CHAOS AND GOD'S ABUNDANCE:
AN ONTOLOGY OF VARIETY IN THE DIVINE LIFE

by James E. Huchingson

Abstract.   The primordial chaos of Genesis 1 may be understood as the *Pandemonium Tremendum* (or PT), the infinite field of variety or abundance within God. The concept of variety is taken from Claude Shannon's theory of communication. Especially significant is Shannon's notion that communication is the limitation of variety through decision processes. In one model of the divine life suggested by the theory, the PT is the boundless source of potential reaped by an agential God in the act of creation as a communication process. Other models for creation include the PT in a biased mode and creatures themselves as decision agents.

Keywords: chaos; communication theory; God; information; Pandemonium Tremendum; Claude Shannon; variety.

[The divine life] is the ground of all abundance, and it is abundance itself.
                                    —Paul Tillich, *Systematic Theology*, vol. 1

Even a casual examination of the history of the doctrine of God reveals how important new theories in science often overflow the formal domain for which they were intended, to influence other disciplines and the broader culture. For example, the mechanistic model of the physical universe of the late scientific revolution had profound consequences for prevailing concepts of the world, humankind, and God. Even today, its unfortunate legacy, the deus ex machina, persists as a widely accepted image of God's relationship with the creation, confirming the observation that, even if theology stands idly by, popular and philosophical reflections on current science will have an impact on religious thought for better or worse.

James E. Huchingson is Associate Professor of Religious Studies at Florida International University, Miami, FL 33199. He presented an earlier version of this paper to the Theology and Science Group of the American Academy of Religion in its annual meeting, 24 November 1996, at New Orleans, La.

No one expects this dynamic to change—indeed, it should be encouraged—but what has changed or is now changing is the understanding of organization in nature. While mechanistic assumptions continue to influence scientific inquiry, there is a growing appreciation for an alternative model of the universe, which consists of dynamic, self-organizing, and complex systems.

Insight based on this appreciation of complexity constitutes a revolution (some would say an epiphany) in itself. Western thought has long relied heavily on Neo-Platonic and classical ontologies of form that emphasize standardization. Science (with its quest for universal laws uniting diverse phenomena) and technology (with its commitment to the efficiency of industrial processes of mass production) clearly illustrate the dominance of this paradigm. The science (and ontology) of complexity is replacing, or at least modifying, the standardization of simple forms as the root concept guiding our understanding of reality.[1] The resulting shift in attitude and vision is transformative in its consequences—even for concepts of God.

The higher reaches of theology, perhaps the highest, are ontological inquiries into the nature of God's inner life. Given claims of divine aseity (God's insurmountable transcendence or wholly other-ness) and the high abstractions involved in their elaboration, attempts to explore the divine life are daunting. Still, if pursued with persistence, ingenuity, and reasonable prudence, the rewards of such efforts are numerous. They include the ability to help in understanding the nature of creation, God's relationship to creation, and the proper place of creatures in it. Without theology as pure "God-talk," those who seek a total understanding of reality within the context of faith would know less about the world than they could.

How things *are* really means, ultimately, how things *are for God* and, furthermore, how things originate in or with God as the first part of a twofold movement, the second part of which is how, once created, things return to God. To narrow the proportion of our ambition, we will focus on the first of these movements: how things *are* in a most fundamental and primordial sense of their origins in and through the divine life.

What follows is a systematic exploration into models of God that is guided by select concepts taken from an influential theoretical science of complexity, the communication theory of Claude E. Shannon. Because this exploration can do no more than illustrate constructive correlation between an ontology of divine life and Shannon's theory, we will limit inquiry to one issue: the role and place of chaos (in the classic sense found in Genesis 1) in the divine life and its implications for the creation.

INFORMATION THEORY: A PRIMER

In 1948 Shannon, of Bell Laboratories (building on the insights of Norbert Wiener, the father of cybernetics, and others), described for the first time in formal mathematical terms what scientists had intuited for years—a comprehensive understanding of communication (Shannon 1948). Shannon developed the tools to predict, and then measure, the capability of a channel to transmit a commodity called "information." Shannon's theory defines a precise unit for the amount of information in various broad classes of messages, similar perhaps to the centimeter in length, the gram in weight, or the milliliter in volume, as these represent basic units of quantity.[2]

Commuters along the information highway know that this unit of information is the *bit* because it is expressed as a binary digit, as a 0 or a 1. A bit may be defined as the quantified measure of a decision that resolves the uncertainty between two equally probable events. Before a coin is tossed, for example, the outcome is uncertain within specified limits, heads or tails (two possibilities, or one bit of capacity).[3] Following the toss, the uncertainty is resolved when the coin lands heads up or tails up. A variety of 2 (a single bit) is reduced to 1, which according to the calculus of information theory is no variety at all, or 0 bits (Ashby 1961, 126).

Toss a coin, and you have sent a message the effect of which is to resolve the probabilities, to reduce the number of states that might occur to the one state that does occur. A message is a signal that reduces uncertainty by decisively reducing the variety of the set from many to few—or, most often, from many to one. The act of communication settles the situation once and for all. Uncertainty vanishes.

A message is the result of the act of communication understood as a decision or selection process—the reduction of a set of possibilities to a single definitive instance. The decision may be intentional, as when I decide to stroke the *v* key rather than any one of the other fifty or more keys on my keyboard when spelling *variety*. In this single act I send a message, or "process" five-plus bits of information. On the other hand, the act may be blindly automatic or even completely left to chance, or some combination of the two, as with the operation of natural selection on random mutations in living things. In each case, variety is reduced, and something is resolved. In Gregory Bateson's whimsical terminology, a "muddle" becomes a "tidy" (Bateson 1972, 3). Information is processed, a message is sent, and communication takes place.

VARIETY IN GOD

Traditional accounts of the nature of divinity are couched in *essential-ism*, the claim that God *is* because God and God alone contains existence as a necessary element of the divine essence. The approach required by the communication model is primarily an operational understanding. The question here is, How does God come about? By what means or process does God constitute the divine nature? God is self-productive in a most fundamental sense, and in some way this productivity spills out of God in intentional abundance and comes to be the creation. Asking how this occurs presents an opportunity to use a constructive approach to theology guided by Shannon's ideas.

When read in the light of communication theory, the creation account of Genesis 1 contains few surprises but a major problem. God calls the creation progressively out of chaos, literally bit by bit, through a series of divisions that resemble discrete message transmissions. Tradition denies that the original chaos, *tohuwabohu* (that "without form" and "void") or *tehom* (the "deep" or "abyss"), had any substantial role in this process. Although the doctrine of *creatio ex nihilo* that God creates out of nothing preserves the sovereignty and majesty of God and protects divinity from dualistic and pantheistic embarrassments, it does so at the cost of dismissing the clearly documented presence of the primordial chaos. More than a child's innocent curiosity is involved in the questions; what is the source and status of the chaos on the first day of creation, and where does the chaos go after the sixth?

An alternative to this paradoxical situation that is frequently recognized but seldom developed in Western theological traditions portrays the primordial chaos as one aspect of the divine abundance, the source of all created things. Representatives of this position include Jacob Boehme's *Ungrund*, later developed by Nicolas Berdyaev as the freedom of *me on* or nonbeing (Hefner 1984); Meister Eckhart's enumeration of the natures of divinity as the indeterminate ground, giving rise to a determinate figure; and, of course, Rudolf Otto's phenomenological appraisal of the experience of the holy as the *Mysterium Tremendum et Fascinans*. Otto's terminology may be modified to reflect the place and role of chaos within the divine life as a source of abundance—the *Pandemonium Tremendum* (hereafter, the PT). Indeed, Otto's accounts of the experience of the holy described as the *Mysterium Tremendum* include elements of dread, foreboding, and creaturely insignificance, just what one would expect in the encounter of a mere mortal with the PT (Otto [1923] 1958).

In an information model of divinity, it is possible to imagine the chaos residing within God as the primal source of all created things. Here, however, the chaos is not limited to an absolute fitful state of affairs that

disallows the emergence of any enduring order. Rather, it consists of infinite variety as understood by information theory.[4] This would be an infinite assortment of discrete events, elements, or states distributed with complete randomness—an equiprobable distribution—shifting and mixing incessantly in a condition of complete instability. Each element or potential state is dead-even with respect to its realization in competition with all other states. Essential also to the PT is the aspect of turbulent mixing or elemental agitation, the ceaseless shuffling of possibilities in a roiling chaotic broth.[5]

As an infinite field of variety, the PT is not yet limited by anything other than its own collectivity. Each element is "out of place," without locus or position. Such extreme context independence or utter happenstance is in consequence of the fact that the radical disconnectedness allows for no mutual influence, not even simple spatial connection. The elements are present to nothing and hence nowhere (although a discussion of their being present to God and therefore somewhere—in or with God—follows).

The nearly universal rejection of composition in God in the theological tradition is based in part on the conclusion that composite things are subsequent to their parts and depend on them. God, being necessary, depends on nothing but God. Hence God must be simple. However, it certainly appears that simplicity is the one attribute an infinite field of variety could never have. If that were so, the conclusion would follow that God, containing the PT, would be liable to disintegration. This conclusion is not so compelling as it first seems for two reasons.

First, the prodigal unorganized complexity of the PT leads to a limiting state approached, as with a paradox of Zeno, asymptotically. The ontological limit of the PT is absolute simplicity. If, as Thomas Aquinas maintained, simplicity means the absence of composition, the PT is both simple *and* discrete, lacking all composition with respect to overall arrangement, relationship between elements, or assortment of those elements into species of classes. With the melding of the Plenum and the Void, absolute heterogeneity approaches homogeneity as its limiting case.

Second, a God incorporating infinite variety cannot fall apart, go to pieces, because the PT is already in a pure equipotential state of maximum informational entropy or dispersion—similar, for example, to Pierre Teilhard de Chardin's concept of infinite multiplicity.[6] A pile of sand is a thing—but only minimally. Variety without constraint, especially infinite variety, is not a thing at all. Decay, disintegration, dissipation, dissolution and other terms signifying "destructure" in a system cannot apply to unbounded variety because the PT has a character of complete indefiniteness, which renders such processes meaningless with respect to it. It is difficult to undermine the abyss.[7]

The presence of the PT, the infinite field of variety, in or with God, counts for nothing unless it is counted by God. In communication theory, variety is the material out of which a transmitting agency constructs messages through a decision process that introduces or increases constraint within a set of possible signals that may be assembled from that variety. To be effective, the transmitter must have total access to the set in the sense of knowing the disposition of each and every element. In like manner, God is both the unlimited source of that variety in that God "knows" the PT thoroughly, and the unwavering, unerring source of the constraint necessary to generate messages. Neither of these aspects is dispensible in the creative divine life. God's survey of the PT and God's decisions regarding it constitute the single integrated activity of reaping the whirlwind while speaking *from* the whirlwind.

The normal process of communication—the reduction of uncertainty through the transmission of messages—cannot apply to God's dealings with the PT. This boundless field of variety is not constrained, limited, or ordered in any way. That is what gives it a distinctive character—or more accurately, its distinctive and complete lack of character, of form.[8] No patterns or tendencies endure in its maelstrom. Any effort by God to organize or domesticate the profound wilderness of the PT would, by definition, destroy it along with its infinite potential. Yet God must necessarily track or oversee the PT in order to employ it as the source of divine transmission. This means that, to know or achieve certainty about the PT, God must employ another approach.

God's sweeping and penetrating survey of the PT is congruent with the infinite range of the field itself; and, in the absolute resolution of its detail, it is also infinite. This combination of breadth and depth is a kind of ordering of the chaos—for order, in one of its definitions, is a state of complete knowing. If the position of every element in a random distribution is known to an observer, then that state is not chaotic for that observer, but rather displays a unique order, unique in the sense that its particular arrangement is not an instance of some more inclusive pattern, nor is it generated by an algorithm.

A good analogy for this rendering of omniscience is a professor's disheveled office, in which piles of books and papers are strewn everywhere. A student entering the office will, to paraphrase Mark Twain, have to take soundings to navigate through the clutter. In the absence of any rhyme or reason to serve as a guide, the student will be in a state of complete uncertainty with respect to the location of any particular book. However, the professor, far from being absentminded, can locate any item without hesitation. Unlike the ignorant student, the professor's certainty resides in the knowledge of the whole territory in absolute detail—in all its microstates. For the professor in this office, no pattern exists, but certainty does.

God may be said to possess knowledge of the PT in the same way the professor possesses total knowledge of the office. God's inventory is complete for any combination of microstates that the system of variety assumes in its constant shuffling. Each element is perceived with respect to its utter detail, its "leastness" understood as absolute context independence, simplicity, and irreducibility.

GOD, THE *PANDEMONIUM TREMENDUM*, AND CREATION

By entertaining the vast PT in all its states without composing or arranging the elements into some preferred system or order, God is perfectly impartial. If this impartiality were the whole story, there would be no creation; but of course there is the creation, and its existence can only be explained by postulating a subsequent act of arrangement on God's part, wherein the divine impartiality is succeeded by partiality. This can only mean that God chooses from among the possible states of the PT and actualizes some while denying all the others. One can imagine this movement as the binary inquiry of information processing—the progressive dividing of the PT by the detailing of reality, similar to the Genesis account, where cosmos is commanded out of chaos through successive stages of *divisio*.

A further implication of this operational account is that God constitutes God's self through the act of receiving variety and subjecting it to decision processes. By imposing constraint upon the PT in this sense, God self-articulates by ever increasing God's certainty through the everlasting act of self-communication. Anyone familiar with process theology can carry this account to its conclusion. The richly connected and complex reality that results from this incessant transmission stream is the creation. The orderly world is the consequence of abundant messages sent and received as God decides concretely what God shall become.

An alternative to this process model is found by relocating the agency of decision or concretion. In an absolute minimal sense, God represents a bias in the PT, an ongoing disturbance in the equipotentiality of the infinite field of variety. This bias serves as a source of constraint and, to a receiver of messages that result from its presence, resembles an agent of decision bringing forth the miraculously articulated world.[9]

If God is the name of the PT in its biased mode, immoderately generating worlds without end, the more appropriate image of divinity is to be found in Eastern rather than Western traditions. The PT stands alone as the Tao, the Plenum or the Void (or both), the great Nothing that "things" prodigiously. In the West the traditional image of God is the means theism uses to make sense of this thinking process, this "lila" or play of the PT positing itself from the matrix of anarchy for no apparent reason (Hall 1978).

In either of these two models (God the intentional agent of decision giving rise to a determinate world through the achievement of divine certainty, or God the irreducible perturbance of the PT, the great swirling cyclone on the face of Jupiter) the world that arises as a consequence is populated with creatures who are genuine decision agents browsing or foraging on the variety immanent in the world.

Indeed, in a third alternative the focus is removed from God or the PT to the world as the primary source of ordering decisions. Through the perspective provided by Shannon's concepts, constraint in nature signifies that communication and decision processes are at work reducing some primal field of variety to discrete and settled instances. Here the image of the PT is that of an incessant transmission stream of undifferentiated primordial variety. This stream branches into numerous smaller streams and these into yet smaller ones, in an iterative process ending finally in an immense number of capillaries feeding individual beings. The nodal points where the excurrent arterial streams branch and multiply are the places where decisions are made, where constraint is imposed on the inexhaustible mother stream through decision events in a process that is repeated in descending fashion and with ever greater limitation until the individuals of the existing world at any given moment are rendered definite and concrete. Although resident agents of decision—creatures—are responsible for much of this branching process, it may be that, at the more inclusive or originating levels, some cosmic agent of selection is still required. In any case, in this model creatures play the decisive and deciding role in the specification of reality. They are self-constituting and partake of the stream for their origin and sustenance as low entropy, high-order natural systems. At the very least, creatures, through their alert exploitation of favorable opportunities, are cocreators in the everlasting process of *divisio*.

Concluding Remarks

It would not be claiming too much to say that there are several potential advantages in this approach. It ends the lingering dualism of chaos and God, and affirms the creation despite the presence of chaos in its midst. In its account of God's sustaining activity in the creation, it eliminates the unconnected deux ex machina of earlier models. By describing the PT as inherently dynamic, it exorcises the residual Platonism of theology found, for example, in process thought. Finally, with an emphasis on an operational rather than an essentialist description of the inner divine life, it offers a way to go beyond classical categories of ontology without abandoning them altogether.

Despite the tentativeness and incompleteness of these ideas, any exploratory attempt to demonstrate the disclosure power of images of the

divine life based on scientific models is a fruitful exercise. Alternative approaches, especially metaphorical theology, are important, but what they often lack is the logical structure that allows for statements about the divine life to be correlated in a thoroughly coherent way. The connection between Shannon's communication theory and theological accounts of abundance in the divine life may, in some sense, be metaphorical (*isomorphic* is preferred), but the important point is that inquiry proceeds much further if the worldly image or scheme with which the concept of God is to be correlated brings with it an inherent rational structure. The advantage of scientific models is that they often provide such structure, and thus more explanatory power, than purely metaphorical models. Shannon's theory of communication is an instructive illustration of this claim.

NOTES

1. This is not to claim that determinate laws of nature are being replaced but that their application does not always lead to the straightforward linear predictability celebrated by Newtonian science. Even as the behavior of natural systems conforms to these laws, a free play of chaos and unforeseen complexity often arises as well. Laws of nature are a fixed canon of rules that provide a wide range of permissible outcomes in varying contexts. The world that conforms to these laws exhibits many degrees of freedom (Ashby 1961, 129), immense possibilities for the instantiation of deceptively simple laws. In this sense we live in an irregular universe, the understanding of which reveals the absurdity of purely Laplacian claims.

2. Unlike many scientific theories, communication or information theory did not arise from the investigation of natural phenomena. Rather, it was developed in response to important problems in technology. In this way communication theory parallels thermodynamics, which arose initially from the study of heat transfer in steam engines. Also, neither communication theory nor thermodynamics is limited in its application to technical or artificial devices—computers or steam engines. The laws of thermodynamics are universal. We can expect that information theory will likewise continue to be expanded fruitfully to include natural systems of all sorts, especially living systems.

3. Information is also the measure of the variety of a system defined as the number of distinguishable elements or possible states it contains. If this number is N, then the bits of information contained in N is the logarithm of N to the base 2. In other words, variety is measured in powers of 2.

4. The ontological status of variety remains to be discussed but, unfortunately, not in this introductory account. Such a discussion would include the obvious question about variety per se. Taken as a noun, variety always signifies the collective distinctions existing within a group or aggregate of differing entities. Variety never refers to a reality apart from this characterization of an assortment. To speak of variety as a reality apart would seem to be reification, linguistic nonsense. However, the widespread reliance on the concept of "Being" or "Being-Itself" as a fundamental axiom of classical metaphysics (God is Being-Itself) would seem to be implicated in an identical fallacy. Variety, at the very least, is the first derivative of Being. But, as we argue here, it is more fundamental than that.

5. Chaos is rarely depicted as a quiescent state. From the stormy waters of Genesis to the fiery impermanence, *anicca*, of Buddhism—literature, metaphysics, and mythology universally describe chaos in dramatic and violent terms. Purely random Brownian motion of particles is more disordered than a set of static elements. Chaos is a state of maximum excitation or, as information theorists would say, total noise.

6. "At the lower limit of things, too deep for any of us to penetrate, it [the world] discloses an immense plurality—complete diversity combined with total disunity. This absolute multiplicity would, in truth, be nothingness . . ." (Teilhard de Chardin 1968, 46).

7.   The concept of the PT carries potential for relating *me on* or relative non-being with *ouk on* or absolute non-being—a distinction made by Paul Tillich (Tillich 1967, 188)—in terms of continuity. If successful, the claim made by some theologians that God's being embraces or contains absolute non-being may be given a reasonable accounting.

8.   Lao Tsu's *Tao Te Ching*, the most authoritative document of ancient philosophical Taoism, makes this point nicely. The Tao is

> The form of the formless
> The image of the Imageless

(Lao Tsu 1972, 14)

9.   In this case a subtle form of agency is attributed to the PT, thereby reducing the necessity of postulating a separate principle or agent of concretion who, in the image of the Neoplatonic *Nous* or Whitehead's God, takes static eternal objects or ideas and incarnates them into the world. In the systems-informational model the dynamic PT is perfectly capable of performing this function on its own.

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