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In Breakable Glasses: Toward a Naturalist Orientational Cosmology

Bunting, Marylu
Boston Theological Institute

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Boston University
The author develops the formula, "that process that gives rise to all that exists," as a specification of the cosmos within which human life may find meaningful, ethical orientation. Her position intends to be consonant with the natural sciences and conversant with traditional orientational cosmologies of the world religions. After analyzing each of the key terms in this central formula, she provisionally proposes three ethical stances (humility, responsibility, and celebration) that might follow from orientation to the cosmos seen as "that process that gives rise to all that exists."

Introduction

Human existence is a question in search of an answer. From the first moment of self-consciousness, my existence has pushed me to ask the questions: Why do I exist? and how can I make my existence meaningful? There are no obvious answers to these two questions. Human beings participate in many religions, which provide various answers, usually commensurate with, or reacting against, their originary cultural context. In the highly scientific cultural context of end-of-the-twentieth-century America, the answers of the religions no longer seem plausible, at least to me; and I am left searching by myself for an orientation to existence. What I seek is an account of my existence that would provide meaningful orientation for my own life within the context of the immense cosmos, the living earth, and the diversity of human societies. Such meaningful orientation would include ethical stances that would fruitfully relate me to other human beings and the natural world. I am searching, then, for an account of existence consonant with the natural sciences and appreciative of the natural world. I am searching for a naturalist orientational cosmology.

In this essay, I attempt to develop just such a cosmology by specifying what I take to be the context of ultimate significance to be "that process that gives rise to all that exists." I view this process scientifically and naturalistically. My argument will proceed through four interrelated sections that examine the expression, that process that gives rise to all that exists, from its beginning to its end. In these four sections, I undertake a close investigation and explication of the individual elements of this expression. In the fifth and final section, I return to the question of existence and its meaning and indicate what I see as one potential ethical framework provided by an orientation to this process.

The goal is to begin to develop a naturalist orientational cosmology that is open enough to be thoroughly integrated with the natural sciences, and evocative enough to provide for meaningful human orientation and ethical reflection. At many points, I will be able to give only the briefest and most general outlines of what a cosmology in its final form would look like. Nevertheless, I hope to begin the types of reflection that will bring me closer to its formulation, adequate not only for myself but also for all those who.
find the question of existence most plausibly addressed via a naturalist perspective.

"That process..."

The first thing I specify concerning the "frame of ultimate significance" for human life is its location in a process. One might rightly ask why I have chosen to call this frame a process and what I mean by it. Certainly alternative formulations could be used—such as the contention of the Abrahamic traditions that ultimate significance is found within the Kingdom of God or the chosen people, or the contention of certain schools of Buddhism that it is found within nirvana, or the contention of certain schools of Hinduism that the "frame of ultimate significance" is Brahman. In this section, therefore, I will address the questions "Why process?" and "What process?". In response to the first, I will defend my choice of the word process as both concrete and vague and therefore suitable to describe the cosmos which the natural sciences represent. In response to the second, I will indicate what I take to be the natural content and rationally intelligible nature of the process.

Why process?

As a naturalist, I am searching for a term denoting the "frame of ultimate significance." I want a term that can capture what I take to be the development of the natural world as the natural sciences approximate this development. Because of the content and nature of the natural sciences themselves, I need a term that is concrete and vague. It must be concrete in the sense of being temporal, historical, and denoting a unitary process constituted by plurality. It must be vague in the sense of allowing for change and amendment in the natural sciences themselves. In this section, I will argue that process is just such a concrete and vague term.

In regard to the concrete, process can have the sense of temporality, historicity, and unity encompassing plurality. I need a term implying temporality and historicity, because science reveals a spatiotemporal cosmos whose currently observed character is a result of historical interactions and development. Process is a good candidate because it can imply temporal phenomena as seen in the derivative words procession and proceed. One element follows another temporally in a process or in a procession, like the bride and her bridesmaids in procession down the aisle at a wedding, or like a mother duck and her ducklings in their procession from their nest to the pond or stream, or as a reaction proceeds after the combination of two chemicals.

Moreover, process can imply historical phenomena in the sense that anything that proceeds temporally can be said to have both a past and future without which it would not be what it is. A recombinant gene therapy to aid in glycolysis would not arise without the historical process of experimentation as part of its development. Similarly the oxygen and nitrogen mainstays of Earth's atmosphere would not have arisen without some historical proceeding of a series of reactions to bond the requisite particles together. In this sense, saying that process is a term implying temporality is also to say that it implies historicity.

Process can also imply unity in the context of plurality. I need a term denoting "unity in the context of plurality," because the natural sciences have come to understand, and attempts to approximate in its developing understandings, a cosmos that issues from the singularity of the Big Bang. The cosmos is unitary in that sense; at the same time, it is plural in that many different, though related, entities—from subatomic particles to supernovae—have arisen as a result of the Big Bang. The cosmos arising from the Big Bang is composed of many entities and processes, but one can ultimately refer it, in its entirety, back to the one process of expansion and cooling arising from the Big Bang.

This phenomenon of unity in the context of plurality may be seen at other levels
of the cosmic process as well. In biology, for example, in Margulis’ account of evolution, increased complexity in organisms can arise both as a result of the combination of less complex organisms, and also as a result of the prolonged separation of equally complex organisms. While evolution denotes the entire stretch of such combination and divergence, it also denotes the pluriuniform occasions of combination and divergence without which evolution would not arise. Moreover, this example illustrates that a unitary process can be constituted with regard both to a plurality of entities and to a plurality of processes—all within the one unitary process.

Since it can bear the meaning of all of these senses of unity in the context of plurality, as well as of temporality and historicity, process is a good candidate for the term denoting the “frame of ultimate significance.” It can take on the concrete dimensions of the cosmos that scientific experiment and approximation represent.

Nevertheless, in their own development, the sciences also suggest the need for a term that is open to new information and amendment. Big Bang theory and evolutionary biology are just two examples of areas in which scientists have significantly developed and changed their views, as growing quantities of data emerged after the introduction of the theory. Scientists continue to amend both theories as they integrate yet more information. The case is the same throughout the sciences. The account of nature put forward by the natural sciences has also undergone, and continues to undergo, amendment as a result of more adequate or different metaphorical paradigms.

My central denoting term thus needs to be similarly open to new information and amendment. Process can bear this burden because it does not depend on any specific interpretation that the natural sciences propose, but rather it relies on the overall flow of the sciences’ representation of the cosmos. The choice of process, therefore, is not founded so much on the individual details, as on the consensus of the natural sciences that the cosmos is a spatiotemporal phenomenon that changes as it expands spatially and temporally. Process is, therefore, both specific enough and open enough to be heuristically valuable with regard to human meaning and ethics, as I argue below.

What process?

If I am talking about a process that is suggested and studied in the natural sciences, then I am talking about a process that is natural in content and rationally intelligible in character. This section is an exploration of what it means to say that the process is natural and rationally intelligible, so as to specify further this key orientational term.

The content of the process is natural in the most obvious sense of implying no supernatural entity that exists external to the process and intervenes in the flow of the process. Yet this is not a positive statement about what is natural. Rather, I take the term natural positively to include all those entities and processes, animate and inanimate, material and emergent from material, that represent potential subjects of study in all
the natural sciences, or that are the products (such as human culture or art) of entities and processes included among those studied in the sciences. To say that the content of the process is natural is to use a shorthand for all of these entities, processes, and their products. By saying that the process is natural, I do not mean to say at any point that there is a process separate from these natural entities and processes. There is not a reified or hypostatized process here—no elan vital, but simply a heuristic term for denoting the entirety of the natural entities and processes without which we could not and would not be speaking about a natural process. There is no natural process without the natural entities and processes that constitute it.

Since it is natural, the process is also, in principle, rationally intelligible. If the entities and processes exhibiting the regularities that the sciences discern constitute the entirety of the process, then none should, in principle, be beyond human rationality. The process is rationally intelligible only in principle, though, since human rationality faces the dual limits of human perception and of the character of the phenomena observed. A good example is the current status of Super String Theory. It proposes to explain the fundamental quantum compositional elements of the universe via “strings” of Planck length ($10^{-33}$ centimeters) that vibrate at various frequencies and thus give elementary particle/waves their character. Since the human ability to perceive entities is limited to sizes much larger than Planck length, the theory cannot be tested directly. The limits of human perception impose corresponding limits on rational understanding—at least as we would want it to be rigorously verified through observation. Even if humans could perceive Planck-length entities, however, the nature of these entities as both very small and very fast (as quantum mechanics shows) would mean that scientists could not simultaneously give both the position and the velocity of these entities and, therefore, could not have the full knowledge necessary to predict future events. Quantum mechanics could thus only provide an account of the probability of a string existing at a certain position and velocity. (I return to this topic below.)

So while the process is, in principle, rationally intelligible, there may be practical limits to the human ability to know it completely. Still, these limitations come at the very boundaries of knowledge and not in the understanding of the broad outlines of the process that are important when seeking orientation for human lives. Moreover, it must always be borne in mind that while attempting to understand and orient oneself within this natural and rationally intelligible process, one is oneself always already both natural and rational, and always already within the very process that one seeks to understand and orient oneself within.⁹

“That gives rise to…”

Saying that one finds oneself within a natural and rationally intelligible process is not, however, to say what occurs within that process—although certainly in specifying it as natural and rationally intelligible, one indicates something of what is included in the form of Big Bang cosmology and evolutionary theory. In this section, I will further specify the process as “giving rise to” all that exists. I will argue for this formulation both negatively with regard to what I see as the weaknesses of alternative formulations, and positively with regard to the strengths of my proposed formulation, gives rise to.

Alternative formulations

In the Western Christian tradition in which I grew up, that process that gives rise to all that exists is usually described in the language of creation and creativity, entailing agency and purpose. Such descriptions often make an analogy between human acts of creativity and the initial act of creativity that results in the grand cosmic creation. Alternatively, and with even more emphasis on purposive agency, some descriptions draw out the analogy of human designing to the
The notion of a designer of cosmic clockwork. In my naturalist perspective, these formulations present several difficulties, specifically, their emphasis on purposive agency, their implicitly static view, and their anthropomorphism. The question is whether such attributes as purposive agency, the unfolding of a static (once for all time) design or creation, and human-like activities are appropriate to the natural and rationally intelligible process within which I am attempting to formulate a meaningful and ethically orientational cosmology.

Formulations implying a unitary purposive agency that creates or designs the process present me with particular difficulty. Within my naturalist perspective grounded in the natural sciences, the first difficulty is that they violate the chain of relationality and causality either in a proposed non-temporal initial act of the agent, or in the proposed continual action of the agent. This violation then results in a violation in the intelligibility of the process, for if supernatural causation prevails, it need not be intelligible to human rationality. Indeed, the claim that the ways of the world are inscrutable and incomprehensible often accompanies the assertion of a unitary agency and the formulation of the existence of the cosmos as a creation. Such claims are usually not made in the case of a formulation of the cosmos as design. But causal regularity and intelligibility are not the only factors that make these agential formulations difficult to support from a naturalist perspective.

The character of the process itself raises difficulties for creation or design metaphors. While some descriptions view the cosmos as a creation or design with a purposive intent, usually for the benefit of humankind, from all that the natural sciences seem to suggest, the cosmos does not itself display a unified purpose, let alone one that favors human beings. That the process is purposive is simply not borne out by scientific understanding. Human beings, for all the interest they hold as a self-aware and agential species, are not specially valued by the cosmos as the “crown” of the process. Rather, in the account the natural sciences give, human beings are one more part of the process (which is, after all, not separate from its parts). Moreover, for a naturalist perspective, to predicate of the process a preference for individual entities within it seems untenable without reifying the process itself and predicating a purpose of the process that the sciences do not support.

A second difficulty with creation and design formulations is the relatively static view that they present of the cosmos. If the cosmos is either created or designed, it is a once-for-all-time kind of operation. One can go in two directions with creation and design, yet both turn out with a fairly static view. On the one hand, one can say that the creator or designer created or designed everything as it currently is. All that is, is as it is, by the intention and the single creative action of the creator. Most have abandoned this claim, however, given that both Big Bang cosmology and evolutionary theory suggest temporal development and change. On the other hand, one can say that the creator or designer created or designed the cosmos via these natural operations so that it would turn out exactly as it has. This view, however, seems to deny meaningful development by turning the process into a more gradual version of the first contention, that all exists as it is by the intention and creative action of the Creator. While this second option is not falsifiable, its heuristic usefulness is questionable. If the emergence of all that exists can be understood via a scientific framework, why add another hypothesis that carries with it the additional difficulties of positing a supernatural agential being? 10

A third set of difficulties arises from formulations relying on creation and design metaphors; these relate to anthropomorphism. A certain amount of anthropomorphism may be unavoidable, because we try to understand the cosmos via what we know best: ourselves. The question is whether
some forms of anthropomorphism are more appropriate than others, given the character of nature that the sciences represent in their best approximations. Certainly, given the two previous arguments, unified agency and creativity or design toward a purpose seem to be inappropriate forms of anthropomorphism. Similarly, other forms of anthropomorphism that often accompany creation and design metaphors, such as the attribution of gender, emotive expression, and independent rational intelligence to the creator or designer, seem inappropriate as predicates of the process when viewed naturally.

Other human characteristics, such as emergence, relationality, and finitude, might be appropriate predicates for at least parts of the process, and relationality might be appropriate for the process as whole. In the case of emergence, relationality, and finitude, however, I have to wonder whether their applicability stems from the fact that humans are parts of the process, rather than from the fact that the process exhibits human-like characteristics. In the end, metaphors of creation and design entangle me in too many forms of anthropomorphism that seem inappropriate for me to deem these formulations as the most heuristically useful in orienting myself to the process.

Strengths of “gives rise to...”

In contrast to these difficulties with agential, static, and inappropriately anthropomorphic formulations, the formulation of the “frame of ultimate significance” as that process that gives rise to all that exists has notable virtues—most especially in avoiding the very difficulties into which creation and design metaphors fall. First, gives rise to does not imply a unitary purposive agent such as a creator or a designer, but rather allows one to take into account the plurality of causal relationships within the process. It is this plurality that constitutes the process itself. There is no process separate from the plurality. Indeed, even such things as the non-local influences hypothesized in some versions of quantum mechanics can be considered as potentially efficacious in that process giving rise to all that exists. In this regard, like process, gives rise to can be both concrete in its acknowledgment of natural causal relationships, and also sufficiently vague to allow for the development and refinement of human knowledge.

Secondly, gives rise to has the virtue of conveying the kind of temporal dynamism that the natural sciences observe in the cosmos. The process qua process continually gives rise to all that exists, and the flip side is that the process also includes the constant passing away of entities. Also within the framework of dynamism, gives rise to can convey a sense of continuity and interrelationship between past, present, and future events. Such continuity and interrelationship is fundamental to the pictures that the natural sciences give of the cosmos in which nothing exists that is not related to other entities in all temporal modes.

Thirdly, gives rise to is not immediately anthropomorphic but can be considered as “nature-morphic.” It is precisely the character of natural phenomena, I would
argue, that they arise as a result of other phenomena, and that they give rise to still other phenomena through their existence. As chaos theory and Bell’s theorem suggest, every existent entity is influencing the existence of other existent entities at every possible moment. Chaos theory shows that one cannot predict how influences will combine to affect the future.\(^1\) And Bell’s theorem shows that a quantum entity cannot be completely isolated from influences extraneous to those imposed in a laboratory experiment.\(^2\)

In light, then, of both the difficulties of traditional formulations, such as creation and design, and the considerable strengths of gives rise to, naturalistically viewed, I conclude that gives rise to is the more adequate descriptor of what occurs within the process that I propose as the “frame of ultimate significance” for human orientational meaning and ethical systems. It is non-agential and non-purposive, allows for the complexity of natural causation and expresses the dynamism and change of the natural world. Moreover, gives rise to, like process, is open to changes and amendments that may occur subsequently in the natural sciences.

“All...”

From what I have argued so far, an entire section on the definition of all might seem odd; but in the context of previous human meaning and ethical systems, such as the world religions, the question of whether the process gives rise to all that exists becomes a pressing issue. Some previous religious orientational systems have posited separate origins for different aspects of the cosmos\(^3\)—such as the famous Manichean formulation of a strict dualism of matter and spirit, evil and good; or the Greek formulation of the One and the Demiurge, the first identified with the Good and the second identified with the creation of the natural world and the root of evil therein. I will argue both negatively and positively for my contention that the process gives rise to all that exists. In the first part, I will address alternative formulations; and in the second I will argue for the strengths of my own proposal.

Alternatives to “all”

Dichotomies arise in the Western tradition\(^4\) especially when philosophers and theologians address the question of evil and the question of human uniqueness. In the case of the former, some have proposed two different sets of originary processes, one for good and one for evil. In the latter case, some have proposed a graduated scale of existence in which the immaterial has a greater existence than the material. These graduated scales interpret the material as having less being and goodness than the immaterial. In this section, I will look at the difficulties of these two formulations in the context of my naturalist orientation.

The question of evil presents a particularly difficult human problem, especially for Western religious traditions, which view the deity as the good Creator of humankind. If the Creator is good, some in these traditions have argued that the deity cannot then be the source of the evil in the world. There must therefore be two sources: God and the devil, or God and a demiurge that creates matter. With such formulations in place, the religious objective becomes a flight from the material world with an escape to the immaterial good deity. The on-going activities of the world become a battleground for the two hypothesized warring deities or forces.

My naturalist perspective has obvious difficulties with such formulations, not only because of their positing of agents external to the process (as discussed above), but also because they fragment the cosmos into two separate and clashing processes. Given that the natural sciences represent the cosmos as a unified process, such dichotomies seem to have no place in a naturalist perspective. Just the same, because of their prominence, I feel I must stipulate that the
process gives rise to all that exists and address the difficulty that produces the dichotomy in the first place. In the next section, I will argue for a naturalist account of evil in the context of the all to which the process gives rise.

The belief in human uniqueness has also been the occasion for a fragmented view of the cosmos. When considering human uniqueness, the divide between matter and spirit is usually at the root of the

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fragmentation in the Western tradition. Many authors propose that it is the immaterial soul that separates humans from everything else that exists. Following the idea of the imago dei in the book of Genesis, they identify the soul or consciousness with God’s image in humankind, who must then turn away from the lesser things of the material world and toward the more thoroughly good things of the immaterial, spiritual world.

This position again presents several difficulties to my naturalist perspective. Foremost among these is its separation of the world into material and spiritual, with the spiritual being closer to the source of the world and the material being either a degraded creation of the deity or a creation of another god or demiurge. As a naturalist, I view what some religions have called the human soul (consciousness or mind) as emergent from the body and inseparable from it. Moreover, there is no reason in evolutionary theory to view the human species as particularly unique, regarding special valuation or goodness, but rather only as different, in respect to all the characteristics that distinguish it from the other species. This difference does not place humankind outside material processes or above other material entities; rather, in the emergence of consciousness from matter, evolutionary theory places humans squarely within the natural world as a product of billions of years of the development of life-forms prior to the evolution of Homo sapiens. Moreover, biologist Ernst Mayr has argued that humans cannot claim consciousness uniquely, since “traces of consciousness are found even among invertebrates and perhaps protozoans.” In the next section, I will provide what I see as the beginning of a naturalist understanding of human difference and its inclusion in all to which the process gives rise.

“All” in relation to evil and human uniqueness

When I say that the process gives rise to all that exists, I truly mean all from whatever perspective or scale one wants to look at the cosmos—from quanta, chemicals, and minerals, to bacteria, plants, and multicellular animals, to planets, supernovae, and dark matter—and also including things that humans have not yet discovered—and may never discover. Moreover, that each of these is part of the process is the relational fact that allows for continuity between and among these entities and the various sciences that study them. As a naturalist, I hold that all scales of existence are meaningfully related, while at the same time I admit that philosophers and scientists have not yet thoroughly formulated the details of this relation. Since I am not only speculating about
the nature of the process that gives rise to the cosmos but also hope to provide for human meaning and ethics, I will at this juncture provide a summary of what I take to be an naturalist account of evil and human uniqueness.

From my naturalist perspective, the concept of evil is just this: a human concept relating to the humanly perceived deleterious effects that human actions and other natural phenomena have on human lives and on the rest of the natural world. There is no independent force of evil, nor is there any entity that is evil. Rather, there are human actions and other natural phenomena that negatively impact—in the sense of inhibiting the flourishing of—human beings and the rest of the natural world. Since the human species arose via evolution within the process, human values can be seen as internal to the process. The key distinction is that these are values that human beings produce and overlay on other phenomena. It is not the phenomena that have or possess these values intrinsically. In this sense, there is no need to introduce a dichotomy or fragmentation into the description of the cosmos to account for the human perception of evil; rather, evil as a concept can be referred back to human beings and their values, and both can be seen as arising within the process.

The case with regard to human uniqueness is similar. Human beings are only unique in the sense that they are different from other natural entities. This species is just as natural, just as existent, and just as much a part of the process as other natural entities. Just as human values (including the concept of evil) arose within the process via evolution, so too do the differences between human and other natural entities. Moreover, consciousness, that human feature usually singled out as unique, is one more of the features that arise within the process, and not something provided by an external deity or world spirit. As Mayr writes, “The human mind seems to have been the ultimate product of a concatenation of numerous miniemergences, in both our primate and hominid ancestors.” While the natural sciences do not yet fully understand the emergence of human consciousness, they do not cast doubt on this emergence, but continue to provide good evidence for the naturalist belief that even something like consciousness that seems immaterial is in fact an emergent property of complex material systems.

Thus, while some human orienting systems have found it necessary to fragment the cosmos in order to give accounts of evil or human uniqueness, the unity of the cosmos can be maintained, and evil and human uniqueness can continue to be accounted for within a naturalist framework. The all to which the process gives rise includes even these seeming intangibles of human creation, since humans themselves are among those entities comprising the all to which the process gives rise.

“That exists...”

I have arrived at this point in explicating my proposal that the “frame of ultimate significance” is the process that gives rise to all that exists, assuming the actual existence of the process, the all, and its arising. Many debates rage—both those internal to the sciences in the philosophy of science, and those external to the sciences in philosophy and religion in general—about how existence is to be understood. In this section, I will explore what I take exist to mean in light of philosophical and scientific considerations.

Philosophical considerations

Along with many in the sciences, I consider critical realism the most plausible stance toward the question of what it means to exist and to have knowledge of things that exist. This philosophy was developed in response to the epistemological questions of science, such as, Does science really produce knowledge about the world, or does it simply construct internally coherent linguistic systems that have the pragmatic value of
producing repeatable phenomenon? According to Delaney, critical realism holds

that the primary object of knowledge is the independent physical world, and that what is immediately present to consciousness is not the physical object as such, but some corresponding mental state broadly construed.21

Critical realism thus assumes the existence of the physical world beyond human perception of it and takes on the challenge of finding and testing ways of representing this world to human consciousness.

In recognizing that the physical is represented in consciousness and not directly present to it, critical realism recognizes the place of the observer in all statements about what exists. Perhaps it simply draws on Descartes’ argument that established the doubting individual and moved outward to affirm the world, but it goes beyond Descartes to say that the way in which the observer perceives the world in his or her representation will change how he or she understands the world to exist. Still, these representations can be tested, and in that way a better, more closely approximate, representation can be found. The fitness of approximations can be judged by whether they provide a necessary framework not only for repeatable and successful22 experiments, but also for prediction in future experiments and for the production of these experiments and research regimes themselves. Philosophically, then, critical realism predicates existence of both the observer and the physical world observed.

**Scientific considerations: scale, duration, and quanta**

Yet the question remains as to how to construe the existence of individuals within the process, and how to differentiate these individuals qua individuals. With regard to scientific considerations of the question of existence, I will break the question of existence down into the questions arising in the context of scale, duration, and quantum mechanics—since in a spatiotemporal process these are the key dimensions that determine whether the question of an entity’s existence can be considered concretely. (The existence of non-spatiotemporal entities can be considered, but only in the abstract logic that explains why the hypothesis of an agential God external to the spatiotemporal universe is a non-falsifiable hypothesis.)

With regard to scale, the question of an individual’s existence is particularly complicated, because one can view any object of human perception from many different scales, from the subatomic level to the level of organism. If one knows every molecule that makes up a person, does one know the person? Not entirely. If one knows that water is made up of two hydrogen molecules and one of oxygen, does one know that water exists in three phases? No. Conversely, if one has just slipped and fallen on a patch of ice, does knowing the molecular structure of water give any relevant knowledge about the cause of one’s newly broken ankle? No. Each level of scale tells something, while none is exhaustive of the whole. The key thing is to determine which is the relevant level of scale, given the operation of understanding with which one is concerned.

At the same time, I would submit that there are unifying levels, primarily levels of organization, that can help to identify the existence of individuals. Subsidiary parts of an entity may change, but as long as the organizational structure remains, the individual—whether it be a molecule or an elephant—can be said to exist. For example, the existence of my body can be investigated at numerous levels, including molecular, cellular, psychological, medical, and even artistic; yet what makes it my body is the particular organization of its many elements and systems, together in a particular place.

In stipulating this, however, immediately the question of duration arises. To say I exist at a particular place is to say I exist at a particular time—I am a spacetime entity. Moreover, I have a supervening organization. My organization continues in both space and time. No other individual can occupy the
exact "placetime" (that is, place and time in spacetime) that I inhabit, although some individuals, such as bacteria inside and on the surface of my body, do inhabit places within and on me. Moreover, with regard to existence as endurance, there are two perspectives that are important to take into account: the proximate and the ultimate.

Proximately, certain entities endure with certain organizations, even though some components change or pass away. The existence of the individual is not contingent on any one of its component, but on the organization; and the entity no longer exists when the organization breaks down. Ultimately though, given the connection of all spacetime to the Big Bang, it could be said that everything has existed since the Big Bang, though in changing organizational make-up. Every entity that can be distinguished proximately by its organization is also ultimately made up of components that comprise the larger organizational framework, spacetime. Some thinkers draw on just this analysis when they say that each person is made up of star dust. This is a statement about the ultimate level of composition in which all that exists can be traced back to the Big Bang.

This statement brings to the fore the two key problematics of existence found within science: quantum indeterminacy and quantum non-locality. The problem of quantum indeterminacy finds its systematic expression in the theory of Werner Heisenberg. He showed that a particle's position and momentum (or velocity) are related, such that the product of the uncertainty of the position, Δx, and the uncertainty of the momentum, Δp, is greater than the Planck constant, h:

\[\Delta x \Delta p > h.\]

This means that one cannot make a precise measurement of position and momentum simultaneously. The more precisely one measures the position at a given time, the less precisely one can measure the velocity, and vise versa. One can, therefore, only produce a probability of any particular particle occurring at a particular position with a particular momentum (or velocity).

In itself, some do not find this principle disturbing. Indeed, many scientists do not find it disturbing at all but see it simply as a feature of small, fast, and brief entities, as well as of the observational techniques. Others, however, feel that this uncertainty entails a fundamentally worrying instability in the natural world, since at a quantum level entities seem to remain probable rather than actual until they are observed. As Herbert writes:

Running parallel to the quantum facts, quantum theory represents unmeasured quons as waves and measured quons as particles. Furthermore it regards these unmeasured waves not as real waves but merely as waves of probability.

So, on the one hand, one could see the uncertainty principle as describing simply a state of experimental affairs, while, on the other hand, one could say that the principle implies that existence is in some sense dependent upon observation itself. As a critical realist, I tend to believe that the former is more the case than the latter; but that is not to say that either is the more plausibly held. Certainly there is something peculiar about observation. At least it is true to say that, when a scientist measures the position of a particle, it exists relative to him

**Consciousness, that human feature usually singled out as unique, is one more of the features that arise within the process, and not something provided by an external deity or world spirit.**
or her only in that position (since special relativity shows that position is always with reference to the position of something or someone else); but whether it is true that the particle only exists if measured is debatable.

Since even the best informed scientists have not reached a consensus about the implications, either epistemological or ontological, of quantum uncertainty, as a non-scientist I want only to note them and to say that a full and scientifically rigorous orientational cosmology would want to take full account of them. Moreover, one implication that can surely be drawn, one that is particularly relevant for my orientational cosmology, is that the entities that make up the world on the quantum level and at greater levels of scale are intimately and inextricably interrelated. This is the case whether one takes Heisenberg’s principle as epistemological, ontological, or both.

Quantum non-locality is similar in nature to quantum indeterminacy. Its implications can be regarded as epistemological, ontological, or both; regardless, in the end it suggests an intimate relationality. Quantum non-locality, as I understand it, basically refers to the fact that no matter how one attempts to isolate a quantum particle/wave, it always displays a certain amount of disturbance resulting from forces that one cannot fully specify. Moreover, it says that these forces are non-local, and that “no local reality can explain the type of world we live in.”

Some physicists, among them David Bohm and Erwin Schrödinger, argue that all quanta are inextricably related beyond the speed of light via previous “phase entanglement” during their close proximity at or near the Big Bang. Their conclusion, as Herbert writes, is:

Bell’s theorem shows that the holistic grammar of quantum formalism reflects the inseparable nature of reality itself. Beneath phenomena, the world is a seamless whole.

Others argue that non-locality is an epistemological issue relating, as does Heisenberg’s uncertainty principle, to the very nature of quanta as very small, very brief, and very fast—and therefore more susceptible to perturbation than are gross entities of ordinary human perception, such as rocks or hippopotami.

As a non-scientist, I am certainly not going to resolve this debate. Still, like quantum uncertainty, in either interpretation, quantum non-locality says something important about the cosmos to which I seek to be related: the cosmos is, on a fundamental level, highly relational. No entity can be fully specified without describing its relation to other entities; and thus all existent entities, to one degree or another, play a crucial role in constituting (either definitionally or ontologically or both) the existence of other entities.

In summary, then, within the context of scientific considerations, exist means several things. In the first place, from a critical realist position exist means that the physical world is, with or without human perception, but that human beings are able to have knowledge of its representation in their consciousness through scientific and philosophical approximations. Secondly, with regard to scale, exist means that an entity can be viewed from many perspectives. I argue, however, that one can discern an organizational level that distinguishes one entity from another. A third understanding of exist may be found in the context of duration, because the organizational level of the individual supervenes precisely because it endures, while all of the subsidiary elements may change. When the organization breaks down, the entity no longer exists, and the elements that once comprised the entity will be incorporated into the organizational structures of other composite entities. In this sense, the elements of the process exist both proximally as individuals, and ultimately as parts of the overall process arising from the Big Bang. Finally, at the quantum level two different features of quanta problematize the notion of existence. Quantum indeterminacy may indicate an intrinsic relation between existence and observation:
it may indicate an extrinsic (to existence) but unavoidable influence of the observer on the observed. Either way, quantum mechanics represents an intimately relational cosmos in which every phenomenon impacts other phenomena. Quantum non-locality likewise suggests that the elements of the cosmos are, at a fundamental level, intricately interconnected, even if the question remains open as to whether or not this relationality is ontologically superluminal and non-local.

Conclusion, by way of possible implications for meaning and ethics

Where am I left, then, once I have concluded that I can indeed view the development of the cosmos—including the Earth, which includes me—as the process that gives rise to all that exists? I am left within the process as I began, but with the difference that, having specified at least some of the character of the process via the natural sciences, I can formulate some possible implications for human meaning and ethical systems. In this section, I will begin this formulation in a preliminary and general way, in what I hope will provide the outlines of a project for further development. First of all, I address the question of meaning, specifically, Why meaning? Next, I address the question of ethics, specifically, What ethics?

Why meaning?

One might rightly ask why human beings have such a need to make meaning in the first place. Why does the question of the meaning of existence follow most assuredly on the heels of the admission of existence? Sociologist Peter Berger sees these questions as arising fundamentally out of the fear of chaos and, ultimately, of death.27 Through meaning systems, human beings seek to avoid the reality of both by imposing a vision of order on the world, where order may otherwise not exist. While it is certainly the case that the fact of death imposes, at least on me, an urgency that life be lived in a worthwhile manner, I do not think, by accepting a naturalistic scientific account of the world, that I am necessarily imposing order where it might not exist. Still, I recognize that I am engaging in the age-old process of considering the world beyond human beings to be of ultimate significant to them. As Berger writes,

Every society is engaged in the never completed enterprise of building a humanly meaningful world. Cosmization implies the identification of this humanly meaningful world with the world as such, the former now being grounded in the latter, reflecting it or being derived from it in its fundamental structures.28

In fully admitting that I am creating meaning, in a sense I believe that there is no other way to function. For even if one says that there is no meaning to human life in the cosmos, one is still making a judgment about what is and is not humanly meaningful, by constructing meaning precisely out of meaninglessness.

I would argue, however, that if one is bound to create meaning, then one might as well do it against the backdrop of the best possible information about the cosmos. This is why it has been so important to me to specify the “frame of ultimate significance” to be that process that gives rise to all that exists. In this way, I have been able to provide a potential basis upon which one could give a naturalist and scientifically informed account of human existence. From and to this account, then, I can be answerable with regard to a critical reception and interpretation of new scientific understanding of the process. This accountability should keep my meaning constructions from becoming obviously inappropriate projections of human desires and wishes onto nature, and from becoming obviously inappropriate projections of human grandeur within the process.

This accountability is efficacious on several levels. At one level, meaning systems must remain open and flexible, given that the natural sciences are constantly changing and refining their approximations of nature. At another level, meaning systems must be evocative enough to allow for continuity in the formulation of meaningful relationships between

THE BOSTON THEOLOGICAL INSTITUTE

13
human beings and with the rest of the natural world. These evocative constructions (even my own, *that process that gives rise to all that exists*) must be constantly scrutinized so that they do not become reified or isolated from their status as constructions always accountable to expanding scientific approximations. Finally, we are always already within the cosmos, within the process. At the same time that we create meaning by orienting ourselves to the process, that process gives rise to us (and perhaps other intelligent entities) as meaning-creating beings. Somehow our meaning systems must acknowledge this fact, along with the concomitant fact that we do not stand outside the process.

So why meaning? In the negative, because it is unavoidable. And in the positive sense, consonant with the natural sciences, because it is—at least in principle and potentially—better informed and more accountable.

**What ethics?**

If it is accepted that meaning-making is a practically unavoidable human endeavor, and, moreover, if it is desirable to keep meaning systems accountable by making them consonant with the natural sciences, then what are some of the concrete values that might be formulated? What implications does it have for action in the world if people orient themselves to *that process that gives rise to all that exists*? I have three preliminary suggestions of stances that seem consonant with the processes that I have detailed above. I put them forward in this conclusion, knowing that there are other interpretations of both the process and its implications, but also seeking finally to begin the process of constructing a personally meaningful framework for action.

Humility is the first stance I would suggest. Human beings are within a process some 13 to 20 billion years old, as far as we can tell (at least within the current expansion-and-contraction cycle of the cosmos). Meanwhile, our species has been on the cosmic scene for only a tiny fraction of this time. Temporally, humility seems appropriate. Additionally, and consequent to the nature of spacetime, humility seems appropriate given our minute scale in comparison with the universe. Spatiotemporally, we are blinks in the process of cosmic arising. Likewise, evolutionarily speaking, we are blinks in the arising of life on planet Earth. Billions of years and many epochs of geological formation separate us from the arising of the first life on Earth. Thus, closer to home, humility also seems requisite. Who are we, after all, to claim to understand the cosmos or to take responsibility for the Earth? We are doing pretty well, but we have a long way to go; and no matter how far we go toward these goals, the Earth and the process in which it arises as a part will continue long after all humankind has passed away. I start with humility because it chastens me to take account of my real situation and thrusts me once again into accountability to the natural sciences.

Secondly, as humans are conscious agential beings, a stance of responsibility seems appropriate. With proper humility about our status in the immense spatiotemporal span of both the cosmos and the earth, we can more fully see the aspects of our lives in which we can really take responsibility. Moreover, taking into account quantum mechanics, we can more fully comprehend the deeply relational nature of reality and, from that, see that it is crucial to act as

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*I would argue, however, that if one is bound to create meaning, then one might as well do it against the backdrop of the best possible information about the cosmos.*
responsibly as we can, even if we can never know with full certainty that our actions will achieve their intended results. We are alive within an amazing, intricately relational process; and just this fact alone, I would argue, ought make us feel the responsibility to do what we can to formulate appropriate actions within the context of the natural world. As conscious beings, we can at least take responsibility for our own actions and, in this light, begin from a naturalist perspective to address the complexly interrelated issues of ecological destruction, human overpopulation, and human poverty.

Thirdly, I would argue that humble and responsible cognizance of the process that gives rise to all that exists should also include a stance of celebration. Our life is short. We have arisen on a small planet in a peripheral section of an unexceptional galaxy. We arose recently in the evolution of life on Earth—and we are still arising. We arise, moreover, as conscious and intelligent. As such, we are able to contemplate the process of our arising in the first place. To be properly oriented to all of these facts, I would argue, we must celebrate the first fact, that that process that gives rise to all that exists exists at all, and that we arise as existing within it. As Brian Greene writes, humility and an inability, due to unjust circumstances, to take responsibility. Full celebration in this sense is contingent on working in humility and responsibility for the alleviation of conditions that cause poverty, disease and lack—both in the human realm and in the rest of the natural world. In this sense, celebration is always provisional and anticipatory. It is a call to more adequate understanding and enactment of human relationships to other humans and to the rest of the natural world. It is a call to an understanding of the process that has given rise to us and the rest of the cosmos, and that allows oppression and destruction, freedom and flourishing, both in the human realm and in the rest of nature.

The process that gives rise to all that exists, to which we are oriented, gives rise to a new day in which we may be appropriately humble, responsible, and joyous. We are alive. Many questions remain unanswered, but the day arises to allow for continued investigation. Ignorance must not be an excuse for inaction, for fear of unintended consequences. If life is to have meaning, we must make it, in as full a consciousness and understanding of the process as possible, so that at the end of our lives we may say with Maria Eugenia Baz Ferreira:

It is truly inspiring that beings confined to one planet orbiting a run-of-the-mill star in the far edges of a fairly ordinary galaxy have been able, through thought and experiment, to ascertain and comprehend some of the most mysterious characteristics of the physical universe.

We must celebrate both our existence and its intelligibility. This celebration should then push us back into a greater understanding of exactly what the nature of the process is, and to humility and responsibility all over again.

Celebration returns us to humility and responsibility, since it forces us to see that not everyone can celebrate. Some have humility imposed on them through poverty, disease, and lack. They can neither define their humility nor take responsibility with reference to the process; rather, they have incommensurate

To all that is brief and fragile superficial, unstable.
To all that lacks foundation argument or principles;
To all that is light,
Fleeting, changing, finite
To all that is light in weight for itinerants
On this transient earth
Somber, raving,
With transitory words
And vaporous bubbly wines
I toast
In breakable glasses....
Works cited:


Endnotes:

1. The definition of existence will find its proper place and fuller expression below. For now, let me signal that I will treat the question of what it means to exist with reference to the spatiotemporal frame in which existing means being related to other existent entities; and I will treat the question of the existence of an entity with reference to its endurance with an internal, relational, organizational structure. Both of these formulations will then, in due course, find problematization in the context of quantum uncertainty and non-locality.

2. Naturalist orientational cosmology: each of these terms demands some explanation. By naturalist, I mean that the ultimate context of human life is the world specified in the natural sciences and that this world operates in the regular and intelligible ways discerned by the natural sciences. This meaning is in contrast to those who argue that the ultimate context of human life is supernatural, and that the world’s regularity and intelligibility is violated by a supernatural being or force. My naturalist account is fully integrated with scientific ways of knowing and also acknowledges the necessity of philosophical ways of knowing concerning questions of epistemology and ontology in the natural sciences. I also see the importance of metaphorical ways of expressing the knowledge both of these provisionally produce. Finally, I recognize that scientific, philosophical, and metaphorical proposals are always provisional approximations of our best knowledge, rather than timeless propositional truths; but I seek to construct a system that can remain always open and critically receptive to new approximations. By orientational, I mean that my proposal seeks to address human questions of meaning and ethics and to provide open and provisional systems in
which individuals can address these questions. By calling my proposal a 
cosmology and in keeping with my 
naturalist orientational perspective, I mean 
to say that one studies the cosmos for 
naturalist orientation. It is in relation to the 
cosmos as a whole and in relation to all 
that exists therein (including human 
societies) that one seeks to orient one’s life. 
In this, I am making a distinction between 
myself and not only those theologians who 
would see the supernatural as the ultimate 
frame of reference, but also those human-
ists who would see human society by itself 
as the ultimate frame of reference. At the 
same time, neither do I want my proposal 
to be seen as a-theist nor as anti-humanist. 
Regarding a deity, the proposal is neutral 
toward this hypothesis, which for this 
proposal is unfalsifiable and unnecessary. 
Regarding humanism, the proposal is 
supportive, but with the aspiration of 
expanding the frame of reference in which 
those concerned with human meaning and 
ethics construct their systems.

3. At one stage in its development, I 
assigned the word “God” to this process; 
but I now believe that the “baggage” of 
this term is too great for such an assigna-
tion to prove heuristically valuable. While 
I would not mean a supernatural or 
independently existing entity by the 
expression, that process that gives rise to 
all that exists, were I to denote it by the 
word “God,” many people would interpret 
it as just such a supernatural and hypo-
statized proposal. At the same time, since I 
hope to construct a proposal that has the 
potential to provide, at once, both a system 
of meaning and of ethics, it will be 
necessary at some junctures to make my 
argument with reference to previous 
explicitly theological proposals—as 
theology is traditionally the realm within 
which such arguments are made and such 
orienting systems sought. However, I seek 
to develop a naturalist orientational 
cosmology, and not a theology.

4. Considerable rebate remains about 
whether the Big Bang can really be said to 
be a singularity, and ideologies cloud the 
conclusion from many sides. However, 
almost no one doubts in general outline 
that the Big Bang is the ultimate source of 
all of the phenomena that currently exist 
and that humans perceive. Whether the 
Big Bang we know is the first or one 
among many in an infinite series of bangs 
and crunches does not fundamentally 
change the human orientational need for a 
heuristic term that encompasses unity and 
plurality. My understanding of Big Bang 
cosmology comes primarily from The 
Elegant Universe by Brian Greene, and 
Foundations of Modern Cosmology, by 
Hawley and Holcolb.

5. See Margulis.

6. This process, as it took place in 
evolutionary biology, is well illustrated by 
Ruse, who explores how evolutionary 
biology became more and more precise in 
its understanding of the natural world as 
its scientific proponents gathered, and 
emphasized the gathering of, more 
evidence through the years.

7. The contention that an ethical system 
can be developed from a consonance with 
the natural sciences might cause consider-
able unease for some people. Earlier in 
the development of the natural sciences, 
perhaps one could not have proposed the 
type of orientational cosmology that I am 
proposing. Indeed, those who did are now 
seen to have been mistaken—for example, 
those who saw the regularities of nature to 
indicate that the different species and 
phyla were each the result of a static 
creation and individual design. Currently, 
however, at least the general trends of the 
natural world towards expansion of the 
cosmos and biological development of 
planet Earth are well enough established 
that one is likely to be correct in working 
from them. At the same time, the natural-
ist orientational cosmologist, no less than 
the scientist, should always be ready to
amend her proposed cosmology in light of new data, metaphors, or interpretations. The burden of making a proposal is always that one may be wrong; yet the possibility of error cannot prohibit the beginning of an endeavor, or no progress whatsoever can be hoped for.

8. See Greene.

9. An interesting question, and one that I leave unanswered for the moment, is how to account for the intelligibility of the process. Why is it that the cosmos is open to human understanding? One possible answer arises from the fact that the human brain is among those entities to which the process gives rise. The brain is—by its nature as a part of the process—fit to understand the process. It would take a stronger argument than that, though, to convince me, at least. Many creatures, for example, the non-humanoid higher primates, have large brains that, according to our best knowledge, are not capable or intrinsically employed in seeking out understandings of the process. Another related question is how to account for the status of mathematics. Why is it that math is so well suited to use in understanding the natural world? Is there some intrinsic relationship between math and reality? Many mathematicians themselves refuse to answer this question. Much in mathematics seems to have no direct bearing on the natural world. However, could it not be the case (as it was with Einstein’s use of Riemannian geometry) that mathematics proceeds ahead of the sciences and that eventually, perhaps many centuries from now, the sciences may discover exactly how the math actually relates to the natural world? I do not have an answer to any of these questions, but it seems that a fully adequate orientational cosmology that is also philosophically rigorous would want eventually to account for the fact that the universe is intelligible via mathematics and other human forms of cognition.

10. One answer to this question is that, while science can explain all that arises, it cannot account for the “beginning” of this arising. This answer is a serious one and is deserving of some reflection. One should realize, however, that in giving the answer one assumes a beginning, a matter that the sciences are by no means decided on in the sense of $t = 0$. String Theory suggests that the cosmos does not reach $t = 0$, but rather that the cosmos finds its smallest unit at Planck length ($10^{-33}$ cm). At the same time, different scientists have different motivations for concluding either for a beginning at $t = 0$, or for an infinite process of crunches and bangs that always exists, never beginning or ending. At first glance, those that conclude on the side of the $t = 0$ position seem more reasonable; yet as I have studied the world religions, I have come to believe that neither position is essentially more reasonable; for example, one could look to the vision of an eternal, cyclical cosmos in some schools of Hinduism. Rather, the ideological and metaphysical frameworks that one brings to the question can have both conscious and subconscious influences on what one decides. Whatever the case may be, the hypothesis of $t = 0$ is both an empirical question remaining to be solved and, as the Buddha said, “a question that tends not to edification” (at least at the present time).

11. In its vagueness, a supernatural element cannot be excluded by saying that the ultimate frame of reference for human meaning and ethics is the process that gives rise to all that exists. It can be said that this supernatural element appears unnecessary within a naturalist perspective. At the same time, the process as giving rise to also leaves open the question of the beginning of the process—or lack thereof. I am comfortable with this ambiguity; and, with the Buddha, I am not sure that questions of an absolute beginning or of the eternality of the cosmic process are ultimately of edifying value.
For the type of orientation that I suggest in the concluding section, what is most important is an understanding of the human location within a thoroughly relational process, and not whether this process has an ultimate beginning or continues everlastingly.

12. My understanding of chaos theory comes primarily from Hayles.

13. My understanding of the consequences of Bell's theorem comes primarily from Herbert's explanation.

14. I can provide only the briefest sketch of such fragmenting or dichotomous views. This sketch is bound to be a generalization; yet because the formulation of the all can only be understood in relation to such fragmenting proposals, for heuristic purposes, I risk over-generalizing them.

15. Dichotomies and even greater fragmentation also arise in many religions and traditions. I simply use the Western tradition, because it is the one most familiar to me, the one in which I was raised. More work could certainly be done, however, regarding the dichotomization and fragmentation of the cosmos in the various meaning and ethical systems of human history. From a naturalist perspective, as odd as it is not to think of the world as a whole or at least as constituting a unified process, I would hypothesize that the position of fragmentation certainly finds expression in at least as many traditions as the unified position.


17. Wilson's Consilience may at least provide suggestive avenues for further understanding of their relation.

18. The concept of negative impact is a human one and reflects human valuations of our own existence and the rest of the natural world. Sorting out negative impact is very complicated and requires a case by case analysis of costs and benefits of particular actions and events. While I mention "inhibiting flourishing" here as one standard for measuring negative impacts, there are certainly others, including "doing harming," "interfering with the natural course of things," and "abuse." Each of these standards of negative impact carries pluses and minuses, and none is clear-cut as an unequivocal standard. Were a naturalist orientational cosmology to be truly adequate, it would have to develop sophisticated ways of adjudicating competing claims, as well as of evaluating different standards of what constitutes both negative and positive impacts. By my brief comments in the body of the paper, I simply mean to indicate that it is possible to make such judgment within a naturalist framework and remain consistent within the rest of the system.


20. Again, as is the case with human valuation of evil or deleterious effects, the natural sciences' understanding of consciousness and the human mind is very complicated. Moreover, much remains to be understood about the exact relationship of human beings to their primate ancestors. What can be said, as Lynn Margulis has (in a lecture at Boston University, 19 November 1999), is that humankind undoubtedly shares better than 98% of their DNA in common with the higher primates.


22. The success of an experiment is by no means unequivocal. What I mean here is that the experiment produces results that allow for further understanding and further theory formation. Moreover, not all of the sciences undertake experiments in the same way as they are in chemistry, genetics, or physics; but, as is the case in evolutionary biology, some have to collect and compare historical data, using the process of the cosmos as the experiment and, thus, having to deal with many more variables than laboratory scientists have to.
Construal of what it means to have a successful experiment or successful theory must, thus, be appropriate to the particular scientific discipline in question. With my discussion of experiments in the body of the paper, I simply mean to give an example of one possible way that a critical realist comes to an approximate understanding of the cosmos that exists external to him- or herself.

24. Ibid., p. 69.

Marylu Bunting is a Ph.D. candidate in theology in the Division of Religious and Theological Studies at Boston University. Her research focuses on how scientific and religious cosmologies impact and provide resources for global ethics, especially with regard for environmental and economic justice issues. She received her undergraduate education at Duke University, where she majored in art history, specializing in the spiritual concerns of modern, abstract artists. Before entering doctoral studies, she received her M.Div. degree from Boston University School of Theology.

She was reared in a United Methodist Church “with a Whiteheadian bent,” and she currently identifies herself as a “nature mystic and global ethicist.” She particularly enjoys hiking in the woods of Vermont, Maine, and her native Colorado.