Chaos, Creation and God

THE PROBLEM

Henry Adams observed in 1907 that "Chaos is the law of Nature; order is the dream of man."[1] David Hume expressed the opinion that order is imposed by human beings on the disorder of nature; we tend to see order where there is none. Only relatively recently, since Mitchell Feigenbaum began thinking about chaos in 1974,[2] has science taken serious notice of the disorder in the universe.

Traditional Christianity proposes a divine creator of all that exists, characterised by omnipotence, omniscience, pure goodness and immutability. However, the creation which was defined by the Bible as "good" is often perceived, through human experience, to be flawed. Creation is also characterised as moving toward an ultimate fulfilment, yet the physical universe is apparently moving toward ultimate death. The basic creative processes of the natural world appear to function by chance rather than purposeful intention. Even the initial Big Bang may well have been the result of a quantum accident in the fabric of space-time.

Stephen Hawking has made a case for not needing a beginning to creation,[3] in which case there is no need for a creator;[4] but Hawking's argument does not diminish the need for the Transcendent. Science alone cannot provide a basis for meaning to life, but in a world in which the relevance of God may be questionable, an image of God which conflicts with a scientific understanding of reality may do unnecessary damage to credibility of revelation. What images of divine creativity best fit an empirical perception of reality?

In the pursuit of this question we are bound by the realisation that the mystery at the foundation of existence seems to be impenetrable. Both scientists and theologians agree on this. Human beings have created images of God as one means by which to speak of this great mystery. Images of God are formulae created to express the human experiences, perceptions and assumptions about the mystery of existence, but they do not explain what God actually is. Over the course of time, even within a given religious tradition, images of God change and evolve in order to continue to be functional, given changes in culture and world view. In recent years, theologians such as Sally McFague[5] have accepted the challenge to try to reconcile theology with a more informed account of creation, but difficulties remain. I believe there is value in seeking an image of God with which both scientists and theologians may speak together about the nature and processes of creation, and which demands no discontinuity between empirical evidence and divine revelation.

Subject matter from a wide range of human endeavours has been gathered here, and an admittedly speculative hypothesis has taken form. I acknowledge that this is only the merest of beginnings in the search for a new image of the Creator.

THE PREMISE

Creation from chaos is portrayed in many creation myths around the world, including the Hebrew creation myth in the Bible. However, the nature of the creative process has usually been depicted as a process of ordering the chaos, where "chaos" is assumed to mean disorder. If the assumption of an initial state of disorder is incorrect, then the creative process may be quite different than previous assumed. This paper proposes that the initial creative act was the disruption of an initial state of order, as Hawking's "No Boundary" model suggests. If there is a Creator-God, then God is a divine stirrer.

Smaller scale parallels with this creation by disruption abound. The human psyche is initially thought to be born in a state of undifferentiated unconsciousness, from which awareness gradually emerges from the undifferentiated state in a disruptive process which, for Carl Jung, was symbolised by a butter churn.[6] Great works of artistic beauty often spring from men and women whose lives and minds are in a state of disarray. The very existence of the physical world depends upon chance events at the molecular, atomic and sub-atomic levels. Biological evolution depends upon instability and, indeed, instability seems to be decisive for self-organising phenomena in many natural systems. Significant changes in the course of history result from apparently small and insignificant random events.

Underlying all is the Second Law of Thermodynamics, often called the Law of Entropy, which states that any closed system (including the universe) moves inexorably toward increased disorder. If there is a divine process exhibited in the natural world, it would seem to include, as one of its basic characteristics, an urging toward disorder. There are pools of stability which form temporarily amid the eddies of the Law of Entropy. We recognise these and identify them as parts of "The Creation," but they are temporary. One lasting characteristic of the universe is its movement toward ultimate disorder. The only apparent certainty about the nature of the creation is that the universe will die, either endlessly expanding and frozen, or collapsed by gravity upon itself in a fiery "Big Crunch."

Creativity, it seems, relies on this underlying movement toward disorder, and if the on-going natural processes within

[1] Michael Shermer, "Exorcising Laplace's demon:chaos and antichaos, history and metahistory," ,*History and Theory*, Feb 1995 v34 n1, p.61

[2] J.Gleick, *Chaos*, London:Sphere, 1988, pp.1ff.

[3] It is theoretically possible for the universe to be finite, but without a space-time boundary.

[4] S. Hawking, *A Brief History of Time*, London: Bantam, 1988, p.149.

[5] S. McFague, *The Body of God: An Ecological Theology*, Minneapolis: Fortress, 1993

[6] C.G. Jung, *Symbols of Transformation*, Princeton: Princeton University Press, 1956, p.149.

creation are a guide to the initial act of creation, the universe itself will have begun its current expansion due to a similar process: a random cosmic accident amidst the pure order of preexistent chaos. In years gone by, order in nature was used as an argument for the existence of a creator; however, it seems more plausible to cite disorder as the creative stimulus. Creativity seems to be the result of the process of disrupting that which is, so as to allow something to grow which has not been before.

The development of images of a beneficent creator who is building an ordered universe may have been a human way of coping with the anxiety of living amongst a creative process which does not act to purposefully fashion the future, but rather acts to disturb the present so that the future has no choice but to find itself. Such a concept may well be unsettling for those who rely on a creative God to bring security in the midst of caprice, but when we look at the world through the eyes of psychology, biology, philosophy, physics, history and the experiences of our own lives, it is hard to escape the perception that newness is born from unpredictable change, and creativity is motivated by disruptions to the settledness of life. Even that which we call "evil" may be part of the action of God which is required to bring about something new.

DEFINITIONS & ASSUMPTIONS

The word, "chaos" originally referred to the formless void from which everything was made. It comes from a root which means to yawn: a yawning abyss. Unlike its modern connotation of randomness and disorder, the original understanding of chaos was of a no-thing, undifferentiated and hence unnameable. Rather than disorder, we may even hypothesise that this initial chaos was pure order. When chaos is used here it will have its original connotation, unless it is part of a quote from another source. The more modern meaning of chaos will usually be conveyed with the word, disorder. Thus we may speak of a God who creates from chaos by disordering it.

In order to proceed, the writer makes some assumptions which are beyond the scope of this paper to explore further. First, the laws of nature are assumed to be valid for the life of the universe, especially the Second Law of Thermodynamics (also called the Law of Entropy). This leads to the conclusion that the ultimate destiny of the physical universe is complete disorder - death.

Second, the processes of creation which can be witnessed today may reliably point to the nature of the Creator (or creating principle) and the creative processes which have existed in the past.

Third, reality is one, therefore, no discontinuities should exist between revealed knowledge and empirical knowledge.

CHAOS THEOLOGY

"The mystery of the initial chaos finds a parallel in the mystery of the singularity of the Big Bang before Planck time (10^{-43} sec)[7] in the scientific account of the cosmological evolution. Theologian and scientist must both admit the limitations of our understanding of beginnings."[8]

In the search for an image of God which will better assist the religion-science dialogue, it is necessary to reexamine the contribution of revelation, especially given its misrepresentation in the past. The Bible is, of course, the authorised record of revelation in the Judeo-Christian world, but more generally, revelation about creation is found among myths in numerous cultures.[9]

In the Babylonian legend of Enuma Elish, chaos (Tiamat) is slain by Marduk and the world is created out of her corpse. Hindu myth tells of the primeval giant, Purusha, who was destroyed by Vishnu, and out of his body the world was created. The Icelandic Eddas relate how Ymir, also a primeval giant, was killed and dragged into Ginnunga Gap and the earth was formed as a result. Likewise, the Koori legend of Karora contains the same elementary idea of the all-containing primal being from which everything springs.[10]

"When God began to create the heavens and the earth, the earth was without form and void...." (Genesis 1:1)[11] This translation of the Hebrew view of creation is similar to other Near Eastern creation myths and to that of *The Timaeus* in that the world was not considered to be created *ex nihilo* (from nothing), unless we equate "nothing" with an undifferentiated "no-thing" (chaos).

The Hebrew creation story, like its Near-Eastern counterparts depicted creation from chaos. Chaos theology is an attempt to state a theological position which arises from the revelation about a God who creates out of chaos. A proponent of chaos theology, Sjoerd Bonting, challenges the church's doctrine of *creatio ex nihilo*, and argues that the Jewish creation story mirrored other Near Eastern creation-out-of-chaos myths: "God

[7] Planc time is theoretical limit to science's ability to investigate events subsequent to the Big Bang;prior to this time, space and time did not exist as we know it.

[8] S. Bonting, "Chaos Theology: A New Approach to the Science-Theology Dialogue," *Zygon: Journal of Religion & Science*, Vol. 34, Issue 2, June 1999, P.7

[9] The word, myth, refers here to eternal stories which lie within the human psyche and find expression in every culture and every generation. One does not ask if myths are true; myths simply are, and they continue to exist because they express a reality which resonates in the soul.

[10] J. Campbell, *Primitive Mythology*, New York: Penguin, 1976, p.106ff.

[11] See Bruce Vawter, *On Genesis: A New Reading*, New York: Doubleday, 1977, p.37, for comments about preferred interpretation of the first two verses of Genesis.

creates not by destroying chaos but by ordering it, by pushing back chaos in the three separations (Genesis 1:2–10)."[12] .

From the biblical record, as well as other creation myths, records of revelation proclaim that chaos is the precondition to creation. My intention is to take a step further, and explore the idea of the God who creates from chaos not by ordering as Bonting has stated, but by disordering. Putting aside for a moment the question of the source of the initial chaos, we note that the chaos of the Bible is a formless void, an undifferentiated whole; therefore a Creator's initial act would have been the differentiation of an undifferentiated no-thing into things, i.e. into differentiated parts. The primary act of the mythic creator would have been the fragmentation of wholeness, ie. an act of disordering. As the ancient myths point out, it is not possible to create something without destroying something else at the same time, even for a creator God. To create the first thing was to destroy the no-thing; to fill emptiness was to destroy it.

Bonting also notes that "The presentation of creation in six "days" plus a "day" of rest, which is not found in any other creation myth, suggests a continuation of the process of creation (*creation continua*) toward a transcendent goal, the destiny of creation."[13] If the ultimate destiny of creation is, as it seems, death, then *creation continua* is a continuation of this process of disordering and ordering until that final act of disorder after which reordering is no longer possible, at least not within the natural laws currently governing the universe.

A traditional Judeo-Christian interpretation depicts chaos as the monster, Leviathan,[14] from whom the Creator protects the world; a beast which threatens to devour the creation, plunging it back into its original state. Chaos theology indeed offers a better explanation for the contingency of creation than the doctrine of *creatio ex nihilo* . The cosmos can be understood as moving between the poles of disorder and order, which matches the scientific perception of the unpredictability and accidentalness of cosmic and biological evolution.[15] Chaos theology also provides a congenial theological insight with which to interpret the scientific expression, the "Big Bang," in terms of "an ordering from initial chaos by pushing back chaos."[16] Yet chaos theology remains at odds with scientific evidence.

When Bonting writes,

> The view that in the future kingdom the chaos element will be completely abolished reflects the perfection and fulfilment of the present world rather than its cataclysmic destruction,"[17]

he seems to be ignoring the reality that the cosmos is winding down. Unless the Second Law of Thermodynamics is to be denied, there is no question about this. Either this law, which has decreed a death sentence upon creation, was itself determined in the initial act of the Creator, or else the Creator was bound by this law before the act of creation, perhaps as the creative mechanism itself.

The Law of Entropy is a foundational element of creation, and indeed may be the most basic creative principle of the cosmos. This is the element which is most likely to be the final word of God, and it will win in the end. To try to put another interpretation upon it, eg. portraying it as the mythical Leviathan which threatens to gobble up the world, is to end up with a metaphysical dualism in which the Creator is reduced to a demiurge who fights an ultimately losing battle with the Law of Entropy.

In its attempt to assist the religion-science dialogue, chaos theology has drawn on information theory. If the information content is proportional to the order of a system, as Tom Stonier assumes, then from the Boltzmann-Schrödinger formula it is possible to derive an equation which shows that at infinite entropy, information content is zero, and vice versa.[18] Bonting draws the conclusion, "If the equation is applicable to the cosmos, we could say that infinite entropy and zero information content would represent the initial chaos at the moment of the Big Bang."[19] But it is not possible in nature to have a system which begins at infinite entropy and proceeds to infinite entropy.

The argument turns on the understanding of the initial chaos. The theologian argues from an understanding of chaos as infinite disorder, but there are problems. Infinite disorder suggests a myriad of differentiated bits of matter-energy having no connections or relationships to one another. This initial state would require a tremendous input of energy to order it, demanding a very powerful act of God indeed. Since energy, like matter, is also a part of the universe, we are left to wonder: Where, unless we turn back to creatio *ex nihilo*, does the energy come from? In fact, this description better fits the end of the universe, the point of maximum entropy. At the end it would appear that any Creator-God who fashioned the universe from total disorder would have to give way to the Law of Entropy as it returned, dust to dust, to its supposedly initial state. Such a God would hardly rate the label, "omnipotent."

We have no such problems (apart from the limits of the mind to conceive of it) if initial chaos is understood to be an infinitely ordered, undifferentiated no-thing . It is also more comparable to the singularity which physicists hypothesise as pre-Big Bang reality. Stephen Hawking's mathematics suggests that, indeed, the present universe must have started in

[12] S. Bonting, *op.cit*, p.4
[13] S. Bonting, *op.cit*, p.4
[14] Job 41:1; Ps.74:14; Ps.104:26
[15] S. Bonting, *op.cit*, p.5
[16] *Ibid*, p.5
[17] *Ibid*, p.6
[18] T.Stonier, *Information and the Internal Structure of the Universe*, London: Springer Verlag, 1990, pp.38–41, 70–72
[19] S.Bonting, *op.cit*, p.8

an ordered state.[20] This order, when disturbed, differentiated and disordered, gave birth to all of the discreet units which we call the universe. Although apparently disordered, the matter and energy released in the Big Bang was also believed to be accompanied by the generation of negative entropy (ie. information-energy).[21] Not only is no input of energy required from outside, but energy is released in quantities which defy the mind to grasp. In its lifetime the universe feeds on this energy, grows and evolves under the influence of a creatively disruptive essence, until at last, in its old age, it dies. This is the natural progression of every part within the cosmos; it is not inconsistent that the same progression should apply to the universe as a whole.

To be consistent with the laws of nature and the apparent end of creation, the precondition to the Big Bang must be infinite information, zero entropy, ie. the pure order of an undifferentiated whole, upon which a disruption (differentiation) is imposed (Big Bang). In the beginning the low entropy (high information) of the total system allowed a reordering of the newly differentiated matter, a process which has continued to this day. Eventually, as information dissipates and entropy approaches infinity, further reordering will become impossible, and the universe will die in frozen inertness.

If the mass of the universe is sufficient, gravity eventually will collapse the matter of the universe upon itself.[22] Some have suggested that, in such a scenario, the universe might recycle in another Big Bang, but unless there is a change in the laws of physics, the Law of Entropy still wins because, though energy may be conserved in the total system, entropy is not; the disorder remains even if the universe collapses.[23]

THE PROCESSES OF *CREATIO CONTINUA*

The universe is riddled with daily disorder. Chaos theory proposes that

> A natural system governed by a nonlinear dynamic equation (living beings, solar system, weather, and so on) may encounter in the course of time a bifurcation point, where it can take either of two directions that are energetically indistinguishable[24] Through amplification of small fluctuations in a succession of such bifurcations the behaviour of the system becomes unpredictable, leading to chaos events... The scientist concludes that chaos events make the universe unpredictable and open.[25]

The exquisite sensitivity of a chaotic system makes it reasonable to believe that quantum mechanical indeterminism could be capable of influencing macroscopic events. God would not have to do very much to such a chaotic system in order to drive it from one type of future state to one of a very different complexion, so modern exponents of chaos theology say that, in such apparently random events, God can be active immanently and providentially through the operation of the Holy Spirit, without violating the physical laws established in God's transcendent action in the Big Bang. This theological statement is a reasonable hypothesis which allows God to be active in the ordering process of creativity, but a disordering process still occurs first; the primary creative act is disruptive. The extent to which God is also involved in reordering what has been disordered remains an open question.

Though we cannot see back in time to the moment of creation, we are witnesses to on-going creation all around us. In various fields of knowledge, disorder is revealed as the key to creativity and changes. What follows is, by necessity, a cursory glance over a wide field of knowledge, in which examples of creation through disorder are evident.

Physical Creation

The development of quantum mechanics and the formulation of the uncertainty principle brought the realisation that there is a practical limit to the ability of science to predict the action of subatomic particles. The best that can be offered is a given probability that a particle will perform in a particular way. Furthermore, the chance that a particle will behave in a certain way is a function of, in addition to the usual parameters, the observer. It seems, that at the most elemental level of existence, the universe defies the human desire to discover order in it. Scientists and theologians have drawn various philosophical conclusions about what this natural indeterminacy means, but there is little doubt about the observed manifestation of random chance among the building blocks of the universe.

Whilst the religion-science dialogue often focuses upon the role of chance in quantum physics as evidence of contingency in creation, we also see chance at work at the molecular level. P.W. Atkens describes chemical reactions as "transformation by misadventure."[26] Underlying all chemical processes is the Second Law of Thermodynamics which creates a tendency for molecules to lose energy to their surroundings. Without this tendency to lose energy, atoms would be so strongly bound that the "initial primitive form of matter would have been locked into permanence."[27] However, this tendency is also marked by a degree of restraint so that there is a "controlled,

[20] S. Hawking, *op.cit*, p.157.
[21] P.Davies, *God and the New Physics*, Middlesex: Penguin, 1983, p.214.
[22] A collapse is now considered unlikely as recent evidence suggests that the universe is expanding at an increasing rate.
[23] *Ibid*, p.158-161.
[24] Crutchfield et al. 1995, cited in S.Bonting, *op.cit*, p.9.
[25] S.Bonting, *op.cit*, p.9
[26] P. W. Atkins, "Why Things Change," *From Creation to Chaos*, ed. Bernard Dixon, London: Basil Blackwell, 1989, p.1
[27] *Ibid.*

not precipitate, collapse."[28] In order for there to be chemical change, atoms must be stimulated by chance energy, eg. two atoms or molecules collide and energy is transferred.

The collapse into disorder (Law of Entropy) "motivates change, for all natural events are outcomes of the tendency to dispersal." [29] However, disorder also stabilises, "because the chance is small that molecules are favoured with enough energy for them to explore alternative arrangements." [30]

The transition from the realm of the physical laws into the biological realm takes with it the underlying tendency toward disorder. Even consciousness may be seen to be driven by the Law of Entropy. Since all reactions are aspects of disorder, then perception, decisions and reflections are also propagated through motiveless, random dispersal.

It may not have been necessary to have a Great Constructor in order for life to have evolved. As Atkins said, "Molecules did not aim at reproduction, they stumbled upon it."[31] Evolution is reaction by seduction, because small change is more likely than large change, and can be regarded as a "geared and cooperative dissipation of energy."[32] At the point at which self-replicating molecules formed, a new level of natural law imposed itself over the purely physical laws of physics and chemistry. Although still bound by the physical laws, this new layer acted to moderate the innate randomness of evolution.

Biological Evolution

As Richard Dawkins pointed out, Darwin's "survival of the fittest is a special case of the more general law of survival of the stable."[33] Replication of certain molecules ensure their perpetuation and so their population will increase faster than those molecules which form merely by chance. At some point in time these replicating molecules linked, by chance, in ways which crossed the border between non-living and living. Those living forms which were best suited to continued replication in their environment flourished relative to those which were not so well suited.

Fortunately for us, the successful forms, which flourished because of their superior stability, were not completely stable. If they had been protected from the disordering essence of the creation, evolution would have ceased. Evolution is only possible because of the errors which creep into the replication process.[34]

Recent experiments on Turing instability have revealed that, when two cells are coupled, a non-linear variation is set up in the concentration of waves of chemically active media which act as morphogenes, causing random variations in the system. These random oscillations of excitability in otherwise stable cells seem to be the mechanism for morphogenesis: the process creating of forms and patterns in the development of an embryo which give it its own uniqueness. One may conclude that instability is a natural and necessary characteristic of systems which organise themselves, and that this instability forms the basis of functioning as well as malfunctioning.[35]

Evolution is also assisted by external disorder as well as natural internal disorder. It has been noted that the evolution of life has not been a smooth progression. Long relatively stable periods have existed, broken by periods of large scale change. In biological evolution catastrophic events have played a decisive role in the course of evolution. Random major disturbances to the environment resulted in an acceleration of evolution which enabled life to continue despite environmental changes.[36]

Over time the locus of the ordering aspect of the creative process has become more and more evident within the creation itself, and also has become more intentional. In biological evolution we witness the rise of a self-ordering factor within the creation which responds against the underlying tendency to disorder.

In the early phase of the universe the only type of explanation available is one in terms of physics and chemistry. Evolution was governed solely by the formation of particles and their gradual interaction and accretion into stars and other cosmic phenomena. With the appearance of life, however, a new type of explanation is possible, because a new form of matter is present. The emergent biological laws (natural selection, transmission of genetic information, cognitive representation of the environment),while being bounded by the laws of chemistry and physics, are not fully describable in terms of those laws. On top of the template of physics and chemistry can be laid a further template of biology. These laws and phenomena, as such, are in hierarchic relation to one another, and it can be fruitful to speak of interaction between different levels of organisation by the exchange of energy and information. This opens the door to speak of "top-down" causation, in which higher-order realities affect lower-order ones by what has become known as top-down causality. Such causation, is not a violation of lower-level physical laws but

[28] *Ibid.*
[29] *Ibid*, p.2
[30] *Ibid.*
[31] *Ibid.*
[32] *Ibid.*
[33] R. Dawkins, "The Replicators,"*From Creation to Chaos*, ed. Bernard Dixon, London: Basil Blackwell, 1989, p. 39.
[34] *Ibid*, p.42

[35] L.M. Kocarev & P.A. Janjic, "On Turing Instability in Two Diffusely Coupled Systems," *IEEE Transactionals of Circuits and Systems: Fundamental Theory and Application*, vol.42, Oct. 1995, pp.779ff.
[36] Niles Eldredge's and Stephen Jay Gould's evolutionary theory of punctuated equilibrium.

is rather bounded by them.[37] In this vein, Peacocke speaks of downward causation in terms of a flow of information, i.e. anti-entropy, to be contrasted with the upward causation in the form of energy.[38]

Within the cosmos, consciousness seems an excellent example of an emergent reality that effects a top-down causation. Conscious minds operate on their own level of reality and readily engage in decision making, questioning, and other activities which in turn affect in various ways the environment around us. The changed environment, in turn, affects us, and we go through the cycle again. The higher-order events of our minds thus impinge on lower-level events, which then affect the very mind that caused the set of circumstances to come about.

Creatio continua is thus characterised by a tension between two forces: an eternal call to disorder and a response by the creation to self-order. As evolution reached the stage of consciousness, the ability of the creation to order itself has increased to the point where, in *homo sapiens*, it can anticipate the future and plan accordingly.[39]

History

In recent years much has been written of the application of chaos theory to history. History is predictable in only a very broad sense, and even those predictions are usually shown to be wrong in hindsight. Scientific insights about disorderliness have been applied to the study of history, and have led to an understanding of the process by which small random events effect large-scale change.

In chaos theory a "strange attractor" causes the flow of change in a dynamic system to be "attracted" to certain points in the system. Similarly, historical focal points in a chronological system act like the strange attractors in a dynamic system. That is, there are special points in history when there is a particular conjuncture of events that creates conditions ripe for significant change.

In 1984, Ilya Prigogine and Isabelle Stengers made a few direct comparisons from physics and chemistry to human history: "We know now that societies are immensely complex systems involving a potentially enormous number of bifurcations exemplified by the variety of cultures that have evolved in the relatively short span of human history."[40] In other words, historical processes can be understood in terms of chaos theory.

In a discussion of the nineteenth-century fascination with the "great men" of history, Charles Dyke asked: What made them great? Divine providence? Special ability? Dismissing the former as untenable for a secular interpretation and the latter as refutable by the fact that lots of talented people never became "great," Dyke turned to a "special circumstances" interpretation in which "historically, under some conditions of stability, even very able people won't be expected to have much of an impact on what goes on. But under conditions of extreme instability - the late Roman Republic, France after a few years of revolutionary government and war, for example - someone with a threshold level of ability in the right place at the right time can have an enormous impact."[41]

Human Creativity

> All the noble discoveries have (if you observe) come to light, not by gradual improvement and extension of the arts, but merely by chance...
>
> Francis Bacon (1620)
> *Novum Organum*

Recent experiments on the brain have shown that, when a new stimulus is introduced to a human subject, brain patterns show a increase in disorder as the brain apparently goes into a random trial and error mode in order to learn how to process the new stimulus.[42] A new random event thus triggers another non-linear complex of events in the brain, and the result is a new pattern of brain activity as the brain learns to deal with a new stimulus, ie. to tame the disorder.

The creative processes of the unconscious seem to work on the principle of creation by accident. Schiller notes that man is at the highest level only when he plays, ie. with no conscious purpose.[43]

> I tell you, one must have chaos in one to give birth to a dancing star. I tell you: you still have chaos in you.
>
> Friedrich Nietzche
> *Thus Spoke Zarathustra*

[37] G. R. Peterson, "The Evolution of Consciousness and the Theology of Nature," *Zygon: Journal of Religion & Science*, vol.34, no.2, June 1999 p.8f

[38] A. Peacocke, *Theology for a Scientific Age: Being and Becoming—Natural and Divine*, Enlarged Edition, Minneapolis: Fortress,1993, cited in G. Peterson, *op.cit*. p. 291.

[39] Ironically, the creation's increased ability to order itself has been accompanied by a matching ability to self-destruct.

[40] I. Prigogine and I. Stengers, *Order Out of Chaos* ,New York, 1984, p.313, quoted in M. Shermer, *op.cit*, p. 62.

[41] C. Dyke, "Strange Attraction, Curious Liaison: Clio Meets Chaos," *Philosophical Forum* (1990), 382f. cited in M. Shermer, *op.cit*, p.63

[42] W.S. Pritchard & D.W. Duke, "Measuring Chaos in the Brain," *Brain Cognition*, vol.27, Apr. 1995, p.353ff.

[43] M. von Franz, *Creation Myths*, Zurich: Spring, 1972, p.26

Creative people seem to fall into two main categories: those such as Beethoven who live a disorderly bohemian life style, constantly close to the unconscious, or more commonly those who need "some upheaval from outside - a depression, emotional upheaval, illness - to get into a state where they can create," eg. Goethe, who "needed to fall in love, complete with accompanying crises, before he could bring out another work."[44]

The Human Psyche

Since creation from initial chaos occurs in nearly all creation stories, this concept assumes the character of an archetype in the Jungian sense, a primordial image in the collective human unconscious.[45] These myths probably say more about the process of awakening consciousness rather than the creation of the cosmos; however, our interest is in the processes of creation generally, given the possibility that the process at work in parts of the created order mirror the processes at work in the whole.

The development of the psyche also begins with an act of disruption or destruction. "Every bit of progress in consciousness, every creative process, every widening and changing of the conscious attitude, first destroys a primitive original totality."[46] The Chinese, especially the Taoists, stressed creation as a sort of murder.

As in some of the creation myths which already have been mentioned, in the creation myth of Tchuang-Tzu, the cosmos arises from the murder of kind, friendly Hwun-Tun, meaning chaos or unconscious. The Master of the Southern Sea has many moods, many facets; he does not have one idea or one purpose of mind - a ditherer. The Master of the Northern Sea is hasty, too quick to seize upon one idea or one course of action. The two could be named Heedless and Hasty. In between is Hwun-Tun (chaos-unconscious): confused, unintelligible, unclear and undifferentiated, but harmonious, without cause, bottomless with roots that cannot be seen. Heedless and Hasty often met in the middle space of Hwun-Tun, and he was always very friendly toward them. Heedless and Hasty often wondered how they could reward him. They noted that, though human beings had seven orifices so that they could see, hear, eat and breathe, Hwun-Tun had none; so Heedless and Hasty decided to give Hwun-Tun a gift of the seven orifices. Each day they drilled a hole into Hwun-Tun, and on the seventh day he was dead. He had been nicely murdered.

These myths express the psyche's knowledge of the creative processes at work in itself, and, with the wisdom inherent in the unconscious mind, project these processes upon the whole of the created order. On their own, such myths are meagre evidence about cosmic origins, but the concern of this paper is revelatory knowledge and reconciling it with empirical knowledge about the origins and destiny of the universe. The myths reveal a creative process which begins in an act of destruction and disorder, whilst western religion posits a God who orders and constructs. Given a choice between a revelation of a God who creates by ordering and a God who creates by disordering, the empirical evidence suggests the latter, while still allowing the work of the former.

AN IMAGE OF GOD

Thomas Wright, the discoverer of galaxies, wrote in 1750, "Since as the creation is, so is the creator also magnified."[47] The 19th century proponents of the argument from design agreed and drew the conclusion that the existence of a watch implied the existence of a watchmaker. Darwin and Huxley showed life as evolving from random processes with natural selection operating of the results, and thus began the destruction of the argument from design. Nevertheless, Wright may not be wrong; a creation which is powered by underlying disorder may magnify our view of a different kind of creator.

Allowing the assumption that the universe did not just spring into being of its own accord, and that there was a creative moment from which it began, we may also be allowed to speculate upon the nature of the creative process. We may prove nothing, but all we need with which to start is an image of the creator which is harmonious with empirical evidence and consistent with revelation, so as to assist the religion-science dialogue and maintain a language with which to speak of the mystery at the heart of reality in hope of discovering some meaning to our existence

Images of God and models of the initial creative act are admittedly speculative; nevertheless they still may be useful in providing a language for discussion. Unless there has been a radical change to the underlying creative mechanism of the cosmos, the natural processes of creation which are observable in the present, though they may take a variety of forms, may be of the same nature as those at the beginning. Given the evidence offered by the processes of *creation continua*, on-going creation seems to yield a moment's stability between two opposing principles inherent in nature: a yearning to find stability and permanence within a dynamic and destabilising stream.

The ordering principles at work in the universe are not really so mysterious. The so-called "new physics" allows for an explanation of the creation of the universe within the known laws of physics[48] Perhaps the four primary forces of nature (weak nuclear, strong nuclear, electromagnetic and gravitational) may be thought of as lines of communication, the remnants of the order of the primal singularity (chaos),

[44] M. von Franz, *op.cit*, p.64
[45] S. Bonting, *op.cit*, p.5
[46] M. von Franz, *op.cit*, p.100f.

[47] cited in F. Dyson, (1979) "The Argument From Design," *From Creation to Chaos*, ed. B.Dixon
[48] P.Davies, *op.cit*, p.216.

which convey the initial information content of pre-Big Bang unity, making it possible for the products of the Big Bang to reorder themselves. The constructive principle in creation could thus be understood to be creation's own self-ordering tendency. As discussed above, the evolution of life has increased the self-ordering intentionality of the universe. The real mystery is found when faced with the stimulus toward disorder: that which caused the Big Bang in the first place, and which causes the various self-ordered parts of the cosmos to continue to disassemble, thus forcing the universe continuously to seek new forms of order. There is no omega point, no goal, no known future except the final state of complete disorder at the end. If one must have a God without including a metaphysical dualism, then God must fit one of two images. Either God is the Great Disrupter who will win out in the end against the attempts of the creation to order itself, or else God must embody both principles: both builder and destroyer.

This writer believes that an image of God is required, not to define some metaphysical reality, but to enable us to speak of mystery. The initial creation is, and will probably always be, a mystery, and it is important to be able to talk about it. The question which Martin Heidegger called the fundamental question of metaphysics: "Why is there something rather than nothing?"[49] is a question about the meaning of life which demands at least an attempt at an answer. The locus of such an attempt seems to be at the point of the beginning of the universe where physical and metaphysical meet.

The traditional theist image of God, that is, a God who is a perfect, immutable, all-good, all-knowing, all-loving eternal, supernatural being who creates and rules the world, has always been on shaky logical ground:

(1) If God is all-good and all-powerful, why doesn't God get rid of the evil in the world?

(2) If God is perfect and all-powerful, why isn't God's creation perfect?

(3) A caring God would experience joy and sorrow like us; but that would mean that God changes and is not immutable and perfect.

(4) The same applies to divine knowledge: for God to know what we experience, God would have to have experiences (which again implies that God is changeable).

As the 19th-century philosopher Ludwig Feuerbach pointed out (in an idea developed further by Sigmund Freud), in order to avoid confronting our own limitations and the harsh realities of the world, we have invented a transcendent father figure (God) who is an idealisation of everything we like about ourselves.

There is a natural human yearning for comfort and security in the face of finiteness, and perhaps one outcome of this yearning has been the image of a God who has everything under control, and who will bring everyone and everything to a good end. Yet scientific empirical evidence suggests that the universe itself will come to a sticky end, and that this end was established with the creation of the laws of nature. Furthermore, the disordering principle which leads to the final end is also part of the creative essence which has has driven the evolution of primal matter into a discovery of consciousness, and which continues to drive it. Alternative images of God seem to be needed.

Pantheism, one alternative, suggests that everything is part of one unity, and this totality is God. Nature/the universe is the ultimate reality of which we are only parts (Spinoza). Panentheism is a variation of pantheism in which God is one with the universe but is also more than the total of all the beings in the universe; God is the complex and creative integration of the whole that is greater than the sum of its parts.

One may object that to be so linked to the world means that such a God cannot end evil and suffering; God can only provide prospects for optimising further resolutions of what has already happened. In fact, this is far closer to the common perception of reality than the traditional theist view. The creation is not perfect; evil and suffering seem to be an integral part of it. What we call evil and suffering may simply the human experience of the necessary processes of evolution.

It is hard to imagine creation from chaos without a metaphysical dualism, and this difficulty was one of the primary reasons for the church's doctrine of *creatio ex nihilo*. Near the beginning of this paper the question of the origin of the initial state of chaos, or the singularity of the physicists' model, was put aside. If an image of God is going to function as a tool in the on-going religion-science dialogue, it must account for the relationship of God to the initial state. A neo-pantheistic approach may be the most helpful.

Information theory has given rise to an image of God as the bearer of the *Pandemonium Tremendum (PT)* the potential for all things. It is an image which fits well into a scientific world understood in terms of chaos theory, communication theory, and quantum mechanics. In an information model of divinity, it is possible to imagine the chaos residing within God as the primal source of all created things.[50]

Although James Huchingson, in discussing this image, interprets chaos as total disorder (infinite entropy, zero information), he also adds that God must also have complete information about the system. One can't have it both ways. If God has the information necessary to define the order of the system, and the chaos is within God, then the chaos is not

[49] M. Heidegger, *An Introduction to Metaphysics*, Yale University Press, New Haven and London, 1959, pp. 7-8

[50] J.Huchingson, "Chaos and God's Abundance," *Zygon: Journal of Religion and Science*, vol.34, no.2, June 1999, p.327f

really disorder at all, but the opposite: the pure order of an undifferentiated no-thing. In fact, Huchingson recognises that the *PT* is undefinable as "thing," and thus it suits the original definition of chaos.[51]

There is a certain poetry in the way that the destiny of the universe reflects the destiny of its parts, including the destiny of the human being. Perhaps this is also the destiny of God. The ancient myths of a cosmos born from the body of a primal being may yet be a helpful language in which to talk about the mystery of existence. The most useful image of God may be that which unites the universe into a living totality - a mystical union - born from the essence (chaos) of God's being, driven by the disrupting action of God's mind acting to discover Godself, evolving first by chance and then by gradually increasing intention, finding fulfilment in an awareness of itself, and then dying, perhaps to reincarnate in another universe when time begins again. If the universe and God are one, there is still room in such an image for something other than matter-energy which may continue to exist when the physical universe reaches its terminal state; something which continues to alter the status quo to find new ways of being which neither the creation nor God have yet imagined.

CONCLUSION

Recent attempts of theologians to accommodate a new scientific world view, and their embrace of chaos theory and quantum mechanics as a means of God's continued action in the process of creation, have gone part of the way toward bringing a creditable image of God to the religion-science dialogue. However, they have been reluctant to challenge the traditional notion of God as an omniscient, omnipotent constructor whose work will one day be perfected, despite scientific theory pointing to the destiny of the universe as certain death. A glance at the creative processes at work in the universe reveal not a careful construction according to a plan, but evolution by chance amidst growing disorder. If God is perfect, this perfection is not reflected in God's craftsmanship, at least not from a human perspective, for life seems capricious and tainted by evil and suffering. These apparent difficulties disappear if God is understood as the eternal disrupter of the status quo, never satisfied with what is; a trial and error God who continually forces the creation to find a new and better order. The issue of the extent to which God has a finger on the reordering process is left an open question, but about a disordering process at the heart of the cosmos there can be little question.

Of course this alternate image of God also creates new problems. A discussion of the consequences of a new image of God on the nature of ethics and on the theological concepts such grace, judgment, salvation and hope are left for another day, but the image of a God who continuously disrupts creation that it may evolve in a process of self-discovery promises to make sense out of previously unanswerable questions about the origin of evil, disorder and imperfection, to eliminate the apparent contradiction between the purpose of God and freedom, and also to provide a metaphysics which does not clash with physics. A new image may even enhance the sense of meaning of human life as is casts it in the role of a conspirator in *creatio continua* which brings consciousness and "top-down" causation to the otherwise random "bottom-up" processes of evolution.

[51] "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...The PT stands alone as the Tao, the Plenum or the Void (or both), the great Nothing," *Ibid.*

BIBLIOGRAPHY

Atkins, P.W. , "Why Things Change"(1981), *From Creation to Chaos*, ed. Bernard Dixon, London: Basil Blackwell, 1989, pp.1-6.

Bacon, Francis, "Novum Organum" (1620), *From Creation to Chaos*, ed. Bernard Dixon, London: Basil Blackwell, 1989, pp.7f.

Bonting, Sjoerd L, "Chaos Theology:A New Approach to the Science-Theology Dialogue,"*Zygon: Journal of Religion & Science*, Vol. 34, Issue 2, June 1999, pp.323-332.

Campbell, Joseph, *Primitive Mythology*, New York: Penguin, 1976.

Capra, Fritjof, *The Tao of Physics*, New York: Bantam, 1976.

Crutchfield, James P., *et al*, "Chaos," *Chaos and Complexity: Scientific Perspectives on Divine Action*, ed. Robert J. Russell, Nancey Murphy, and Arthur R. Peacocke, Berkeley, Calif.: Center for Theology and Natural Sciences, 1995.

Davies, Paul, *God and the New Physics*, Middlesex, England:Penguin, 1983.

Dawkins, Richard, "The Replicators"(1976), *From Creation to Chaos*, ed. Bernard Dixon, London: Basil Blackwell, 1989, pp.38-45.

Charles Dyke, "Strange Attraction, Curious Liaison: Clio Meets Chaos," *Philosophical Forum* 1990, pp.382f.

von Franz, Marie-Louise, *Creation Myths*, Zurich: Spring, 1972.

Gleick, James, *Chaos*, London:Sphere, 1988.

Griffin, David R, "Creation Out of Chaos and the Problem of Evil," *Encountering Evil*, ed. Stephen T. David, Atlanta: John Knox Press, 1981.

Hawking, Stephen, *A Brief History of Time*, London: Bantam, 1988.

Heidegger, Martin, *An Introduction to Metaphysics*, New Haven and London: Yale University Press,1959.

Huchingson, James E., "Chaos and God's abundance: an ontology of variety in the divine life," *Zygon: Journal of Religion & Science*, vol.32, no.4, Dec. 1997, pp.515-523.

Jung, Carl G, *Aion*, Princeton: Princeton University Press, 1959.

Jung, Carl G, *On the Nature of the Psyche*, London: Ark, 1988.

Jung, Carl G, *Symbols of Transformation*, Princeton: Princeton University Press, 1956.Kocarev, Ljupco M. & Janjic, Predrag A, "On Turing Instability in Two Diffusely Coupled Systems," *IEEE Transactionals of Circuits and Systems: Fundamental Theory and Application*, vol.42, Oct. 1995, pp.779-784.

McFague, Sallie,*The Body of God: An Ecological Theology*, Minneapolis: Fortress, 1993.

Peacocke, Arthur, *Theology for a Scientific Age: Being and Becoming—Natural and Divine*, Enlarged Edition, Minneapolis: Fortress,1993

Peterson, Gregory R, "The Evolution of Consciousness and the Theology of Nature," *Zygon:Journal of Religion & Science*, vol.34, no.2, June 1999, pp.283-307.

Popper, Karl R., "Scientific Reduction and the Essential Incompleteness of All Science," *Studies in the Philosophy of Biology: Reductionism and Related Problems*, ed. Francisco Jose Ayala and Theodosius Dobzhansky, Berkeley: Univ. of California Press, Vatican City State: Vatican Observatory Publications, and Berkeley, Calif.: Center for Theology and Natural Sciences,1974.

Prigogine, Ilya & Stengers, Isabelle , *Order Out of Chaos* , New York, 1984.

Pritchard, W.S. & Duke, D.W., "Measuring Chaos in the Brain, *Brain Cognition*, vol. 27, Apr. 1995, pp.353-397.

Shermer, Michael, "Exorcising Laplace's demon:chaos and antichaos, history and metahistory," *History and Theory*, vol.34, no.1, Feb 1995, pp.61ff.

Stonier, Tom, *Information and the Internal Structure of the Universe*, London: Springer Verlag, 1990.

Vawter, Bruce, *On Genesis: A New Reading*, New York: Doubleday, 1977.

Zukav, Gary, *The Dancing Wu Li Masters*, Glasgow:Flamingo, 1979.