forming and animating organisms, also provides a likely source of inclinations that appear in the course of developing events: inclinations would result, at least in part, from tendencies based upon an aim toward successful embodiment of inherited, goal-directed, habitual processes developed by similar predecessors

and refined through repetition and natural selection.

This model provides some refinement in terms of understanding previously recognized broadband connections between the present occasion and all past occasions. An event ontology illustrates why all past events serve to constrain fields of potentiality for physical systems by requiring they be consistent and coherent with other established facts. In addition to these constraints and influences, Sheldrake's formative causation points to a heightened attunement, or resonance, based on similarity with past events, which influence present processes to follow past courses that have been established through repetition.

This similarity underlying the resonance or connection may be based on the identity or form of the organism having the experience. It may be enhanced by similarities in physical momentum or feelings involved. And there may be a heightened connection based on similarity of particular processes taking place. Once an organism initiates embodiment of a habitual activity, such as a cat prowling and hunting, it comes into influential resonance with all past enactments of the pattern by similar others. The influence of past, dissimilar occasions, on the other hand, presumably fade into virtual irrelevance unless some previously established entanglements of contingency exist.

Formative causation describes an influential connection between an organism's present circumstances and past occasions that had similar trajectories and spheres of potentiality. The influence imparted through such resonance might affect an organism's inclinations and ultimately lead to particular choices being made. Similarity enhances the significance of influential connection, inclining physical processes toward following preestablished pathways (Sheldrake 109). If Sheldrake is right and formative causation turns out to be a real, measurable phenomenon, then a great deal of light has been shed on the spectrum of potentially influential

connections between an occasion and past events and processes.

This model represents a basis for explicating an entangled web of individual organisms, each of which grows and behaves according to an inherited group of recurring processes or habits that are characteristic of its type--individual cells divide, pine trees form cones with seeds inside, and vines on the forest floor search for rays of light penetrating the canopy and for objects to grasp. A repeatedly embodied, recurring process, typical of type, consists of a series of actualized events involving experience and the development of potentially affective inclinations, with each event resulting in the appearance of new stubborn facts about the state of the universe. Consciousness is not necessarily required in this process, but something else is.

Successful implementation of a predeveloped habit or pattern of activity, presumably one with a goal or desirable endpoint, in a changing and unpredictable environment could well require an ability to improvise. Predators must modify their approach based on reactions of prey, and the spider must build her characteristic web according to contours and dimensions of a chosen location. Consciousness is not necessarily required for embodying habits successfully, but a capacity for adjustment and improvisation probably is. An ability to improvise, once developed, might provide a basis for agency in an unpredictable world of active, constantly interacting entities with agendas.

Evolution of the Universe toward Consciousness

In the early universe, there may have been chaotic patterns of energy and matter existing primarily in states of potentiality. This period would have been characterized by high levels of decoherence resulting from actualization being a relatively rare phenomenon. In this ferment, the (proposed) tendency for repetition would likely have resulted in archaic patterns increasingly

repeated and followed, resulting in regularities that may have evolved into what we think of as natural laws like gravity and electromagnetism (Sheldrake 296-97). Emerging tendencies and recurring patterns might have provided a relatively stable basis for the appearance of atoms, molecules, and crystals, deepening through recurrence the habits on which their forms depend. With increasing complexity and the establishment of some order and regularities of form, centers of entanglement--relatively stable physical entities embodying habits--might have emerged, developing and refining capacities for sensing, reacting, persisting, and improvising in the face of changing and uncertain circumstances. Natural selection would have been a factor throughout.

In this way, the universe now consists of many centers of experience, all of which are embodying recurring, characteristic processes and coordinating their existences and movements in order to form and contribute positively to the web of life. Based on an event ontology and formative causation--the assumption that occasions and processes tend to follow well-worn pathways--this scientific model goes a long way toward explaining the emergence of habits and the functioning of the universe around us. But a world of habitual organisms would ultimately be a disappointing world. What about epiphany? How about the potential efficacy of communities striving to make a better world? It cannot <u>all</u> be habit and improvisation, right?

Given the evolution of organisms capable of experience, each individual of a type being the inheritor of a script of characteristic habits and sometimes being called to improvise on script in the face of imminent conditions, it is not surprising when consciousness emerges among certain individuals and communities in various branches of the organic hierarchy. Consciousness may be a phenomenon that appears spontaneously, and mysteriously, as participating entities interpret conditions and make choices during the course of a process of actualized events.

Though speculative and lacking detail, this scenario describing the emergence of

consciousness is superior to mechanistic models where the phenomenon of consciousness is denied altogether or viewed as an epiphenomenon or else as an apparently inconsequential vestige of either neural activity or a misperception of imagination (see Nagel). Unlike mechanism, this foundation of postmodern organic science provides a window through which consciousness might enter the universe seamlessly and have consequences.

Reducing to Mechanism

Classical equations work well in describing material motion in space and time until velocities increase upward toward the speed of light. In this domain, classical treatment fails and Einstein's equations of special relativity become necessary. It is fortunate that these equations reduce to, and become the same as, classical mechanics as speeds slow down. The success of special relativity does not imply that classical physics is wrong; it is understood that classical analysis works only in a limited sphere and physical reality beyond that sphere cannot be accounted for or described classically.

In a similar way, this model does not claim that modern science is wrong, only that it applies to a limited range of situations. In particular, modern science is adequate for describing the evolution of physical systems whenever no one with power cares or forms inclinations relative to outcomes of pertinent events. As inclinations become factors influencing outcome, physics and chemistry as currently formulated become increasingly inadequate. A postmodern science hopes to extend scientific description to include the realm of agential, informed physical entities interacting in complementary ways and forming the web of life. It reduces, as it must, to mechanism and determinism in situations where nobody is interested or develops inclinations relative to outcome.

Differences from Whitehead

Though this development attempts to avoid many details and much of the complicated language associated with Whitehead's version of process philosophy, it may be useful to highlight some outstanding differences between the model presented here and a thoroughgoing Whiteheadian approach. First, it has not been necessary to assume, as Whitehead does, that there is a universal tendency toward balance between regularity (reproduction) and diversity (reversion) (PR 278) or that originality is conditioned by an initial subjective aim supplied by God's primordial nature (PR 108). In spite of some intriguing arguments suggesting that theology and God's nature are peripheral to Whitehead's scientific thinking (see Cobb), it does not appear that his model can be considered complete without assuming the existence of subjective aims aligned with a primordial, formative influence.

The organicism presented here does not appeal to God, yet, unlike mechanism, neither does it rule out spiritual influence or divine presence. Who knows the developed capacities and well-vetted habits, not to mention the powers of improvisation and creativity, of entities that have endured for millions or even billions of years? From the limited perspective of organisms like us, they would have established and would be embodying archaic habits that might appear eternal or even divine. It seems reasonable that establishing connections with outstanding or admirable individuals might be significant and effective, especially if such individuals may have embodied habits or developed capabilities one would wish to emulate.

Furthermore, who can say with confidence what additional influences on potentiality may exist, apart from requirements for consistency, mechanistic constraints, entanglements, and effects of individual entities with inclinations? Under an event ontology, periods of

indeterminacy provide a window through which a diversity of influences might come into play. A mechanistic model and the determinism it embraces, on the other hand, offer little space for agency, consciousness, spiritual connection, or even Einstein's spooky action at a distance. If God and spirit do exist, this model offers a window through which they might enter and have an effect on the material world.

A key feature of this development is the assertion that actualized, fact-producing events are always the result of organisms having experiences during which inclinations may influence outcome and that an organism's agenda, largely developed by and inherited from similar antecedents, is the basis for the majority of inclinations. In Process and Reality, Whitehead says that "an "entirely living nexus" is, in respect to its life, not social. Each member of the nexus derives the necessities of its being from its prehensions of its complex social environment; by itself the nexus lacks the genetic power which belongs to "societies" [with societies being linear successions of actual occasions forming historical routes in which some defining characteristic is inherited by each occasion from its predecessor]. But a living nexus, though non-social by virtue of its "life," may support a thread of personal order along some historical route of its members.'(107; also see 198)

It is interesting to note that Whitehead proceeds in this passage to refer to originality (of a living actual occasion) as being "canalized" and intensified because of transmission, via prehension, from one subject to another.

This excerpt from Process and Reality may foreshadow the model being presented in this article. Whitehead recognizes that some so-called societies of cooperating entities (living beings) are influenced by the environment (constituted by nearby entities) and that they form a trajectory

or historical route in which inheritance is involved. His use of the word "canalization" brings to mind the chreodes associated with Sheldrake's habitual processes. Yet Whitehead ultimately fails to account in sufficient detail for interactions between members of his societies. What forces would inform and organize them to collectively embody long-standing patterned processes characteristic of type?[10] There is little to be lost and much to be gained by viewing organisms--not microscopic actual occasions or societies of such occasions--as the actual, informed participants in processes at all levels in the web of life.

Elaborating on categories of transmutation and conceptual reproduction, Whitehead identifies a tendency for re-creation, with occasions building on a foundation consisting of forms, feelings, and trajectories of preceding events (PR 248-54). Yet this does not sufficiently account for organisms embodying recurring, predeveloped processes characteristic of type. For this, similarity of form must be a key criterion for establishing intensity of connection between organisms/societies and past occasions/processes. Only an intense connection--a resonance--resulting in an increased likelihood to follow preestablished pathways, can account for the phenomenon of habit. Formative causation, if it is verified, not only extends, refines, and simplifies Whitehead's organic philosophy, it also bridges the gap between matter and mind. The explanatory power of an event ontology, coupled with Sheldrake's formative causation, provides a promising, straightforward roadmap toward a substantive and believable account of organisms and their agendas.

If one expects an event ontology to inform physical and biological sciences, it is important to recognize organisms making choices based largely on inherited agendas as essential participants in actualizing events and that both individual histories and ancestries tend to matter. Examples of such active organisms might be scientists making controlled measurements in

laboratories; deer stepping into meadows, sensing opportunity and liability; or acorns sprouting in warm, wet, spring earth. Transcending mechanism while simplifying and clarifying Whitehead's vision of the functioning of living organisms, this model demonstrates how recurring processes animating such organisms come into being and how they are connected to, and are embodied by, appropriate successors.

Conclusion

Developing a viable model that describes the functioning of organisms requires accounting for agency, yet this is a difficult, if not impossible, task given present mechanistic assumptions. Utilizing an event ontology, in which events and the processes they comprise are viewed as more fundamental than material things and the forces that move and rearrange them, coupled with Sheldrake's hypothesis of formative causation, this development leads to an alternative model in which organisms are animated primarily by recurring processes characteristic of their particular type.

An event ontology suggests periods of indeterminacy may provide space for inclinations of organisms to influence which, among a matrix of probable states, will come into being and that this phenomenon represents the ultimate sources of agency. Authentic agency requires having both inclinations that can affect outcome as well as an agenda upon which inclinations are based. The assumption of formative causation--that events and the processes they constitute are likely to follow the courses of similar past events and processes--accounts for inclinations and agendas. It suggests habit development may be a fundamental characteristic of the universe. If so, implementation of habit based inclinations serves to bridge the gap between mind and matter. Just as equations of relativity reduce to classical description when speeds slow down,

predictions made by this model reduce to those of modern science whenever no one with power is interested in the outcome of an event or process.

This postmodern organicism, based on event ontology, formative causation, and the assumption of agency, is not consistent with a thoroughgoing Whiteheadian perspective primarily because it identifies Whitehead's actual entities (and societies of actual entities) with organisms making choices based largely on inherited agendas, thereby developing individual histories of experience. Though this particular version of organicism may have been prefigured by Whitehead's philosophy of process, it represents a simplified, extended version that is streamlined and therefore more accessible to the layperson. As such, it offers a practical method of transcending mechanism and accounting for agency and may provide a realistic pathway toward re-enchantment of science as well as a scientific substrate supporting ecological civilization.

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[1] At the well-attended 2015 conference at Claremont sponsored by the Center for Process Studies, "Towards Ecological Civilization," David Ray Griffin, in his keynote address, explicitly outlined this important goal.

[2] To be more precise, in Process and Reality Whitehead refers not only to an actual occasion but also to an event as a "nexus" of actual occasions and also to "societies" of actual occasions. The goal here is to relate all of these concepts (actual occasion, nexus, and society) to events involving organisms, during which there is experience and where informed choices are made.

[3] The "missing piece" refers to a source of agency. How does one account for inclinations and agendas of any entities making autonomous choices in the world?

[4] John Cobb expressed this to me personally and Griffin and others have invited Sheldrake to a conference in Claremont.

[5] Unless, of course, one views "primordial nature" as involving tendencies to repeat/re-embody processes, whenever circumstances are similar.

[6] A particular measuring apparatus renders certain facts about the world. An apparatus that measures wavelike characteristics may provide, for instance, facts about momentum while an apparatus that measures particle-like characteristics may provide facts about position. A wavefunction describing a system is dependent on initial facts. If initial facts for a system, resulting from a particular measurement, were to be different, then the wavefunction describing potentiality for future measurements of the system would also likely be different. Therefore, choices of what attributes to measure can result in different likely futures, at least in the quantum domain.

[7] Whitehead's category of subjective unity necessitates integration of different potentials into a single, unified outcome that, once established, continues to exist as a "stubborn fact."

[8] Others may disagree, but it is the author's opinion that Whitehead's "society of actual occasions" does not satisfy the criteria listed above for being an organism or for being capable of agency: coherence, persistence, and a unique individual history; characteristic form and behavior inherited from ancestors; sensing capabilities; and the ability to put sense data and their relation to past experiences into context.

[9]Whitehead attempted to account for the phenomenon of memory--the influence of past events on the present occasion--by appealing to structure-preserving event historical processes via prehensions, but it is difficult to see how this adequately explains inheritance of specifics of form and characteristic habits or how it shows how an organism's activities are connected with and influenced by experiences of a succession of preexisting similar organisms.

[10] This model, which includes Sheldrake's hypothesis, does account for coherent interactions

between individual entities that are part of a society or organism. *The habitual behavior pattern of higher level organisms recruits lower level organisms as suits its purposes.* The swarming behavior of honeybee colonies in search of new homes is a pattern that sweeps up individual bees in such a way that they contribute in a coordinated manner to the larger process/habit of swarming.