EMERGENCE

The New Creation Story

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EMERGENCE

Introduction:

> ***Emergence is the view that new and unpredictable phenomena are naturally produced by interactions in nature; that these new structures, organisms, and ideas are not reducible to the subsystems on which they depend; and that the newly evolved realities in turn exercise a causal influence on the parts out of which they arose.***[1]

One of the key ideas in modern scientific thought has been that of evolution. That idea is most strongly linked to the notion of biological evolution stemming from the work of Darwin, but it also shows up in a vast array of other scientific areas of thought. The basic idea is that the current status of things is a product of gradual change through natural causes, and that the world is not the same as it always was but rather that things have always been in some sort of gradual change. This idea was introduced into geological theory first by James Hutton in 1795 and then made more popular by the work of Charles Lyell (e.g. his Principles of Geology published in 1833). Lyell and Hutton argued that geological formations had arisen from the gradual action of processes that could be observed at present such as erosion, natural floods, earth quakes, and volcanic activity.

Lyell's writings were among the influences on Charles Darwin as he developed his ideas about the evolution of biological creatures. It has been reported that Lyell's book on the Principles of Geoloy was one of the few volumes that Darwin took with him on the voyage of the Beagle. Darwin extended the idea of gradual evolution to the world of living things, and sharpened it in that arena with the notion of survival of the fittest. Those living creatures among a particular population whose characteristics best fitted them for their environment were the ones who would have the most reproductive success. Thus their characteristics would become more common amongst that population.

A third piece of this picture came in the twentieth century with the discovery of the famous 'red shift', the development of the theory of the expanding universe by Edwin P. Hubble, and George Gamow's Big Bang hypothesis. These ideas brought the notion of gradual evolution into the cosmic arena. In a 1991 paper I summarized the picture this way:

> ***It has taken a few years for all of the pieces to fall into place, but we are***

[1] Clayton, Philip; MIND AND EMERGENCE: From Quantum to Consciousness; Oxford University Press, 2004; p. vi.

now looking at a process of development, change, growth, call it evolution, which goes all the way from an initial singularity whose only distinguishing characteristic was an immense flow of energy, to a world of seemingly unending complexity and structure. One of the most fascinating pieces of the whole picture being the evolution, in we humans, of the capacity to reflect on the story itself. When we look at our own aspect of this story it encompasses human cultural history, human pre-historic development, biological evolution, geological evolution, solar/planetary evolution, galactic evolution, cosmic evolution, going all the way back to either the Big Bang, or whatever image of earliest time we may next develop. It is a story which allows many interpretations, but a dominant theme seems to be the pattern of growth and transformation in systems of order and complexity. That's an epic without peer in any literature. It boggles the mind, or should I say, it is awe inspiring[2].

One of the curious features of that story was pointed out by Mark Bickhard:

…most everything we are scientifically interested in did not exist at the moment of the Big Bang, and, therefore, that most everything we are scientifically interested in had to emerge since that time …[3]

Thus the emergence of novelty must have played a most important role in the development of our present world, and in our being here to reflect upon this process. Emergence then becomes a key idea, worthy of our reflections.

There have been a number of published works dealing with this idea of 'emergence', most of them in he last few decades, although credit for the modern idea of emergence goes back to the late 19th century[4]. Since Descartes there had been a strong tendency to assume that the best scientific explanation of things was obtained by reduction to the least components of whatever was to be explained. Gradually some both within the scientific realm (e.g. Prigogine, Laughlin) and without (e.g. Polanyi) have questioned the reach of this sort of explanation.

In its full form the notion of emergence argues that the material of this world exhibits a tendency towards structural organization and is found at various levels of organization. As material at any one level reaches particular levels of complexity of organization it yields new levels of phenomena and structures that could not have been deductively predicted from the characteristics of the originating level. The new entities produced by these processes of organization exert causal influence on their constituents.

There are weaker versions of the notion of emergence that modify the claims above. In

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[2] Tarbell, David W; SPIRITUAL LANGUAGE in a NATURAL WORLD; Collegium paper, Craigville, MA; 1991.

[3] Bickhard, M. H. (2000). Emergence. In P. B. Andersen, C. Emmeche, N. O. Finnemann, P. V. Christiansen (Eds.) *Downward Causation.* (322-348). Aarhus, Denmark: University of Aarhus Press.

[4] Clayton (Ibid. p.7) gives credit to G.H. Lewes in "Problems of Life and Mind", published in 1875 (London, Kegen Paul, Trench, Turbner & Co.).

general they do not support the idea of downward causal influence. These versions of 'emergence' tend to see emergent phenomena and entities as convenient structures for interpretation and explanation, but not as necessary. These weaker versions of the idea of emergence retain an ontological notion of reductive explanation.

In this paper my focus is on the argument for a strong version of emergence.

Fundamental Issues:

Time and Change

The most fundamental issue here is time. It is the nature of this world that everything is in a state of change, and the measure of change is time. There is also a large degree of continuity, not everything changes at once, and most change is gradual not abrupt. Time also appears to be a continuum (See my previous work on time[5] and the work of Neville[6] and Rosenthal[7]).

A Theory of Everything:

There has been a tendency in scientific thinking towards the idea that the current standard model of fundamental physics really explains everything if only we examine things in sufficiently fine detail. In this line of thought the different regions of interest can each be reduced to explanations founded on the component elements of that region. Psychology is explained by neuroscience which is a branch of biology. Biology is explained by chemistry. Chemistry is explained by particle physics and particle physics is explained by the standard model of Quantum Electrodynamics (QED). There are a few troublesome details. For one, no one has yet shown a clear way of merging the standard model with Einstein's relativity theories. For another, carrying out many of the analyses that would be required to actually accomplish some of this explaining would exceed the capabilities of our current methods of analysis. And it has been shown that some physical systems are so complex that predicting how they will behave is not practically possible (chaos theory). But those who hold a reductionist paradigm of scientific explanation have confidence that these difficulties can be overcome or that they can be shown to have no ultimate importance.

There are a few within the scientific community who aren't so sure of this picture, however. And I suspect that the number of doubters nay be growing. One strong expression of this doubt found expression in a paper published in January of 2000 by Robert B. Laughlin and David Pines. This paper, entitled "The Theory of Everything"[8], pointed out a significant weakness in the broad idea of such a reductionist theory.

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[5] Tarbell, David W; Time: Reflections and Speculations; Collegium 2002.

[6] Neville, Robert Cummings; ETERNITY AND TIMES FLOW; State University of New York Press, Albany NY, 1993.

[7] Rosenthal, Sandra B; Time, Continuity, and Indetermionacy: A Pragmatic Engagement with Contemporary Perspectives; State University of New York Press, 2000.

[8] Laughlin, R.B. and Pines, David; "The Theory of Everything"; Proceedings of the National Academy of Sciences, vol. 97 no. 1, January 4, 2000;

While the key equations of modern non-relativistic quantum mechanics seem to apply to all aspects of our every-day world, these equations tell us almost nothing about most of the things we encounter in this everyday world. It turns out that without additional input from experimental measurements, we cannot use these equations to predict key attributes of our everyday world.

Laughlin and Pines point out a number of areas in physics where additional experimental data has been needed to develop a sound theory. Even more significant, they point out some areas where the microscopic aspects of matter are masked by features that depend solely on structural organization. This shows up in the crystalline state in solid state physics as well as in other areas.

What Pines and Laughlin seemed to be telling us is that science is never going to succeed in the dream of explaining everything by reducing the terms of explanation to fundamental particle physics. Rather, there are multiple regions of natural processes which must be examined, each on their own merits, if we are to discover how our world behaves.

> ***In his book "The End of Science" John Horgan argues that our civilization is now facing barriers to the acquisition of knowledge so fundamental that the Golden Age of Science must be thought of as over. It is an instructive and humbling experience to attempt explaining this idea to a child. The outcome is always the same. The child eventually stops listening, smiles politely, and then runs off to explore the countless infinities of new things in his or her world. Horgan's book might more properly have been called the End of Reductionism, for it is actually a call to those of us concerned with the health of physical science to face the truth that in most respects the reductionist ideal has reached its limits as a guiding principle. Rather than a Theory of Everything we appear to face a hierarchy of Theories of Things, each emerging from its parent and evolving into its children as the energy scale is lowered. The end of reductionism is, however, not the end of science, or even the end of theoretical physics…. The central task of theoretical physics in our time is no longer to write down the ultimate equations but rather to catalogue and understand emergent behavior in its many guises, including potentially life itself. We call this physics of the next century the study of complex adaptive matter. For better or worse we are now witnessing a transition from the science of the past, so intimately linked to reductionism, to the study of complex adaptive matter, firmly based m experiment, with its hope for providing a jumping-off point for new discoveries, new concepts, and new wisdom.***[9]

Process and Quantum Fields:

Mark Bickhard points out some of the difficulties that arise in accounting for emergence on the background of traditional scientific thought[10]. He argues that this difficulty stems from background metaphysical assumptions that pervade traditional scientific thinking. He further argues that these assumptions are ill founded, and might be replaced by a philosophic perspective

[9] Ibid; page 30.

[10] Bickhard Op.Cit.

more amenable to the notion of emergence.

The arguments against strong emergence claim that the only causal factors that we know are those that are found at the level of the basic particles of physics. Everything else can and must be explained by these laws. That everything must be explained by such laws is because there are no other scientifically grounded mechanisms of explanation. Birkhard says that this position stems from the assumption that the world must be explained in terms of substance and properties (the old Aristotelian model) and the only basic substances are the primary particles discovered by physics.

Birkhard then insists that there is an alternative to this model. He raises the idea that we might look at the structure of the world in terms of quantum field theory.

> ***Fields: But, such particles are not all there is. There are also fields, and, in particular, quantum fields. Quantum field theory yields a very different picture than that of micro-particle mechanics. Quantum fields yield non-local interactions, such as result in the Pauli exclusion principle. Note in contrast that, in the particle picture, all causality is itself atomized to the very local points of particle to particle encounters. Quantum field theory yields a continuum of never ending activity, of process, even in a vacuum (Aitchison, 1985; Bickhard, in preparation-c; Brown & Harré, 1988; Saunders & Brown, 1991). The background is not one of nothing happening except geodesic motion and local particle encounters — of an inert stage for particle mechanics — but, rather, a background of seething continuous creation and annihilation of quantum excitations of the field with various symmetries, therefore conservations, constraining the interrelationships within this activity. Ontology is not atomized to particles on a space and time stage, and cause is not atomized to points of particle encounters.***
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> ***In fact, there are no particles. Quantum field theory yields the conclusion that everything is quantum field processes (Brown & Harrd, 1988; Davies, 1984; Weinberg, 1977, 1995, 1996; Saunders & Brown, 1991). What appear to be particles are the consequences of the quantization of field excitatory activity, which is no more a particle than is the quantization of the number of waves in a vibrating guitar string.***[11]

And he further points out that there are some critical properties of systems that are dependent upon non-internal factors.

He points out that the metaphysics of substance/property which flows down in western culture from Aristotle, in relation with particle physics, supports a view that micro-particles and their properties are all that is fully real. Everything else is then seen as reducible to that level. If, on the other hand, we take quantum field theory as basic, everything is some sort of organization of process and no particular level holds explanatory priority. Particles and pianos are both structures of organization whose properties can only be understood if we understand the corresponding overall structure and process. This eliminates the metaphysical presumption of

[11] Ibid. .

reducibility.

Structure All The Way Down:

Robert Laughlin published a book[12] in 2005 which built on and enlarged the arguments of the paper he had published with David Pines in 2000.

Laughlin makes the point that the Newtonian laws that formed the basis of the technological revolution in western culture appear to be emergent phenomena of the systematic organization of quantum level particles. Some have claimed that the Newtonian laws are approximations to the quantum descriptions of large aggregates of material, but he says no approximation scheme yielding such results has ever been found.

In the course of his book he points out the curious parallels between some of the laws of quantum mechanics and laws of solid state physics. He then makes the argument that it is entirely plausible that the quantum mechanical level that science has recently disclosed is an emergent phenomena founded in the organizational structure of some lower level of material. The quantum activity of the vacuum state is a particularly strong indicator of some further underlying reality.

Thus Laughlin not only argues that some of the characteristics of our everyday world are emergent from lower levels going down to the quantum level, but that the quantum level too may be emergent and based on structure rather than a matter of substance-property ontology. In effect, it may be structure all the way down and back up.

This, in effect, takes the argument from Bickhard a step further. There is no reason to believe that any level we have been able to explore is not a function of underlying structure, including that of quantum electrodynamics and its field theory. This seems to suggest that we live in, and are a part of a universe of nested patterns. No one level here is privileged relative to the others. Each must be understood in itself with only limited reference to others.

The Pattern of Language:

In his book, The Symbolic Species[13], Terrance Deacon has presented us with a plausible theory of the development of language and culture in humans.

Deacon starts with the question, ‘why are humans the only animals with any language at all?’ Why aren’t there even any examples of simpler languages in other animals? What is the unique factor in humans? His starting guess is that it must have something to do with the evolution of the human brain.

Deacon suspects that the efforts at resolving such questions to date have failed due to false starting assumptions. Key to his thinking is the notion that language is a unique form of communication, not just a development of other forms. Communication through gestures and bodily expressions is simply different in kind from language, however complex it may be.

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[12] Laughlin, Robert B; A DIFFERENT UNIVERSE: Reinventing Physics from the Bottom Down; Basic Books, New York NY, 2005.

[13] Deacon, Terrance; THE SYMBOLIC SPECIES: The Co-evolution of Language and the Brain; W. W. Norton & Company, New York & London, 1997.

Theories like those of Chomsky and Pinker identify the element to be explained, a language instinct or inate ability, but offer no clues of how it might have developed.

Deacon believes that the key issue is to understand symbolic reference. He says that the way words refer is not like the way a simple sign refers, through mere correlation. It is better described by Frege's idea of sense and reference where there is a cognitive meaning as well as a correlate in the world. But what is this cognitive meaning?

Deacon notes Peirce's notion of three kinds of reference, iconic (based on resemblance), indexical, (based on correlation), and symbolic (based on convention or rule). He further says that these can be related in a hierarchical structure where iconic reference is the simplest, indexical reference builds on prior iconic, and symbolic builds on indexical.

He then points out that iconic reference is not determined merely by resemblance, but rather by the way some level of resemblance is used. In particular it is by the degree to which the non-resemblance is ignored. That is, we decide to allow a particular form of resemblance to lead to a referential relation. Thus it is the interpretive process that determines the relationship. It is the basic process in which one thing is interpreted to re-present another.

Type correlations in memory depend upon iconic reference, e.g. when I smell smoke I am reminded, by similarity, of previous occasions when I smelled smoke. If I sense fire along with the smoke, I may also be reminded of previous occasions of fire. When I recognize the co-occurrence of smoke and fire on repeated occasions I may form an indexical relation between smoke and fire. In this sense, indexical reference builds on iconic.

Interpreting the terms this way, Deacon says that most occasions of animal learning are based on indexical reference (temporal correlations) and are not truly symbolic. In symbolic reference the symbols have relations both to each other and to stuff in the world, and the symbol-symbol relations serve to pick out and stabilize the symbol-world relations. That is how we can establish understanding of Tolkein's world of middle earth with so many objects which we never encounter (elves, orcs, and magic spells for example) yet for which we have clearly established words.

Since Chomsky's proposals, some have argued that the rules of language could never be arrived at by inductive reasoning. There are too many variations and combinations and never enough examples. Deacon suggests that we should consider different patterns of learning. There is no good reason to think people learn rules of grammar, most people don't even know many such rules. If we do know any rules of grammar we probably learned them in school, from a theory that was developed by looking at usage. The way we speak and understand came first. Deacon argues that the way neural nets learn pattern recognition is a better example of how people learn language.

Deacon's argument here clearly fits with the notion that learning language is essentially a pattern recognition phenomenon as I have argued previously[14]. This also fits my assumption that pattern recognition is the basic learning strategy that explains much of what conscious animals of all kinds do.

It is interesting, and I think suggestive, that structure and pattern seem to be keys to both the notion of emergence, and the nature of animal and human consciousness.

[14] Tarbell, David W; Meaning and Difference: Pluralism Among Us; JLR …

Overall Pattern:

There seem to be a few very large scale types of stuff with associated patterns of emergent development and change: I would identify at least the following:

Quantum Level:

Modern physics has shown that at a microscopic level the world appears very different from our everyday world. This is the realm of quantum electrodynamics (QED), a region sometimes described in terms of particles, but particles that behave in ways unlike any objects we are used to. It is also sometimes described in terms of energy waves and fields. The field-wave mode of description helps to account for some of the strangeness, but not all.

There is a well developed theoretical account of this realm, although there are still problems with a complete theory.

Laughlin has argued that the patterns of QED bear a striking resemblance to patterns that show up in solid state physics. He points out that the latter patterns are a function of underlying structure and goes on to suggest that what we have discovered in QED may be the evidence of a still deeper underlying structure. If so at least some of the strangeness of QED would have a clearer explanation. It may be that the realm governed by the theories of QED is emergent from something prior.

Modern cosmology tells us that the history of the universe goes back to a singular event called the 'Big Bang', and says that shortly after the initial point the universe was completely controlled by what we now think of as quantum characteristics. Only gradually did a macro-scopic world emerge from the quantum arena.

Our everyday world is largely in the realm of macro-scopic physics.

Macro-physics Level:

The revolution in scientific understanding ushered in by Gallileo, Newton, and others changed our sense of nature. That change was captured in the philosophic works of Deacartes and Locke. It left us with a view of physical nature as a machine, or soulless mechanism. That view has stayed with us in background even as we have learned the strong connections between the purely physical world, the world of biological life, and our own conscious existence.

There is a serious disconnect here between the philosophic sense of what 'nature' is and the growing awareness of the continuity between all of the forms of existence that we encounter.

There still seems to be a conviction that 'nature' is a strictly deterministic clockwork sort of thing, even when we see that much of what is natural is far from being of that kind. The tendency is then to say that if we learn to know more of how everything works we will discover the underlying deterministic structure which 'has to be there because that is what nature is like.'

The observations of scientists like Prigogine[15] point to other characteristics of complex systems. We know hear that the behavior of many complex systems cannot be predicted because

[15] Prigogine, Ilya; THE END OF CERTAINTY: Time, Chaos, and the New Laws of Nature; The Free Press, New York NY, 1996 and other works.

the systems are too sensitive to initial conditions at a level beyond our ability to measure (chaos theory). The failure of Newtonian description at ultra fine scales suggests that the inability to measure is fundamental, and thus so is the unpredictability. To insist that such systems are governed by strict deterministic laws, when we can never verify that claim seems to defy what we thought was the foundation of scientific knowledge.

It would seem that strict determinism is a limiting form of behavior which is approximated in some situations, but is not ontologically fundamental. It is less likely to hold where systems are large and complex.

On the other hand, the apparent consistency of macro-physical law throughout the observable universe argues in favor of strict determinism. Although a possible alternative explanation might lie in Laughlin's ideas. If what we encounter as the macro-physical world is emergent by way of structure from the underlying world, then the patterns of structure might account for the large scale consistency. One still has to explain the consistency of pattern, however.

We find that particles in structures like atoms are not the same as separate particles, but are influenced by the fact of the larger structures in which they lie. It is in the break-up of such structure that we find what appear as separate particles. We also find that in various particular areas of macro-physics there are emergent realms, such as that of solid state physics, where the rules of behavior are dependent on structure and cannot be reduced to the rules of the underlying elements apart from that structure.

The modern story of galactic evolution from the expanding universe to the life history of starts and the formation of planets lies mostly within this realm of macro-physics. A few of the details of stellar radiation and explosions bring some of quantum physics back into play. Those stellar explosions appear to be the source of the heavier elements which yields the kind of material we find making up this planet earth that we live on.

The history of this planet shows that life first appeared in the very early period of its development. It would seem that life has emerged from the chemistry and physics of this earthly material.

If we were stuck with the metaphysical assumptions of Descartes, Locke, and the rest of the enlightenment period, we would have to believe that living things were, as Descartes thought, a form of automata, self moving machinery, with a strictly deterministic explanation. If we accept a fully emergent view of the stuff of this world, we can more easily explain the data which shows living things as different from non-living and yet fully natural.

Biosphere:

The pattern of distinct species coupled with the fossil record of evolution suggests a pattern. It would seem that evolution reaches various relatively stable arrangements. These are what we then see as distinct species. There is some genetic variation within any species, but no obvious trends towards change.

Occasionally there are changes in environmental circumstances, and/or chance developments in genetics which lead to situations that are not stable from an evolutionary perspective. These would be situations where a significant fractions of the viable genetic variations show significantly different probabilities of reproduction and survival. When such a situation develops there is liable to be genetic change until a relatively stable pattern is achieved.

From what we have observed, the development of new species is not strictly deterministic. Separation of groups over a long term seems likely to lead to differences in genotype due to slow random variations even when environmental conditions are similar.

In at least some life forms, there is a process of perception at a distance which can lead to decisions to act. A sunflower turns toward the source of radiant energy, and whether or not that is the sun, it accomplishes its goal. A trout rises to the surface to catch what it takes to be an edible insect. Sometimes it is correct in its judgment and it obtains a meal. Sometimes it is wrong and it gets caught by a fisherman. The kind of judgment about the world that can be wrong is not just a stimulus response issue. There is more to it. There is some form of an interpretation of the world going on.

In human experience we seem to have a highly developed process of interpreting our world (See my "Who We Are"[16] and other writings). There seems to be a correlation between the presence of 'consciousness' and the process of interpreting our world. The presence of consciousness would seem to be an emergent phenomena which we share with at least some of the animal population. In the human situation the development of language and he resulting development of culture would seem to be still another level of emergent change.

Language and Culture:

The use of language transformed culture from a minor to a major factor in the development of human life. While we see patterns that we might call culture among the higher primates and perhaps some other animals, these patterns do not play a dominant role.

In the case of human development, we seem to have achieved a situation where cultural change is far more responsive to environmental changes than is genetic change. This is largely due to the fact that cultures change more rapidly than do genotypes.

This would seem to be a candidate for the kind of change that Laughlin refers to as 'emergent'. The factors which are dominant in behavior here are distinct from the underlying structures, and tend to mask the underlying structures.

Deacon's account of how this development came about is persuasive.

In human society cultural patterns have lead to situations where the role of environmental hazards in weaning out less optimal phenotypes is largely masked. We take care of people who have developmental problems and do not allow them to be killed off by environmental pressures.

At the same time, we develop cultural solutions to environmental problems much faster than the processes of genetic evolution.

Human Reason:

A key element of human nature and culture is the use of human reason. Descartes claimed that to note that "I think" provides proof of my actual existence. In some sense that seems an exaggeration, yet my self-conscious self, the me who can ask about my existential status, does seem to be inextricably linked to that very process of conscious thought. We make

[16] Tarbell, David W; Who We Are; Journal of Liberal Religion; Vol. 3, No. 1;

decisions about how we think both we and our world are put together, and we make these, in part, using a function we call 'reasoning'. What does that tell us about who we are and what is going on here?

In his book "Mind & Emergence", Philip Clayton raises this question[17]. He makes reference to Thomas Nagel[18] who argues that there must be some fundamental fit between the nature of the world and our function of reason. How else can one explain how we can draw conclusions of infinite range (e.g. 'there are an infinite number of prime numbers') when we are but finite creatures. Plantinga carries this argument a bit further[19]. He says that if naturalistic evolution were the total explanation of the development of humans there would be no basis for believing that we posses a capability for judging between truth and error. Plantinga says that we must assume a self-conscious benevolent creator if we are to explain such a capacity.

I suspect Nagel is closer to the correct conclusion. Plantinga assumes that no other explanation could work, which seems unwarranted, and he ignores all the problems that assumption would raise (such as the old 'problem of evil'). Nagel seems to think that the conclusions of reason express some sort of profound truths about the world, which I also think is unwarranted. They seem to me to be a working out of a demand for consistency. If we make certain assumptions, certain results will necessarily follow. If we construct systems in thought of a certain kind, these systems will have some necessary content (the system of ordinary arithmetic will lead to the conclusion about prime numbers). If we can apply such systems of thought to stuff in the world, we can then draw conclusions about what to expect of that stuff. If those conclusions are supported in observation our assumption that the system applies is supported. If those conclusions are not supported then we must adjust our assumptions about what cognitive systems apply (e.g. Euclidian geometry fails in application to the transmission of light in our universe, and we have been forced to conclude that a non-Euclidian geometry must be assumed in its place.)

If the tendency towards structure which we find in the world is parallel to the seeking of both structure and consistency which we find in human reason, then perhaps we have here the parallel we seek between self and world. This sort of parallel would suggest that human reason is appropriate for striving to understand our world. Discoveries in logic such as Godel's proof (see also Patrick Grim's work[20]) also suggest that human reason does not yield any closed system or final answers. The patterns we seem to find in the world would suggest there are no closed system final answers to be found. The world is always in flux and evolving.

In the use of reason we make judgments about the value of certain ideas in relation to other systems of ideas. This is basically a relation of systematic fit. As I have argued before[21] these are aesthetic judgments. Truth is a species of value judgment along with beauty and goodness.

Deductive reason unpacks the content of ideas we have already developed. Rational intuition yields new ideas which we may then judge relative to prior systems. This is a species of

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[17] Clayton; Page 172 ff.

[18] Nagel, Thomas; THE LAST WORD; Oxford University Press, Oxford and New York, 1997;

[19] Clayton; page 178 ff.

[20] Grim, Patrick; THE INCOMPLETE UNIVERSE: Totality, Knowledge, and Truth; MIT Press, Cambridge MA, 1991

[21] Tarbell, David W; Values in Experience, Journal of Liberal Religion, Vol. 5 No. 1;

aesthetic intuition, and appears to be not unlike what we call emergence in other situations.

Big Picture

What, if anything, can we say about the nature of our world looked at on the very largest scale.

We see a complex universe which appears to have evolved through expansion from a singular point we refer to as 'the big bang'. We are not sure what the future of this universe holds, but it appears to tend toward a continuous expansion to what some have called a 'cold death'. That would be a state in which the stuff of this universe is so thinly distributed that very little interaction takes place.

Recent studies suggest that the composition of this universe is 'layered' through a process of 'emergence'. As the stuff of this world becomes organized in patterned structures patterns of behavior emerge which are founded in those structures and which could not be predicted from knowledge of the underlying stuff alone. The only way to determine the 'laws of nature' that apply at a particular level of emergent structure is to observe what happens at that level.

We might assume that there are two long term tendencies at work in his universe. One is a long term trend from high density to low. This is what would take our universe from the Big Bang start point toward the highly dispersed 'cold death'. The other is a tendency for stuff to organize itself into complex structures when there are appropriate levels of energy and material density to support such change. That would lead to the emergence of various forms of structured organization.

Life is an example of this tendency towards complex structure.

Our human sense of value, in all of its many forms, is an instance of this tendency toward complex organization.

As Laughlin has pointed out, explanation at each level of emerging structure depends upon lawful patterns that pertain to that level. It may well be that human consciousness is an emergent phenomena from increasingly complex neurological structures within our organism. That does not mean that neuro-science will eventually offer a definitive explanation for the characteristics of human consciousness. Consciousness is an emergent level of being with its own ways of behaving. It does lie on a foundation of prior levels, and knowledge of those levels will help to inform our understanding of consciousness, but it also involves aspects of being not found or explained in other than its own terms.

Postscript

I have argued in a previous paper[22] that information, value, life, and freedom are all

[22] Tarbell, David W; Meaning and Difference, Pluralism Among Us, Collegium 2004 and Journal of Liberal Religion, Vol.6 No.1.

dependent upon an opening provided by the evolution of our world from the extreme concentration of the 'big bang' toward the extreme dispersion of a 'cold death'.

These things require enough order to escape chaos, and enough openness to escape mere uniformity. They all involve something we might think of as aesthetic value which is a form of complex structure.

The idea of emergence suggests that kind of opening may yield different orders of being. This world is so structured that value and freedom can flower in the midst of its total life. But this world, as enabler and carrier of such things is mortal. The value dimension of this world comes to be and passes away.

Coming to be and passing away are aspects of time, and time is an aspect of eternity.[23] Value dwells in eternity, as does everything. Eternity is not 'more time', it is a different dimension. Past, present, and future have there being and relationship in eternity.[24]

These thoughts require further development.

[23] Tarbell, David W; Time: Reflections and Speculations; Collegium 2002.

[24] Neville, Robert Cummings; ETERNITY AND TIMES FLOW; State University of New York Press, Albany NY, 1993.