Substance or *System* as Foundational Metaphor for a Contemporary Christian World View?

Stephen Toulmin in his book *The Return to Cosmology* published in 1985 proposed that scientists, philosopher and theologians through sustained conversation should be able to come up with a new world view or contemporary cosmology that would be suitable in the intellectual vacuum created by postmodernism with its drastic relativizing of all points of view[1] In the meantime, however, no such consensus has been achieved, largely because those in the natural sciences and in the humanities seem to live in separate worlds of discourse with different presuppositions or theoretical starting-points in the way that they look at physical reality and determine what is true or false in whatever statements they make about the world in which they live.[2] Yet in the medieval period of Western civilization, Thomas Aquinas and other philosopher/theologians took for granted that Aristotelian metaphysics provided a governing conceptuality both for the philosophy of nature and for Christian theology as derived from Sacred Scripture. The basic categories of Aristotelian metaphysics (i.e., substance and accident, the priority of cause to effect, the relation of time to eternity, etc.) seemed to apply equally well in human understanding of physical reality and of the Christian God-world relationship. Metaphysics, after all, was presumably a generalization of ontological principles already at work in the world of nature that would enable one to talk about Being on all levels of existence and activity.

For various reasons, this harmonization of reason and Christian revelation collapsed at the beginning of the modern period in Western civilization and has never

been fully restored to this day. If anything, the gap between the thought-worlds of those in the natural sciences and in the humanities is even more pronounced than ever, as Toulmin makes clear in his book. What then is to be done in order to come up with a new world view that will be at least intelligible to all parties concerned? My suggestion in this essay is to start all over again; that is, to look at the metaphysical presuppositions at work in contemporary natural science and then to ask whether the dominant paradigm or basic conceptuality for contemporary analysis of physical reality can be likewise employed in the explanation of traditional Christian beliefs and values. For, as Granville Henry argues in *Christianity and the Images of Science*, (a) Christians normally accept good science and find a way to integrate science into their understanding of the God–world relationship as revealed in the Bible; (b) conflict between science and religion arises when religion, after accepting one scientific approach to reality into its theology, encounters a new and different scientific approach to reality; and (c) the new scientific approach to reality inevitably involves a new philosophical understanding of physical reality that could be of considerable help to Christian theology in the elaboration of its traditional beliefs.[3]

Accordingly in this essay, I first argue that natural scientists, especially those involved in the life-sciences, increasingly employ the notion of system in their analysis of physical reality. That is, they are no longer preoccupied with the relation of individual entities to one another in terms of classical cause-effect relations. Rather, they look at reality in terms of the interaction of organized groups of individual entities with one another. Then in the second part of the article, I argue that Alfred North Whitehead's

understanding of the ever-changing reciprocal relation between constituent actual entities and the society to which they belong removes the danger of regarding systems as closed or completely deterministic rather than as open-ended and self-organizing.[4] Finally, in the third part of the article I indicate how this more socially oriented approach to reality makes excellent sense in terms of the understanding of classical Christian beliefs like the doctrine of the Trinity, the Incarnation, and Eschatology (the Four Last Things).

Recent Scientific Research on Open-Ended Systems

In 1995 Stuart Kauffman at the Santa Fe Institute in New Mexico published *At Home in the Universe* in which he studied the emergence of proto-cells from non-living molecules with a sufficient amount of diversity and dynamic interrelation.[5] His results were based on computer models rather than empirical observation of molecular activity, given the time-lag inevitably involved in the latter alternative. Yet it was clear that molecules under the right conditions constituted an open-ended system with a built-in principle of self-organization.[6] At the same time, he did not further speculate about the philosophical implications of his hypothesis, above all, its implicit challenge to Aristotelian-Thomistic metaphysics with its claim that a substantial form determines its material constituents, not vice-versa. For in the case of the molecular components of prokaryotic cells, the effect they co-produce (the cell) is evidently a consequence or byproduct of their interrelated activity, not their antecedent cause. Something genuinely new has come into existence. This is a case of bottom-up rather than the top-down causation found in Aristotelian-Thomistic metaphysics where a substantial form produces empirical results proper to its predetermined nature or essence. In 2008,

moreover, he published *Reinventing the Sacred* in which he argued that growth and development within the physical universe presupposes an underlying principle of self-organization which he terms creativity. So for Kauffman the realm of the sacred is part and parcel of the workings of the cosmic process. At the same time, it is not transcendent of it as with Christian belief in God the Creator.[7]

In 2012 Terrence Deacon at the University of California, Berkeley, published *Incomplete Nature: How Mind Emerged from Matter.* Even more consciously than Stuart Kauffman, Deacon rejected the Aristotelian-Thomistic understanding of formal causality. For him this type of active formal causality must be rejected since it is by definition prefixed by an outside source instead of being internally process-oriented.[8] Instead, he introduces a new understanding of formal causality as simply an objective constraint on the workings of the constituents of the system. Furthermore, when two systems interact, each with its governing structure or mode of operation, they thereby spontaneously co-generate a third system with even further constraints on the constituents of its subsystems.[9] Equivalently then, at the level of human existence and activity, free choice is exercised in virtue of a high degree of constraint by that human being. One must set aside multiple alternative options and consciously pursue only one goal or value[10]

To be more specific, Deacon distinguishes between thermodynamic, morphodynamic and teleodynamic levels of existence and activity within nature. A thermodynamic system tends to have very little constraint on its conventional mode of operation and thus tends to move progressively toward a state of virtual equilibrium

(complete entropy) in which nothing new ever takes place.[11] A morphodynamic system is one in which two rival systems each with its internal structure and mode of operation impact upon one another and thereby unconsciously bring about the existence and activity of still a third even more complex system whose governing structure and mode of operation act as a further constraint on the interrelated activity of the two subsystems and their constituents.[12] What Deacon and others call "autocatalysis" is evidently at work here.[13] The two rival lower-order systems have to synthesize their workings in order to produce the higher-order system. Finally, a teleonomic system involves varying degrees of self- awareness and conscious planning and thus at least in human beings brings about the possibility of rational deliberation and genuine free choice.[14] Thus, over and above "autosynthesis" of rival subsystems in the creation of a higher-order system, there is what can be called "autogenesis," some measure of planning for the future in terms of anticipated goals and values.[15] Hence, one has a completely naturalistic understanding of how mind over time emerges out of matter.

My misgivings with Deacon's argument is that it tends toward mechanistic determinism and thus eliminates any real contingency within the cosmic process. Accordingly, I prefer to claim that the ultimate constituents of all these systems are what Alfred North Whitehead calls actual entities, that is, momentary self-constituting subjects of experience that in succession carry forward from moment to moment a mode of operation or governing structure. Deacon is quite aware of Whitehead's hypothesis but rejects it as a modern form of animism.[16] For then everything is alive from inanimate entities like mountains and streams to fully conscious human beings without distinction.

As I shall explain below, this misgiving on the part of Deacon arises from not taking note that Whitehead distinguishes between grades or levels of complexity of actual entities.[17] Some actual entities are more self- aware than others (e.g., successive moments in the mind of a human being as a psychic system vs. successive moments in the "life-history" of a mountain or stream). Human beings change their conventional mode of thinking and behavior much more rapidly than mountains or streams, but the latter too undergo subtle changes with the passage of time as their constituent actual entities (momentary self-constituting subjects of relation) evolve in their dynamic interrelationship. Mountains grow or diminish in size over the years; streams alter their rate of flow and overall direction, depending upon contingent environmental factors. Thus animism may not be as primitive as Deacon believes. Perhaps Deacon and other scientists of the same mind-set are themselves unconsciously still involved in an overly reductionistic and materialistic approach to physical reality.[18]

Still a third philosopher/scientist, Jesper Hoffmeyer, Professor Emeritus at the Biological Institute of the University of Copenhagen, should be investigated for his path-breaking book *Biosemiotics: An Investigation into the Signs of Life and the Life of Signs.* Published in Danish in 1991, this book has resulted in Hoffmeyer's current status as one of the central figures in the new field of biosemiotics. In terms of this hypothesis, information is traded between entities by way of signs that have to be interpreted in order to be understood.[19] Yet the trading of information exists not only among human beings and higher-order animal species but also according to Hoffmeyer is present even at the level of molecules which find themselves aggregated into natural configurations/systems

that are "informed" by what Whitehead would call a governing structure or common element of form. To be alive is to exchange signs and their interpretation with other entities of the same level of existence and activity within nature.[20] Hoffmeyer, however, is reluctant to endorse Whitehead's notion of actual entities as momentary self-constituting subjects of experience in virtue of their dynamic interrelation with one another from moment to moment. Presumably the fear of animism likewise controls Hoffmeyer's thinking on this matter. Yet a persistent ontological question in this case thereby remains unsolved, namely, how molecules can be capable of an ongoing exchange of signs among one another if their constituent atoms are inert unchanging material entities. Presumably a system cannot be half-dead and half-alive at the same time.

I have selected the work of three well=known cientist/philosophers since they illustrate so dramatically a process- or systems-oriented approach to physical reality as opposed to the Aristotelian-Thomistic understanding of reality as based on substances (individual entities in contingent relations to one another) . But the systems-oriented character of the world in which we live is also clear in the thinking of many others in the natural sciences. Evelyn Fox Keller, for example, in her book *The Century of the Gene* indicates how the understanding of the nature and function of genes as biochemical vehicles for the sharing of genetic information from one organism to another has evolved over the years.[21] Initially it was thought that genes were mini-entities that never varied in their self-constitution from one organism to another. By the end of the twentieth century , however, it was clear that genes varied considerably in the role that they played in

different organisms, depending upon how the organism in which they reside responded to varying environmental factors. So not just the organism as a whole but also its genetic components are "alive," responsive to contingent circumstances.[22] Furthermore, the notion of a biological niche which organisms create to protect themselves from extinction in an ever- changing environment has gained universal acceptance within the life-sciences (www.brittanica.com/science/community-biology). Biological niches, of course, closely resemble cultural niches that human beings fashion in order to survive and prosper.[23] Finally, Simon Conway Morris has set forth the provocative hypothesis that basically the same principles of self-organization are present in the evolutionary growth and development of widely different plant and animal species. It is as though the cosmic process operative on this earth has an inbuilt 'tool-kit" with which to achieve specific goals and values in its evolutionary orientation and growth.[24] How it came to possess such a "tool-kit" from its beginning billions of years ago remains a mystery, but Morris proposes in the penultimate chapter of his book *The Runes of Evolution: How the Universe Became Self-Aware* that it might indirectly portray the subtle presence and activity of a Creator God.[25]

Still another way to understand the notion of a "tool-kit" for growth in complexity of the cosmic process is provided by John Gribben in his book *Divine Simplicity*. He there argues that at the Big Bang, the beginning of the cosmic process, there was total equilibrium or deep simplicity in that the negative energy of the gravitational field exactly corresponded to the mass- energy of any object in the field. When this bubble of mass-energy exploded, the Universe was born[26] This was followed by a period of

expansion in which whatever happened occurred by pure chance. But out of this chaos new highly complex forms of order gradually took shape in virtue of some universal principle of self-organization within the cosmic process.[27] I would further argue that this inbuilt process could be described as "habit-taking." After a period of experimentation in which various options for further growth are tried out, a consistent pattern tends to emerge that lasts until new environmental conditions arise and the process of experimentation has to begin all over again. As Gribben points out, Mandelbrot fractals exist everywhere in nature by repetition of the same pattern over and over again with different sizes and shapes.[28] Perfectly straight lines exist only in the minds of mathematicians and mapmakers. For us human beings, of course, habit-taking is the way that we develop a consistent pattern of thinking and behavior or "personality."[29]

Finally, Thomas Nagel, University Professor of Philosophy and Law Emeritus at New York University, published *Mind and Cosmos* in which he argued that "mind and everything that goes with it is inherent in the universe."[30] At the same time, he recognized that the dominant presupposition of contemporary natural science is that all physical entities are necessarily composed of inanimate mini-entities (i.e., subatomic particles, atoms and molecules) that are governed by mathematically precise laws of nature. Yet, "if physics and chemistry cannot fully account for life and consciousness, how will their immense body of truth be combined with other elements in an expanded conception of the natural order that can accommodate those things?"[31] No alternative naturalistic explanation for the existence of life and consciousness, however, seems to be fully satisfactory. Creationism or theism presumes a dualism between mind and body,

matter and spirit. That is, an external source is responsible for the existence of all the laws of nature, including the laws governing the emergence of life, consciousness and rationality.[32] Likewise, conceptual behaviorism seems to fall short. That is, external signs of life and mind are not sufficient to verify that there is a realm of the spirit over and above the purely physical order. For, " behaviorism leaves out the inner mental state itself."[33]

Physical reality must involve psycho-physical components at all levels of existence and activity within nature. Yet this position is more a description of what seems to be the case, not its proper explanation.[34] Appeal can be made to a causal explanation based exclusively on efficient causality or to the intention of a divine Creator, as noted above, or to a teleological account in which principles of self-organization are postulated that are not explained by the laws of nature alone.[35] In this teleological account, the universe is rationally governed "not only through the universal quantitative laws of physics that underlie efficient causation, but also through principles which imply that things happen because they are on a path that leads toward certain outcomes—notably, the existence of living, and ultimately of conscious, organisms."[36] Human reason, however, "cannot be analyzed into the activity of the mind's protometal parts, in the way that sensation perhaps can be.[37]" So explanation of the psychophysical character of everything that exists in this world cannot be simply explained by analysis of individual "actual entities," momentary self-constituting subjects of experience, in the metaphysical scheme of Alfred North Whitehead.[38] Yet, as I explain below, Whitehead's explanation of "societies," the objective result of the ongoing dynamic interrelation of

individual entities, produces a new corporate reality that is other than and more than the sum of its parts or individual constituents. Hence, what Nagel proposes as "the fully formed conscious mind"[39] might well be understood as an intersubjective rather than simply a subjective reality. As Martin Buber suggests in his book *I-Thou, "*I require a You to become; becoming I, I say you."[40]

Universal Intersubjectivity as Precondition for a Systems-Oriented Approach to Reality.

In the first chapter of *Process and Reality,* as noted above, Whitehead claims that "the final real things of which the world is made up are actual entities/actual occasions", momentary self-constituting subjects of experience, that in various combinations are the constituents of all the entities, individual and social, making up this world.[41] Each such actual entity is unique in its self-constitution but at the same time is heavily influenced by all the other actual entities in its past history. Here Whitehead is partly agreeing with his predecessor in the history of Western philosophy, Gottfried Leibniz. In his book *Monadology* Leibniz claims that the world is made up of monads, individual mini-substances, each of which was programmed to operate in a singular way but was coordinated with other such monads through a pre-established harmony determined by the Creator God of Biblical revelation.[42] Leibniz's position was, of course, an example of extreme philosophical atomism.

Whitehead for his part rejected the notion of "windowless" monads with his insistence that these monads (for him actual entities) had windows, openings to the full panoply of the world of past actual entities. But he retained Leibniz's proposal that monads/actual entities are still unique in their individual mode of operation. In this way,

as I see it, Whitehead endorsed a less extreme form of philosophical atomism in his own philosophy. But as a result he inadvertently set aside the novel possibility that the natural world is based on a principle of universal intersubjectivity. That is, every actual entity is conjoined with other actual entities in various kinds of intersubjective relations. By an intersubjective relation I mean a relation that is constituted by two or more subjects of experience (actual entities) simultaneously relating to one another. Neither actual entity is ontologically prior to the other. There is no classical cause-effect relation in which the cause is prior to the effect. The relation between them arises out of simultaneous mutual causation so that the actual entities co-determine the relationality common to bothl of them and this newly defined relationality in turn "constrains" (to use Deacon's terminology) the pattern of co-existence of the actual entities in the next moment. So the "common element of form" or governing structure of the Whiteheadian society is not fixed but evolves.[43] Yet it changes form slowly rather than rapidly like the constituent actual entities of the moment. Hence, the Whiteheadian understanding of the reciprocal relation between societies and their constituent actual entities from moment to moment seems to be an appropriate philosophical explanation of what in the life-sciences is called a self-organizing or open-ended (as opposed to closed or deterministic) system.

There is some correspondence here to the thinking of two modern Jewish philosophers Emmanuel Levinas and Martin Buber. In his book *Totality and Infinity* Levinas speaks of the priority of the Other and the needs of the Other in assessing one's social responsibilities.[44] Buber in his celebrated book *I-Thou* refers to the "Between" or "We" relation that momentarily exists when one moves from an impersonal I-It relation

toward other entities to an I-Thou relation in dealing with other entities.[45] Admittedly, elsewhere in *Process and Reality* Whitehead claims that intersubjectivity in the strict sense is impossible since there is always a brief time-gap between the 'superject" or objective self-expression of one actual entity and the "prehension" (feeling-level perception) of that superject by a later actual entity.[46]. Here he fails to take into account the continuity in discontinuity in his own basic understanding of the relation of actual entities to one another and the societies to which they belong. An actual entity only lasts for a brief moment. Its enduring value and significance is the contribution that it makes to the society/system to which it belongs.[47] That is, actual entities share in the intersubjective reality of the societies to which they belong. Focusing simply on actual entities apart from the societies to which they belong is implicitly to reaffirm the doctrine of philosophical atomism.

I turn now to an inspection of a key passage in *Process and Reality* that sets forth Whitehead's understanding of the reciprocal relation between societies and their constituent actual entities from moment to moment:

> The causal laws which dominate a social environment are the product of the defining characteristic of that society. But the society is only efficient through its individual members. Thus in a society, the members can only exist by reason of the laws which dominate the society, and the laws only come into being by reason of the analogous characters [individual patterns of self-organization] of the members[48]

As already noted, there is no classical cause-effect relation between the actual entities

constitutive of the society and the society itself with its "common element of form" or governing structure. Rather, the society and its constituent actual entities sustain one another in existence from one moment to moment. This is related to the Whiteheadian understanding of an actual entity as both a momentary subject of experience and its "superject" or objective self-manifestation from moment to moment. Neither one can exist without the other.[49] Instead, a Whiteheadian society with its governing structure needs constituents, namely, dynamically interrelated actual entities from moment to moment, so as to continue to exist. Likewise, the constituent actual entities need the objective "constraint" of the governing structure of the society at that moment. For Deacon, these constituents of the system are inanimate and function mechanically. In Whitehead's scheme the constituents of a society are alive, momentary subjects of experience, and function spontaneously. That is, they are different from one another but actively influence one's another's self-constitution.[50] At lower levels of existence and activity within nature, of course, the degree of spontaneity thus involved is minimal so that the results seem to be purely mechanical. But at higher levels of existence and activity where consciousness or self-consciousness is involved, the difference between past and present moments of experience is much greater so that creativity and spontaneity are clearly needed to bridge that gap. So the entity in question is evidently alive. In any case, the Whiteheadian proposal of simultaneous mutual causation between a society or system and its constituents from moment to moment is very helpful to explain what Terrence Deacon and other philosopher/scientists mean by "autocatalysis" and "autogenesis." in the emergence of higher-forms of life from lower-order forms of life within the world of physical reality. In effect, the distinction between primary and

secondary causality within classical Aristotelian-Thomistic metaphysics[51] disappears since with autocatalysis and, above all, with autogenesis all the constituents of the entity are equally involved in its ongoing corporate reality as an evolving or a self-organizing system. Simultaneous mutual causation is thus distinctive of an evolutionary approach to reality or a metaphysics of becoming.[52] The same cannot be said of an Aristotelian-Thomistic approach to reality, however, in which nature is indeed hierarchically ordered but in which there is nothing like the unexpected emergence of new forms or levels of being with the passage of time.

In classical metaphysics lower-order entities still serve the needs of higher-order entities or substances (e.g., non-living entities serving the needs of living entities, plants providing food for animals, lower-order animals ordered to the needs of higher-order animals, above all, human beings). But the difference between these two hierarchically ordered metaphysical schemes is that the classical scheme works top-down and the evolutionary scheme works bottom-up. That is, the classical scheme presumes that the enduring substantial form of the entity fully determines the workings of its material constituents (lower-order entities), whereas in the evolutionary scheme the material constituents (subsystems) only ndetermine from moment to moment the form or governing structure of the higher-order system. In both cases, formal causality is operative. But in the hierarchical scheme of classical metaphysics the form is active, whereas in the evolutionary scheme the form is relatively passive, simply acting as an objective constraint from moment to moment on the workings of its subsystems.

Adaptation of Systems Thinking to Key Christian Beliefs

Tus far we have reviewed the increasing role of systems-thinking in the natural sciences and have paid special attention to open-ended or far-from-equilibrium systems in which growth in complexity takes place through constant interaction with external energy-sources in the environment. Likewise, we explored the possibility of a deeper philosophical understanding of the evolutionary process here on earth in and through the metaphysical scheme of Alfred North Whitehead. Now it is time to investigate how this relatively new understanding of physical reality could have further application in the Christian understanding of the God-world relationship as summed up in key doctrinal beliefs.

First of all, is there a systems-oriented explanation of the overall God-world relationship? What comes to mind is the relatively new understanding of the God-world relationship called panentheism (everything in God but still distinct from God in its own finite mode of existence and activity). This is an intriguing idea since it seems to correspond to St. Paul's exhortation to scholars at the Agora in Athens in which he claimed that in the one true God we all "live and move and have our being" [Acts 17:28]. Yet, in the further explanation of the notion of panentheism, there has been little agreement among Christian philosophers and theology.[53] A systems-oriented understanding of panentheism, however, seems to make sense. That is, given a hierarchically ordered understanding of reality, what exists as the topmost system is what might be called the divine life-system, the ontological unity in diversity represented by the Christian doctrine of the Trinity, three divine persons together sustaining one and the same corporate existence as a life-system, From within the transcendent field of activity

proper to the divine persons in their mutual influence on one another, the so-called "Big Bang" presumably took place. That is, a bubble of mass-energy within the divine field exploded 13 billion years ago that was followed by the continued expansion of the cosmic process in size and complexity to this day.[54]

Yet every finite reality thus brought into being from the most primitive (e.g., an atom) to the most complex (galaxies and clusters of galaxies) would still be derivative for its existence and activity from a divine energy-source even as the field proper to the world of creation followed its own more limited mode of operation. Moreover, the basic mode of operation would be the same in every instance. For example, subatomic particles will spontaneously aggregate to form the higher-order unity of an atom, the most primitive system to be found in the world of nature. The unity of the atom "constrains" the activity of its constituent subatomic particles even as these subatomic particles in their dynamic relationship from moment to moment are needed to sustain the ontological unity of the atom Similarly, when atoms aggregate into molecules, they are "constrained" in their independent existence as atoms by the mode of operation of the molecules. Molecules in sufficient numbers and internal diversity later are combined so as to become constituent parts first of prokaryotic cells and then of eukaryotic cells. These cells in turn become constituent parts of ever more complex organisms, and the organisms become component parts or members of a biological community or environment. So a systems-oriented cosmic process gradually unfolds within the parameters of the divine life-system.

Yet the laws and ongoing mode of operation of the cosmic process as a whole are presumably derivative from the inner workings of the divine life-process with its own

transcendent mode of operation. This hypothesis seems to correlate well with the so-called "fine-tuning" of the original parameters of the Big Bang so that the latter would not collapse back into its original state or expand much too fast to allow the subatomic particles to stay in touch with one another and sustain the energy-potential of the original explosion. One can say, of course, that this all happened by chance, given a virtually infinite number of possible worlds. Yet even if it happened by chance, the cosmic process would still seem to be characterized by an ongoing process of converting an initial diversity of parts or members into a higher-order totality. From a Christian perspective, of course, this can be described as the cosmic process becoming more and more the "corporate image" of the triune God.[55]

Furthermore, even within the Christian tradition, belief that the unity of the triune God is the unity of a corporate process solves many of the conceptual problems associated with reconciliation of the notion of three divine persons who are only one God. For it provides a logical middle-ground position between strict monotheism and tritheism. God is indeed one; but it is the unity of a transcendent corporate reality, not the unity of a transcendent individual entity. Each of the divine persons is a process-oriented reality in "his" own right. But by their ongoing dynamic interrelation they simultaneously co-constitute the reality of their corporate existence as one God, a corporate process or divine life-system/community. If Thomas Aquinas, for example, had subscribed to a process-oriented metaphysics of becoming instead of the Aristotelian metaphysics of being for the formulation of his doctrine of the Trinity, then his celebrated definition of a divine person as a subsistent relation would have led him to likewise conclude that the

unity of God is a process-oriented life-system (three dynamically interrelated subjective agencies), not a transcendent individual entity.[56] For, it is relatively easy to understand how three subsystems thus defined by their dynamic interrelationship can combine to constitute a higher-order system. Most higher-order physical organisms have multiple levels of systematic organization (e.g., the nervous system, the circulatory blood system, the pulmonary system, the digestive system) as constitutive parts of their overall mode of operation as a higher-order system. But there is no logical explanation for how three individual entities can become a higher-order individual entity without sacrificing their own reality as individual entities. As Aquinas himself conceded, every individual substance has only one substantial form. If other entities are absorbed into that entity (e.g., atoms and molecules as constitutive parts of a cell or other organism), then the constituent atoms and molecules only potentially exist in the higher-order entity until it dissolves once again into its component parts.[57]

Perhaps even more striking is the way that a systems-oriented approach to reality allows for a new understanding of the classical doctrine of the Incarnation. For, according to the oft- quoted decree of the Council of Chalcedon, Jesus is one person with two *natures*, one divine and one human, that are distinct from one another but inseparably joined together in their conjoint existence and activity:

> We confess one and the same Christ, the Son, the Lord, the Only-Begotten, in two natures unconfused, unchangeable, undivided and inseparable. The difference of natures will never be abolished by their being united, but rather the properties of each remain unimpaired, both coming together in one person and substance, not

> parted or divided among two persons, but in one and the same only-begotten Son, the divine Word, the Lord Jesus Christ.[58]

This decree makes no logical sense if the divine nature and the human nature refer to two quite different fixed ontological realities (*natures* understood as nouns rather than verbs) that somehow still harmoniously co-exist within the same individual entity. But if the term *nature* refers to two life-systems (*natures* in an action-oriented or strictly verbal sense) that are hierarchically ordered to one another so that the divine nature is superior to the human nature and yet "constrained" in its mode of operation through union with the humanity of Jesus, just as the humanity of Jesus is "constrained" in its existence and activity by inclusion within the divine nature, then the classical doctrine of the Incarnation makes perfect sense from a purely rational perspective. It is no longer simply a religious belief lacking in empirical verifiability. For example, during his earthly life Jesus functioned more obviously in virtue of his human nature even though the divine nature was invisibly operative in his words and actions, above all in his healing miracles. After his resurrection, the divine nature was more evident though the human nature was still present. The Apostles and Mary Magdalene still recognized Jesus in his glorified body after their initial shock in seeing him alive again. Likewise, in the Pauline doctrine of the Cosmic Christ "who fills the universe in all its parts" (Eph. 1:23) the divinity of Christ is more prominently displayed than the humanity but the humanity is still an integral part of the existence and activity of the risen Lord.

Two other traditional Christian beliefs that can be conveniently reinterpreted via a

systems-oriented approach to reality would be the doctrine of life after death and the salvation of the entire world as part of the cosmic process. First of all, with respect to life after death for human beings, I note that in a systems-oriented approach to reality a human being is a complex set of subsystems (ongoing sets of dynamically interrelated events) that together constitute that person as a human being. At the moment of death these systems start to break down. Hence the transformation of an earthly human body into a glorified body capable of enjoying eternal life takes time. For a new overall pattern of existence and activity for that human being can only occur when one's physical body is reduced to its subatomic components (in a Whiteheadian context, its ever-changing constituent actual entities). At that point, the new pattern proper to a glorified body can reorganize all the patterns that governed one's bodily life over the years and adjust them to full participation in the divine life-system in which one has unconsciously lived from the moment of creation. Hence, the transition from life in this world to eternity is in its own way quite natural. Like Jesus, one has always lived in two dynamically interrelated life-systems (however unconsciously). Within this life, the human life-system takes precedence over the divine life-system. In eternity, the reverse is true. That is, the divine life-system takes precedence over the human life-system. One is living in a glorified body, not a corruptible body as in this life, but still in a body.

How one lives in this glorified body, however, depends upon the decision one makes at the moment of death or sometime thereafter. In virtue of the dramatic reorganization of one's bodily life-system, presumably one will experience oneself as a

whole for the first time. That is, at the moment of death one will comprehend the full pattern of events that have contributed to who one is, what one has become, up to that final moment. This is a moment of judgment when one either accepts responsibility for what one has become over a lifetime or rejects it because it is too painful to admit to oneself. The divine persons, in other words, do not judge that person. The person passes judgment on his/her own life. To be admitted into the company of the elect, one has to be truthful about one's past history and ask for forgiveness from others where needed. If one agrees to do so, one is "saved." If one refuses to ask for forgiveness, one condemns oneself to "hell," eternal life but in isolation from the divine persons and all the saints until such time as one sees the error in one's ways and asks for forgiveness.

With respect to the salvation of the entire cosmic process, I argue that it is actually taking place from moment to moment but that it will be complete only when the cosmic process as a whole comes to an end as a result of the inexorable workings of the principle of entropy on a cosmic scale. Just as with human beings, all the innumerable systems at work in the cosmic process will progressively break down as the universe either expands to the point where no contact of systems with one another is possible any more or where the universe contracts to the point where it is reduced without remainder back into the divine energy-field from which it emerged at the time of the Big Bang. Over the course of the cosmic process, then, all the finite systems proper to this world will be progressively transformed from an earthly status to a glorified status so as to belong to the Kingdom of God or the Cosmic Christ in its fullness. Admittedly, since everything that exists shares in the "fallen" character of the world described by St. Paul in the Epistle

to the Romans (Rom. 8:19-21), everything has to be purified of its participation in that fallen state. Naturally, the bulk of the responsibility for the fallen state of the universe rests with human beings and other higher-order animal species who make more or less conscious choices for good or evil during their lifetime. But the need to transform the world from its present fallen condition into the glorified state proper to participation in the Kingdom of God or the Cosmic Christ still has to be all-inclusive. For, as Whitehead comments at the end of *Process and Reality*, everything in this world that can be saved will be saved.[59] Nothing of value in the cosmic process will be lost. Or, as Teilhard de Chardin expressed it at the end of his book *The Phenomenon of Man/The Human Phenomenon,* "In its radical nucleus, the world finds its shape and natural consistency by gravitating against the probable, toward a divine focal point of Spirit that draws it forward. Something in the cosmos, therefore, escapes entropy—and does so more and more."[60]

CONCLUDING REMARKS

Given this summary of a systems-oriented approach to reality at all levels of existence and activity, one should at the same time remind oneself that this metaphysical scheme is only a model or symbolic representation of what is in fact the case. As a result, it will be useful in some respects in constituting for oneself a new contemporary world view and yet deficient in other ways for that same task. Such are the limits of human understanding of the world in which we live. There is always more to learn than what we already know or can even imagine at the present time.

ENDNOTES

[1] Stephen Toulmin, *The Return to Cosmology: Postmodern Science and the Theology of Nature* (Berkeley, CA: University of California, 1982), 272: "We can do our best to build up a conception of 'the overall scheme of things" which draws as heavily as it can on the results of scientific study, informed by a genuine piety in all its attitudes toward creatures of other kinds: a piety that goes beyond the consideration of their usefulness to Humanity as instruments for the fulfilment of human ends."

[2] Ibid., 16.

[3] Granville Henry, *Christianity and the Images of Science* (Macon, GA: Smith & Helwys), 21-31.

[4] Alfred North Whitehead, *Process and Reality: An Essay in Cosmology*. Corrected Ed., eds. David Ray Griffin and Donald W. Sherburne (New York: Free Press, 1978), 90-91. Hereafter, PR.

[5] Stuart Kauffman, *At Home in the Universe: The Search for the Laws of Self-Organization and Complexity* (New York: Oxford University, 1995), 3-30.

[6] Ibid., vii, 47.

[7] Stuart Kauffman, *Reinventing the Sacred: A New View of Science, Reason and Religion* (New York: Basic Books, 2008), 281-88.

[88] Terrence W. Deacon, *Incomplete Nature: How Mind Emerged from Matter.* (New York: W.W. Norton, 2012), 175-81.

[9] Ibid., 182-205.

[10] Ibid., 479-80.

[11] Ibid., 227-34.

[12] Ibid., 261-63.

[13] Ibid., 292-95.

[14] Ibid., 319-25.

[15] Ibid., 264-71.

[16] Ibid., 77-79.

[17] Whitehead, PR, 177-78.

[18] Thomas Nagel, *Mind and Cosmos: Why the Materialist Neo-Dearwinian Conception of Nature is Almost Certainly False* (New York: Oxford University, 2012), 15.

[19] Jesper Hoffmeyer, *Biosemiotics: An Examination into the Signs of Life and the Life of Signs,* tr. Jesper Hoffmeyer and Donald Favareau, ed. Donald Favareau (Scranton, PA: Scranton University, 2008), 3-5.

[20]Ibid., 31-37; 195-97.

[21] Evelyn Fox Keller, *The Century of the Gene.* Cambridge, MA: Harvard University, 2000), 66-72; 133-48.

[22] Ibid., 71-72.

[23] Deane-Drummond, *Wisdom of the Liminal, 219-22.*

[24] Simon Conway Morris, *The Runes of Evolution: How the Universe Became Self-Aware* (West Conshohocken, PA: Templeton Foundation, 2015), 3-8.

[25] Ibid., 297-300.

[26] John Gribbin, *Deep Simplicity: Bringing Order to Chaos and Simplicity* (New York: Random House, 2005), 117-18.

[27] Ibid., 74-84.

[28] Ibid., 88-100.

[29] See also Deacon, *Incomplete Nature,* 182-84; Hoffmeyer, *Biosemiotics,* 39-40 for their understanding of habit-taking within a systems-oriented approach to evolution.

[30] Nagel, *Mind and Cosmos,* 15.

[31] Ibid., 8.

[32] Ibid., 21.

[33] Ibid., 38.

[34] Ibid., 44-45.

[35] Ibid.,, 58-59.

[36] Ibid., 67.

[37] Ibid., 87-88.

[38] Whitehead, PR, 18.

[39] Nagel, *Mind and Cosmos,* 87.

[40] Martin Buber, *I and Thou*, tr. Walter Kaufmann (New York: Scribner's, 1970), 62.

[41] Whitehead, PR, 18.

[42] . W. Leibniz, *Monadology,* tr. Robert Latta (Blacksburg, VA: Virginia Tech, 2001), nn. 53-59.

[43] Whitehead, PR, 34.

[44] Emmanuel Levinas, T*otality and Infinity: An Essay on Exteriority,* tr. Alphonso Lingis. Pittsburgh, VA; Duquesne University, 1969), 42-48.

[45] Buber, *I and Thou,* 62.

[46] Whitehead, PR, 27-28.

[47] Alfred North Whitehead, *Adventures of Ideas.* (New York: Free Press, 1967), 204.

[48] Whitehead, PR, 90-91.

[49] Ibid., 28.

[50] Ibid., 22-23; 34.

[51] Thomas Aquinas, *Summa theologiae* (Madrid; Biblioteca de Autores Cristianos, 1951): I, Q. 22, art. 3.

[52] Gribbin, *Deep Simplicity,* 111.

[53] *See, e.g., In Whom We Live and Move and Have Our Being: Panentheistic Reflections on God's Presence in a Scientific World,* eds. Philip Clayton and Arthur Peacocke (Grand Rapids, MI: Eerdmans, 2004), x-xvii, where a brief summary of the understanding of panentheism by each contributor is presented.

[54] Gribben, *Deep Simplicity,* 117-18.

[55] Cf. Colin E. Gunton, *The One, the Three and the Many: God, Creation and the Culture of Modernity* ((New York: Cambridge University, 1993), 210-31.

[56] Thomas Aquinas, *Summa theologiae* (Madrid: Biblioteca de Autores Cristianos, 1951): I, Q. 29, art. 4. N.B.: I presume here that *relation* be understood in a verbal sense as an activity (i.e., "relating") rather than in a nominal sense as an individual entity.

[57] Ivor Leclerc, *The Philosophy of Nature* (Washington, D.C.: Catholic University of America, 1986), 136.

[58] See *The Teaching of the Church,* tr. Geoffrey Stevens, ed. Karl Rahner, S.J. (Staten Island, NY: Alba House, 1969), 154.

[59] Whitehead, PR, 346.

[60] Pierre Teilhard de Chardin, *The Human Phenomenon,* tr. Sarah Appleton-Weber (Portland, OR: Sussex Academe, 1999), 193,