

# Consciousness in Evolution

## Sketch for a New Model – A Speculation

Donald F. Padelford

**Abstract:** It is hypothesized that hierarchically negentropic systems (defined herein), including organisms, are associated with partially non-local information/probability fields which, a) entail or express interiority, b) engender “entangled learning” with similar negentropic systems, and c) cause otherwise random processes, including mutation in biotic systems, to become somewhat non-random. These effects, which are believed to be driven by quantum interactions, modify those identified with the Modern Evolutionary Synthesis. A series of tenets, or broad organizing principles, related to such systems and their associated fields, are enumerated. An empirical test which could potentially falsify certain aspects of the hypothesis is given.

**Key Words:** Adaptive mutation, consciousness, directed mutation, entanglement, entropy, evolution, falsification, information / probability fields, interiority, natural philosophy, negentropy, non-locality, non-random, reductionism.

### Introduction

2009 marks the 150<sup>th</sup> anniversary of the publication of Charles Darwin’s *On the Origin of Species*, in which he formulated the proposition, now almost universally accepted among the scientifically literate, that natural selection, in conjunction with heritable variation and resource limitation, is the principal driver of evolution. When, during the early decades of the twentieth century, this proposition was combined with the work of Darwin’s contemporary (albeit unknown to him), Gregor Mendel, the Modern Evolutionary Synthesis (MES, aka neo-Darwinism) was born, and has mostly triumphed ever since. The “nutshell” version of the MES is that evolution is a product of random mutation plus natural selection.

These mutations of course happen in the genes, which are discrete areas of DNA found in every cell in one’s body, and are passed along to the next generation via gametes (egg and sperm cells). Francis Crick was co-discoverer of the spiral nature of the DNA molecule (the famous double helix), and won the Nobel Prize for this in 1962. Sometime during the next decade he showed up at a men’s club my dad belonged to and gave a little speech which started out with the statement, “You are all machines.” Towards the end of his life he expanded this into what he called “the astounding hypothesis:”

You, your joy, your sorrow, your memories, your ambition, your personal identity and your free will are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules. (Crick, 1994, p. 3)

Of course, as a machine, your “free will” is entirely notional.



This is pretty much the state of play in academic biology, with its underlying scaffolding of evolutionary theory, today. Depressing, but if it's true, it's true, and we've just got to live with it. But is it true? The thesis of this paper is that there is another model of evolution which better accounts for the facts at hand, and that, thankfully, is less depressing. One might even go so far as to say it's hopeful. To the neo-Darwinian proposition that evolution consists exclusively of random mutation in gametes plus natural selection, the new model of evolution sketched out here adds, "Except that organisms create information/probability fields (IP fields) which both convey heritable information directly to progeny, and which have the effect of causing otherwise random events, including mutations, to become somewhat non-random." There's a lot more to it than this, but that's a start.

It has become common in conferences convened to look at the Big Questions, such as *What is consciousness?* or *What does science have to say to religion?*, to invite both scientists and philosophers. The scientists provide a "reality check" and the philosophers provide what might be called an "assumption check." In other words, they are trained to ferret out assumptions that people, including scientists, may not know they are making, as well as to draw logical inferences between disparate fields of thought. So I would like to start in this introduction with a little philosophy, namely parts of the philosophy underlying science as it is currently defined and practiced. The remainder of this essay (a) introduces and discusses the tenets and argument supporting the new model of evolution sketched here, (b) suggests the resulting picture, (c) offers my hypothesis, (d) discusses relationships with the work of Kauffman and Thompson, (e) and, with that ground prepared, presents the model.

The most basic assumption underlying orthodox science is that the stuff of the universe is, well, stuff. It may be quarks, or super-strings, or something else, but it is something, some unit of matter and/or energy and/or space-time or something (some thing). This stuff then somehow combined and somewhere around 14 billion years after the Big Bang produced consciousness. The so-called "hard problem" of consciousness studies is *How does it do this?* That it does it, that matter/energy produces "your joy, your sorrow, your memories, your ambition, your personal identity" is not at issue. Whether it's via a "vast assembly of nerve cells" (Crick), or a 40 hertz collapse of quantum waves in the micro-tubules within those nerve cells (Stuart Hameroff) or something else – however it happens, the general idea is that you start with matter/energy and end up with consciousness. To most contemporary researchers this is so obvious that it doesn't rate a second glance. But it is exactly these "doesn't rate a second glance" issues that rate not just a second glance, but a good, hard second, or even third, look. It is exactly these issues that constitute our underlying assumptions and need to be put on the table, since if they are faulty, then everything that follows from them is also faulty, or at least incomplete.

Ken Wilber, an American philosopher, in his lengthy book, "Sex, Ecology, Spirituality," has an amusing example of a "doesn't rate a second glance" from a previous era, a popular "refutation" of Galileo's discovery of the moons of Jupiter:

There are seven windows given to animals in the domicile of the head, through which the air is admitted to the tabernacle of the body, to enlighten, to warm and to nourish it. What are those parts of the microcosm? Two nostrils, two eyes, two ears, and a mouth. So in the heavens, as in the macrocosmos, there are two favorable stars, two unpropitious, two

luminaries, and Mercury undecided and indifferent. From this and many other similarities in nature, such as seven metals, etc., which it were tedious to enumerate, we gather that the number of planets is necessarily seven. (Wilber, 1995, p. 387)

Today we would say that this is kind of crazy, but to our forbearers it was just common sense. It's certainly possible that a few hundred years hence our descendents will look at the universe-as-machine model we have constructed with the same kind of bemused incredulity. In any event for the present I merely want to point out that this basic assumption—the stuff of the universe is stuff—has not been shared by a very long-standing tradition of both Eastern contemplation and Western mysticism, including some prominent practitioners of quantum physics. Within these traditions the basic stuff of the universe is not stuff, but rather consciousness, or mind:

There is no matter as such. All matter originates and exists only by virtue of a force... We must assume behind this force the existence of a conscious and intelligent mind. This mind is the matrix of all matter.

– Max Planck

The universe begins to look more like a great thought than a great machine.

– Sir James Jeans

This tradition, that of Idealism and its cousins, runs counter to our contemporary “common sense” view that the universe is made up of matter (or matter/energy). While it is off the main path of argument here, I would like to note one thing in passing. Namely “Mind creates the universe” is a nearly identical statement to “In the beginning God created heaven and earth.” Especially if God is consciousness.

Also in passing: Any universe we know, or can know, has a knower, an observer in it. Any fully objective universe, one which has no such an observer and therefore is devoid of subjectivity, while it may (or may have) exist (existed) is purely conjectural. And if consciousness is to any extent non-local, to be explained later, then this condition is impossible. Rerunning Descartes' query, *What can we know for absolute certain?*, the contemporary answer, it seems to me, is *Consciousness of stuff exists*. So the universe we know has a conscious observer, and we know that this observer has observer affects via quantum physics (on which more later). Therefore the known universe is, in part, subjective. What we see is partly an effect of our seeing it. And even if that part may be a very small one, it also may, via the “butterfly effect,” leverage up into macroscopic effects of real consequence, or even (as we will touch on later) have calibrated the parameters of the pre Big Bang universe in such a way as to allow organized matter, life, and consciousness, to have come into existence in the first place.

But that's getting way ahead of the story. Returning to our narrative, starting with Galileo, the thrust of science has been to construct a model, a predictive model, of a non-theistic universe, which is to say one devoid of the supernatural and of “magical thinking.” How do things work? And no need for any frig'n ghosts (or Ghost) in the machine either. Which brings us back to the assumption that matter/energy creates consciousness. As a starting point, I want to question that assumption. In particular, I want to explicate a dual approach in which matter/energy affects consciousness, and consciousness affects matter/energy (and without trying to decide which is

the ultimate “top dog”—a largely futile task) in somewhat the same sense that matter can be converted to energy and vice versa. I think that there is plenty of evidence that this dual view better fits the facts. I would even go so far as to say that the way orthodox science has dealt with some inconvenient data is to simply ignore (or suppress) it. Those familiar with the philosopher of science, Thomas Kuhn, will recognize this as a well-worn pattern: if the data do not fit the reigning paradigm, dump data in the river. Those with longer historical memories will recognize that this was also exactly how the (Catholic) Church initially dealt with the early empiricists, albeit the Church admittedly had tools of persuasion that are thankfully unavailable to the reductionist orthodoxy of today.

Any speculation, such as detailed here, about the nature of reality, is by definition a thought experiment. But what kind of thought experiment? Clearly the model espoused here is not a work of science in the modern sense since I am, in part, questioning an assumption of science as it is currently defined (“the stuff of the universe ...”). On the other hand, neither is it a work of philosophy because I will point out at least one place where implications of the model could be tested, and potentially falsified. Falsification is the bedrock of science. If a statement can be found to be potentially wrong via experiment or empirical observation, then it is a scientific statement. If not, not (Popper). It is true, of course, that the concept of falsification cannot itself be falsified, but I won’t pursue that particular conundrum any further here. (This simply shows that empiricism is based on non-empirical assumptions, as is any system of thought.) It may also be true that a strict adherence to falsification is “honored more in the breach than the observance.” If falsifiability is the “gold standard,” then most science is conducted on the silver or bronze standard (with a bit of tin thrown in now and then). Scientists are people. People are known to advance their views through politics, through ridicule of the opposition, through intimidation and the like. None of these less-than-admirable behaviors are foreign to the scientific community. Still, at the end of the day – sometimes in the middle of the day but other times at a minute or two to midnight – the better approximation to truth will out. That is the virtue of science. Unlike philosophy it has a referee, and his name is Falsifiability. On the other hand, to the extent that an assumption is an absolute one, it cannot be disproved, and therefore belongs more to metaphysics than to science (Collingwood as cited in Castell, 1963). This is the case whether that absolute assumption is *The stuff of the universe is stuff* or *The stuff of the universe is the awareness of stuff*. One may fit the facts better, but neither can, strictly speaking, be ruled out (disproved, falsified).

So, if not science (at least in the hardest sense of that term) and not exactly philosophy (since aspects of it are falsifiable), what exactly is it that I am presenting here? I am inclined to hearken back to an earlier term, *natural philosophy*, to classify what I’m up to, albeit certain reviewers have objected to this characterization, preferring the more general term, “integral theory.” A third possible term is speculative science. However characterized, though, the argument remains the same. I chose the term natural philosophy because the tenets enumerated in the model of evolution to be laid out here fall somewhere in the twilight realm of falsification: Certain implications can be tested and potentially proved wrong (if they are wrong). Others can’t be. And unlike the situation that was addressed by the Michelson-Morley Experiment, which, at least in hindsight, definitively ruled out the existence of the “luminiferous ether” through which light was assumed to be transmitted similarly to a wave being transmitted through water, there is unlikely to be a test that definitively rules out the orthodox model or the model presented here

(though the work of Harvard biologist John Cairns, to be explained later, may possibly come close). Rather, new data will tend to better fit either the orthodox model, the model presented here, or some as-yet-unknown third alternative. Let the chips fall where they may.

## Tenets of a New Model of Evolution

What follows are twenty tenets, broad organizing principles, of the model. These are the model's bare bones, which I will subsequently flesh out a bit. In reading these one should bear in mind that, per hypothesis, they operate via the information/probability (IP) field effect, mentioned earlier.

1. Evolution is a phenomenon that takes place in hierarchically negentropic systems in general, and in life forms in particular.
2. Hierarchically negentropic systems are negentropic systems made up of, or constituted from, negentropic sub-systems, which themselves are made up of negentropic sub-sub-systems, etc.
3. Hierarchically negentropic systems are characterized by interiority.
4. Interiority is that aspect of hierarchically negentropic systems which, if concentrated sufficiently, results in consciousness.
5. Thus matter does not create consciousness. Rather highly evolved hierarchically negentropic systems (i.e., advanced life forms) manifest consciousness.
6. The tendency of hierarchically negentropic systems to become more negentropic, with more layers of hierarchy over time constitutes evolution as seen from "outside."
7. As seen from "inside," interiority seeks to increase itself, which is to say, to become conscious, or more conscious.
8. Interiority is, to some extent, non-local.
9. In particular similar (or identical) hierarchically negentropic systems share a degree of interiority. This is the view from "inside" such systems.
10. The view from "outside" is that hierarchically negentropic systems probabilistically tend to adopt, or conform to, solutions found or chanced upon by similar systems.
11. The partial non-locality of hierarchically negentropic systems exists in terms of both time and space.
12. The deeper the hierarchy in hierarchically negentropic systems, the more non-locality is evident.

13. Lower levels of the hierarchy in hierarchically negentropic systems have causal effects on higher levels and vice versa.
14. Also, causal effects operate from exterior to interior and interior to exterior.
15. As reductionism only fully recognizes the former effects (lower to higher and exterior to interior), it is wrong, or at least incomplete.
16. Idealism, while not a major force in today's world, makes the opposite mistake.
17. Up-to-down and in-to-out causality are, to some extent, the same thing, since systems with deeper levels of hierarchical negentropy embody greater degrees of interiority.
18. Likewise down-to-up causality is, to some extent, the same thing as out-to-in causality.
19. Taken to its logical end point, the ultimate hierarchically negentropic system would theoretically be totally non-local as to time and space and share an interiority common to all such systems lower in the hierarchy, including all life forms. The overlap between such an ultimate hierarchically negentropic system and what the religiously inclined call "God" is reasonably evident.
20. Because life continues to evolve, such an ultimate hierarchically negentropic system would logically also continue to evolve.

## The Argument

Before launching off on an examination of these tenets I should probably state the nature of my argument. What I am attempting to do is to weave together the findings of various researchers such as Robert Jahn, Dean Radin, Rupert Sheldrake, Johnjoe McFadden and others, and apply my synthesis of these findings to the subject of evolution. Except where I express reservations, I accept their findings as valid. Those readers who want to make their own determination about such validity will need to study the work of these researchers as I don't spend any time in persuasion or in countering critics, who are definitely out there. Those readers who have read and are unpersuaded by the work of these researchers are likewise unlikely to be persuaded by my analysis.

Some thinkers who, either by implication or explicitly, do not generally accept the finding of the above researchers, and to whom I situate the theory here in contrast, include the philosophers Evan Thompson, John Searle, and Dan Dennett, as well as the scientists Stuart Kauffman and Richard Dawkins. My disagreement with these gentlemen varies from partial to near-total as the narrative will disclose. The essay includes a section detailing my divergence from Kauffman and Thompson.

I should state that the tenets listed here exhibit considerable overlap with those of Ken Wilber (1995) in his *Sex, Ecology, Spirituality*, mentioned earlier (hereinafter "SES"), which in their turn exhibit much overlap with similar "canons" laid out by Arthur Koestler (1968) in his book,

*The Ghost in the Machine.* One major difference is that Wilber's unit of analysis is the "holon," which, following Koestler who coined the term, he defines as anything which is simultaneously a whole and a part of a whole. So for instance a word is a whole thing, which is made up of phonemes (or letters), sub-holons, and which is, or can be, part of sentences, super-holons. However, words don't resist entropy (explained below). The term I have coined, "hierarchically negentropic systems" would be equivalent to Wilber's physical holons (except to say that they are only physical would be misleading, as I trust will become evident). The biologist, Rupert Sheldrake, also uses the word holon in his work, but confines it to physical holons. So Sheldrake's holon is largely equivalent to my hierarchically negentropic system.

## Discussion

Now let's take the tenets one or two at a time.

1. *Evolution is a phenomenon that takes place in hierarchically negentropic systems in general, and in life forms in particular.*
2. *Hierarchically negentropic systems are negentropic systems made up of, or constituted from, negentropic sub-systems, which themselves are made up of negentropic sub-sub-systems, etc.*

The subject is evolution both in biotic (living) and in pre-biotic systems. (To some extent humanity could be considered to have created a "post-biotic" world, a major theme of Wilber's work, but not of this paper.) An example of the former is a cell. An example of the latter is a molecule. These systems are "negentropic" meaning that they resist entropy. Entropy is, roughly speaking, disorder. An example is a sugar cube put in a glass of water. Over time, the sugar dissolves into the water. But the opposite process is not seen: a glass of sugar-water will never spontaneously form a sugar cube. (Another example is your kid's bedroom after he or she has had a "play date" with a friend.) Entropy is an expression of the second law of thermodynamics, which states that the universe is inexorably "winding down," leading in time to its eventual "heat death." Fun guys, scientists.

Negentropy is the opposite process. It is the "winding up" of certain systems. For instance, a whirlpool may be considered negentropic in that it spontaneously expresses order. No claim is made here that negentropy matches or exceeds entropy on the macro scale. Generally scientists believe that it is the other way around, that whatever negentropy may occur is more than made up for by increased entropy elsewhere, with the result that total entropy always increases. I am not challenging that belief, and I don't express an opinion, one way or the other, as to its general validity. I would note in passing that it is incompatible with certain cosmologies, such as that in which the universe has no beginning or end, but this is not a paper on cosmology.

(Note to physicists re use of the term entropy, and thus negentropy. In the sense used here a royal straight flush is more negentropic than a hand with two of a kind. As I understand it, this is a function of information entropy vs. its thermodynamic cousin. Obviously the physical temperature of the cards is irrelevant to this use of the term. So, yes, I am more or less equating entropy with disorder, as do many (but not all) the researchers I cite, although sometimes their

use appears to be ambiguous. If you are disapprobative of this use of the term, please feel free to insert the word *disorder* for *entropy*. The main thrust of the argument will not be materially altered thereby.)

However, the example I just gave, that of a whirlpool, is not the kind of negentropic system I am talking about here. What I am talking about is a negentropic system that is made up of negentropic sub-systems, which themselves are made up of negentropic sub-sub-systems, etc (with an undefined lower boundary). For this reason I use the term *hierarchically negentropic systems*. For example a molecule is made up of atoms, which are made up of sub-atomic particles (neutrons, protons, electrons), which are made up of more basic components of matter (quarks or whatever), until, perhaps, we end up with super-strings. Which is as far as we've gotten so far. (Actually further, since no one knows whether super-strings even exist.) The claim, which I believe is non-controversial, is that these entities (e.g., molecules or atoms) tend to maintain their order, their negentropy. (Uranium spontaneously decays, which could be characterized as maintaining its negentropy less well than other, more stable, elements.)

The further claim, also believed to be relatively non-controversial, at least within the scientifically-informed world, is that evolution is not limited to the realm of what are generally seen as living systems, but also takes place in the pre-biotic realm as well. Since nearly everyone who accepts the scientific worldview agrees that life emerged from the pre-biotic, this is almost by definition true (although the mechanisms of evolution could differ). Also it is difficult or impossible to say exactly where living processes end and non-living process start. Is a virus alive? Hard to say. Another perspective on this is that following the Big Bang only very simple particles existed, then the first and simplest atoms, hydrogen and helium, and then, over time, more complex atoms formed in the center of large stars, until still later molecules were created from those atoms. The general thrust here is that, whatever the level of total entropy in the universe, there is at least a sub-section of it that is going in the opposite direction, towards greater complexity and greater negentropy. The hierarchical nature of this process, e.g., first atoms then molecules, is also evident. In SES Wilber points out a simple test as to what is higher or lower. If a higher holon were to cease to exist, the lower level holons would continue, but not vice versa. So if, somehow, molecules were wiped out, atoms would remain, but not vice versa. Likewise if humanity were to destroy itself, that would not be the end of life on earth. But if all life on earth were to end, that would also be the end of humanity.

One final thing on these first two tenets. Because what I am describing is *hierarchically* negentropic systems, in the biotic realm I am following the lead of the biologist Johnjoe McFadden, in stating that these are not dissipative systems, which he characterizes as “order from disorder” (McFadden, 2000, p. 136). The example given above of a whirlpool is an example of such a dissipative system, “driven by the random motion of billions of particles.” Rather I am focused on *hierarchically* negentropic systems, “order from order” (Schrödinger’s term in McFadden, p.137). A great deal of the scientific establishment believes that life is exactly a dissipative system. (This is conjoined to the view that “downward causation” is actually “systems causation,” as with the whirlpool example. See Thompson, 2007, p. 426). The claim here is to the contrary since, to repeat, a dissipative system is negentropic but not hierarchically negentropic. Clear?



3. *Hierarchically negentropic systems are characterized by interiority.*
4. *Interiority is that aspect of hierarchically negentropic systems which, if concentrated sufficiently, results in consciousness.*

Here I am departing decisively from scientifically orthodox thinking (assumptions), not to mention “common sense” (but remember Wilber’s example of medieval “common sense” about the correspondence of human orifices with the number of planets). However, common sense is a somewhat selectively applied notion. At a conference on the conflict between (orthodox) science and religion (*Beyond Belief*, 2006, viewable on the web) the assembled chuckled at the story of a petroleum geologist who in his professional capacity obviously understood that the precursor materials for oil deposits were laid down hundreds of millions of years ago, but who in his private life believed that life was put on earth 6,000 years ago. These same assembled did not, however, seem to find any contradiction (or humor) between their idea that, as reductionists, they purportedly have no free will, and their idea that they “should” spread scientific thinking. “Should”? Either your garage door opener works or it doesn’t. You don’t tell it what it “should” do. Should implies choice, and reductionists (sophistic arguments of certain philosophers to the contrary notwithstanding) don’t believe that choice, and free will, exist. Like the geologist, they believe in contradictory propositions, each of which is “common sense,” at least in their world.

Tenet 4 is, of course, simply a definition tying consciousness to something else, interiority. In both tenets I am saying that as we go from “deeper” hierarchically negentropic (HN) systems, ones with more hierarchical layers, to shallower ones, interiority likewise gets shallower, but, and here is the break, it never totally disappears. (While I haven’t read him, I understand that this mirrors Whitehead.) This may not be too controversial if we limit ourselves to the upper layers of HN systems. Humans are, of course, conscious and even self-conscious. For instance we can contemplate our death or what someone else may think of us, how they’re wrong, and just who do they think they are anyway? Nearly everyone likewise agrees that companion animals such as cats and dogs are also conscious, but of course not in as deep a way. Your dog may loathe (or love) the neighbor dog, but he doesn’t think, *Who does he think he is anyway?*

Exactly how far down the phylogenetic table one wants to ascribe consciousness varies from person to person. Descartes notoriously excluded all non-humans. Most people, no doubt, see mammals as conscious, but what about birds? If birds are conscious, what about insects? *Et cetera*. The point is that one can probably draw the line on consciousness wherever they want, though only a true pan-psychic would believe that a simple molecule has it. (And research indicates that our brains are aware of many things of which we are not conscious, for instance under conditions of so-called “blind sight” – Google it). But as far as “interiority” goes, it’s a lot like life. Just as there is no clear line between “life” and “not life” (is a virus alive?), so there is no clear line between “exhibits interiority” and “doesn’t exhibit interiority.” That’s the claim anyway.

The way I (attempt to) establish this claim, as will become evident below, is that clearly conscious “systems,” such as people or rats, show similar learning, and particularly non-local or entangled learning (to be described later) as clearly non-conscious systems, such as molecules (“clearly” to all but pan-psychists). It is possible, of course, that two different mechanisms that

appear identical, one mechanism for systems with interiority and one for systems without it, are at work. But, borrowing Mr. Achem's Razor (also known as Occam) for a moment, I would assert that one system is preferable to two seemingly identical ones. Especially when, to repeat, finding the line between "has interiority" and "doesn't have interiority" seems as arbitrary as "alive" and "not alive."

Another approach to this issue is to see it in terms of evolutionary selection. Just as detection of light must exist in cells in order for evolution to gradually select for better and better "light detectors," which eventually end up as eyes, so if evolution selects for awareness/consciousness, that is, if it has survival (negentropy) value, then it must exist in the most rudimentary life forms (and even in "dead" matter if evolution extends to the pre-biotic as almost all scientists believe) in order for evolution to work on it.

5. *Thus matter doesn't create consciousness. Rather highly evolved hierarchically negentropic systems (i.e., advanced life forms) manifest consciousness.*

This is a conclusion from the prior two tenets. As stated previously, this conclusion throws the so-called "hard problem" of consciousness studies *How does matter create consciousness?* out the window. Answer: it doesn't. Rather hierarchically negentropic systems and interiority are the same thing seen from two different perspectives, "outside" vs. "inside." (Although, as touched on later, it is conceivable that "artificial interiority" may be achievable in quantum computers, and computers are not hierarchically negentropic systems.)

This does not mean that a pencil, *qua* pencil, has interiority, let alone consciousness. The reason is that a pencil is not a hierarchically negentropic system. In fact it's not even a negentropic system since it doesn't resist entropy. To review: an atom, a cell, a plant, an animal, are all HN systems. So the atoms in the pencil are hierarchically negentropic systems, but the pencil itself is not. How about dead plants or animals? When an animal is first killed, or a plant growing in the ground is cut down, its cells will continue to grow and divide, or at least some of them will. So, for the time being, while the organism is dead, these cells are alive as active HN systems. When the cells die, then their atoms remain hierarchically negentropic system, but the cells themselves do not.

The idea that consciousness is "baked in" to the universe was explored by Paul Davies (2007) in his book, *Cosmic Jackpot*, which is subtitled *Why Our Universe is Just Right for Life*. If any of a number of parameters were just slightly different, a universe that permits life, and therefore consciousness, would never have developed. And others have also made this point:

... the density of the universe at the start ... had to be fixed with an accuracy of around  $10^{-60}$ . That is to say, if one figure after sixty zeros had been different, then the universe would be barren. There would be no life, no consciousness, and no you and me to discuss it. This astonishing precision is analogous to the dexterity of an archer hitting a one-centimeter-square target placed 15 billion light-years away, at the other end of the observable universe!

– *The Quantum and the Lotus*  
Matthieu Richard and Trinh Xuan Thuan (2001, p. 41);

also see *Just Six Numbers: The Deep Forces that Shape the Universe*, Martin Rees (1999)

Needless to say, the conventionally religious take this fact as support for their beliefs. For his part, after running through a list of the various possible explanations, Davies ends (albeit somewhat half-heartedly) with the possibility that consciousness itself creates the conditions under which consciousness could arise. In this view consciousness is in some way outside time and acts on or shapes matter to “fix” the parameters so that they are favorable for life, and therefore consciousness, arising. The model presented here is consistent with, but does not require, this cosmology (which I personally like). However one difference between this model and Davies’ view is that he, similarly to Stuart Kauffman, has an “emergent” view of life and consciousness in that he believes, for instance, that the cell is a machine (Davies, 2007, p. 224), whereas I am saying that a cell, or even a molecule, embodies some degree of interiority, no matter how slight, and that machines, not being hierarchically negentropic systems, do not.

6. *The tendency of hierarchically negentropic systems to become more negentropic, with more layers of hierarchy, over time constitutes evolution as seen from “outside.”*
7. *As seen from “inside,” interiority seeks to increase itself, which is to say, to become conscious, or more conscious.*

Tenet 6 is a definition of evolution that, among academics anyway, is a bit archaic, although it represents the layman’s understanding of the term, and it is also pretty much how Darwin (1859/1964, p. 489) saw things: “And as natural selection works solely by and for the good of each being, all corporal and mental endowments will tend to progress towards perfection.” Under neo-Darwinism, though, evolution doesn’t really have a direction. This is because, per the Modern Evolutionary Synthesis (MES), the creative mechanism that produces the “design space” from which natural selection chooses, is randomness in the form of random mutation. And randomness obviously doesn’t have a direction. It is not teleological, which is to say it has no goal. And in the orthodox view, neither does natural selection have a goal. Whatever reproduces itself, reproduces itself. End of story. Thus most academics would say that if, due to varying food supplies, Darwin Finches with stout beaks have more young (because the stout-beaked don’t starve) than the slender-beaked (which do starve), that this is evolution at work. And if in the following years the slender-beaked have more young, taking us back to where we started in the first place, that this is also evolution. Exactly this back and forth process was involved in perhaps the most famous example of “evolution,” that of moths becoming darker, because more difficult to see by their predators, during Victorian England when coal use was at its height and thus surfaces were sooty, and then becoming lighter in subsequent decades as coal burning lessened (or at least became cleaner).

By contrast, the popular view, and the one adopted here, is that when you go from slime mold to monkeys, or, extending things further, from Big Bang to Bach, that’s evolution. And going from light colored moths to dark colored ones and then back again isn’t. In part this is definitional, but the result of this definition is that evolution does have a direction. Namely towards more layers of negentropy, and greater interiority. Of course the simpler negentropic systems (including simpler life forms) don’t all disappear (albeit many go extinct). The

appearance of molecules does not spell the end of atoms. Viruses continue to prosper. And Darwin Finches may merrily vary the shape of their beaks back and forth over time.

In my view, these dual tenets deal more adequately (or less inadequately) with the issue of increasing negentropy or more complexity. The neo-Darwinian view on this is that it's all a matter of natural selection. (I guess if all you've got is a hammer, everything looks like a nail.) But while the process of natural selection may be enough to account for better eyes evolving from worse ones, it's not clear that complexity (not to mention interiority) in itself has any survival value at all. In the event of a full-scale nuclear war, it's reasonably clear that bacteria, unlike people, would survive, as they apparently have as hitch-hikers on moon probes:

Bacteria of the species *Streptococcus mitis* were inadvertently sent to the moon in the unmanned Surveyor III in 1967 and were "rescued" still alive [dormant – dfp] two years later by the crew of Apollo 12 who brought back Surveyor's TV camera. The organism had been subjected to very low pressure [to say the least!] and temperatures of minus 100 degrees Celsius. [= -148 Fahrenheit] (Milton, 1997, p. 217.)

If your only goal in life is to replicate, which is the MES view, then you're probably better off being a bacteria, or even a virus, than a mammal. In contrast, the view here is that a drive to escape entropy is "baked in" to hierarchically negentropic systems, and perhaps the universe itself. In which case it's better to be a mammal.

Tenet 7, interiority seeks to increase itself, of course, is totally beyond the pale as far as orthodox researchers are concerned, but I think it more or less follows from the previous tenets. If there is a "felt sense" of interiority within all hierarchically negentropic systems, then almost by definition, negentropy "feels good" however one might want to interpret or think about the term "feel" if we are talking about, for example, a molecule. Everyone (using that pronoun in the very widest sense) likes to feel good. And one drop of water dripped in the Pacific Ocean creates a wave, even if a very small one, that can go from California to Japan and back again. So you don't have to be a big wave to be a wave (don't have to be an advanced hierarchically negentropic system to have a level of interiority). Of course if there is no interiority in HN systems below some level, which is the emergent view, then we are faced with the "hard problem" of consciousness all over again, except this time we have to figure out how matter/energy creates proto-consciousness, or interiority. At the risk of repeating myself, I simply feel it is simpler, more economical ("achem-onomical") to posit one system as seen from the "inside" and "outside," rather than two totally different ones.

The emergent view is that of, for instance, the philosopher (I would even call him a practitioner of natural philosophy) Daniel Dennett in his book, *Darwin's Dangerous Idea*. Make a machine complex enough, and somehow it acquires consciousness and autonomy: "you can transcend your genes ... to build an almost entirely independent ... locus of meaning on the base your genes have provided" (Dennett, 1995, p. 426). In his view, determinism and autonomy are consistent, which I would call a close cousin to the concept that freedom and slavery are the same thing. I might call Dennett's line of reasoning "magical reductionism." Of course to posit that even a molecule has some kind of "interiority" could also be labeled magical. But I would assert that the "magic" required by not being able to locate a line between "has interiority" and

“doesn’t have interiority” is considerably less than that of imagining the something-from-nothing entailed by a machine creating consciousness. And there is an empirical test (to be explained later) which at least indirectly gets at this question.

8. *Interiority is, to some extent, non-local.*

This tenet is a set up for the next two tenets. By “non-local” I mean what quantum physicists mean by that term. One interpretation of quantum physics is that a particle can be in two places at once. Another interpretation is that “entangled” particles are separate but communicate instantly. In theory if one such particle were here and its “mate” were at the other end of the universe, then if we flipped the one here “up,” the other would instantly flip “down.” (Don’t ask me what “up” and “down” mean in this context, I don’t know.) Of course by the time we got confirmation of this via the fastest speed possible, that of light, we would all be long gone, as would the earth. Also, and this is largely another way of saying the same thing, when a quantum wave function collapses, it does so everywhere, instantaneously. (How this squares with the General Theory of Relativity, under which the concept of simultaneity is obviated, I’m not entirely sure.) And if, for instance, that wave function is associated with a proton, then that proton is “precipitated” from a “super-positional” (quantum) state into a “classical” state. In the way we are used to thinking of chairs, trees and rocks as “real,” it becomes real at that point. Previously, to borrow a term of disparagement and use it for other purposes, it’s a “ghost in the machine” (suggesting, I believe correctly, albeit inadvertently, a correlation between quantum reality and consciousness).

Another demonstration (or aspect) of non-locality is that of so-called psi phenomena, and the most sober scientist in this field is Dean Radin. Formerly a researcher at ATT Bell Labs, Radin has also worked at GTE Laboratories, Princeton University and SRI (formerly Stanford Research Institute), among others. At SRI the client was the clandestine agencies of the US government. Psi includes such phenomena as telepathy (sending information between two individuals absent normal means, basically mind-to-mind interaction), and remote viewing (being able to see or otherwise sense things at a distance by other than normal means). I have concluded from Radin’s work and elsewhere that these phenomena are real. Perhaps the clearest, most scientifically “nailed down” example of psi is provided by the research of Robert Jahn of Princeton University, formerly Dean of the School of Engineering. Over several decades he and his collaborators systematically and scrupulously investigated whether people could influence random number generators (RNG’s, essentially electronic coin flippers) to produce more “heads” than “tails” (ones than zeros), simply by a person’s *intent* to have them do so, without any physical intervention (see, for instance, Radin, 1997, p. 43, and Jahn, 1987). The short answer, is *yes*, people can do this. The effect isn’t large, but it is extremely statistically significant. As much as anything can ever be established by statistics, this phenomenon is established. As Radin has pointed out, calling a baseball player a “power hitter” is a matter of statistics. If you’re batting 300, you’re doing great, but you’re only hitting one in three times at bat.

By the qualifier in this tenet, “to some extent,” I mean that even if, as I believe, these phenomena are real, they are nonetheless weak. (On the other hand it is strong enough for Radin to have created and patented a switch, with which one could, for instance, turn on or off a robot on a distant planet, utilizing the effect.) While the CIA used “psychic spying” for decades (Targ,

2008), it's much better, if possible, to examine a missile launcher in person than to remote view it. Not always possible of course, which is why the CIA employed psychics. (By the way, the program was dismantled after the Cold War and thus was not in place to remotely view alleged "weapons of mass destruction" prior to the invasion of Iraq in 2003.)

9. *In particular similar (or identical) hierarchically negentropic systems share a degree of interiority. This is the view from "inside" such systems.*
10. *The view from "outside" is that hierarchically negentropic systems probabilistically tend to adopt, or conform to, solutions found or chanced upon by similar systems.*

Tenet 10 expresses the findings of Rupert Sheldrake as reported in his books, *A New Science of Life* (1981), and *The Presence of the Past* (1988), and elsewhere. Tenet 9 is my extrapolation, looking at these phenomena (as well as the results of psi phenomena such as telepathy mentioned above) from "inside." I will attempt to show the nature of Sheldrake's findings via a series of examples.

*Example one.* The New York Times publishes a crossword puzzle every day. If you take two groups of people with equal puzzle-solving expertise and have one group try to solve, say, the Monday puzzle on Monday, and then take the second group and, making sure they weren't exposed to it (the jury sequestration issue), have them try to solve it on the following Saturday, after millions of people around the world have previously worked on it, you will find that the second group does better, gets more right answers in a set amount of time, than the first group. These groups can be widely separated geographically.

*Example two.* If you take two groups of identical rats with, say, one group in New Zealand and the second group in New York, and you have the first group learn a particular maze, and if, some time later, you set the second group loose on the same task, the second group will learn the maze faster than the first group.

*Example three.* Scientists sometimes create novel molecules that have never existed before in nature. When they do this, they always have a hard time getting them to crystallize. But once a lab somewhere (let us say New Zealand again) gets the first group of novel molecules to crystallize, then labs elsewhere (say New York) find that it becomes easier.

Two of these examples (people learning a crossword puzzle, rats learning a maze) involve sentient (conscious) hierarchically negentropic systems. One (novel molecules crystallizing) doesn't. But the pattern of shared and "non-local" (or entangled) learning seems to be the same. Thus, following the prior tenets, it seems reasonable to look at this process from both the "inside," which is to say from a standpoint where consciousness, or at least interiority, is involved, and from the "outside," which is to say objectively.

*Note: This brings us to an important point and one where at least parts of the model presented here could be tested and possibly falsified.*

Let's take the rats in a maze example and set about the following experiment. First, run the same experiment and confirm it with a fresh batch of rats and a new maze. Next build a set of robot rats with the same level of maze-learning ability (and speed) as the real rats and have them learn the same maze. The hypothesis is that a second group of identical robo-rats in another location would not benefit from the non-local learning that is enjoyed by the flesh and blood rats. The hypothesized reason for this hypothesized deficit in the robo-rats is that, since they are not hierarchically negentropic systems as defined earlier, they presumably have no "interiority." However, and this is another important point, note that the novel molecules *do* exhibit this non-local learning. Therefore a possible conclusion is that the molecules, hierarchically negentropic systems after all, exhibit or express interiority. In any event, according to the model, they do.

I should note that other interpretations of the above-hypothesized results are possible. For instance, it is possible that non-local learning and interiority are independent effects of some unknown third factor, and that this factor can cause one effect, for example non-local learning, without causing the other. As Hume famously pointed out, correlation is not tantamount to causality. However, without an experimental protocol to tease out different experimental results in this other interpretation, the two interpretations are for all practical purposes indistinguishable. (This is a good example of an instance in which it is possible to draw a philosophical difference between two views without being able to untangle them from a scientific, or practical, standpoint.)

This projected result of the rats vs. robo-rats experiment has implications for the question of whether conscious machines can be made, and if so, in what ways they might differ from biologically-based conscious systems (organisms). Following Roger Penrose (1989), I don't believe that classical computers, no matter how "smart" (e.g., able to play chess) will ever become conscious. But would robo-rats with quantum (i.e., non-classical) computers for brains suffer the same (presumed) lack of interiority and therefore non-local learning? In my mind that's an open question. If not, then portions of the model presented here would need to be modified, since not even quantum computers (which don't exist except in the most rudimentary form yet) are hierarchically negentropic systems. (If quantum computers did become conscious, then a function we could expect from them would be an ability to affect random number generators via intent a la the Jahn experiments described in tenet 8. However, it is unclear to me how it would be possible to program a computer to express intent. Computer programs are, as Dan Dennett [1995] has said, algorithmic: if this, then do that. Dennett believes that Darwin's genius was that he found a simple algorithm for increasing biological complexity, and that any such algorithm is necessarily transposable to a different medium such as silicon. But how do you program for: If this, then *intend* that? I, at least, have no idea.)

The above examples involve learning, not morphological development. However, while I do not examine it in this essay, Sheldrake devotes a good deal of time on the latter issue in his early books. The orthodox view is that development is controlled by selective switching on and off of genes, whereas Sheldrake's theory involves non-genetic inheritance. Most of the (genetic) work on this subject was conducted subsequent to Sheldrake's initial books. While he doesn't discount the idea that non-local shared learning (my terminology, not his) could have genetic effects, and the implication of his theory is that such effect should exist, in none of his writings of which I am aware does he make the claim that this sort of learning *does* have genetic effects (and he has

emailed me that he does not wish to assert this claim). To this extent his theory (but not, at least in my view, its implications) is compatible with the MES since the neo-Darwinian process, with its random shuffling of genes every generation, could be going on in parallel to the processes identified by him. On the other hand, his views are incompatible with the MES to the extent that per neo-Darwinists non-genetic (learned or directed) inheritance is impermissible (“magical” is the term often used).

By the way, Darwin, who didn’t know about genes and thus didn’t distinguish genetic from non-genetic inheritance, made claims which are strikingly similar to those made by Sheldrake in the realm of morphology: “From the facts alluded to in the first chapter, I think there can be little doubt that use in our domestic animals strengthens and enlarges certain parts, and disuse diminishes them; and that such modifications are inherited” (Darwin, 1859/1964 p. 134). This sentence could be inserted, without modification, into any of Sheldrake’s early books. Of course, neo-Darwinists completely disavow this aspect of their hero’s work. (Not to mention the following: “[A]t some future period, not very distant as measured by centuries, the civilized races of man will almost certainly exterminate and replace throughout the world the savage races” in *The Descent of Man*, Darwin, 1871/2004, p. 201. Oops!) In any event, I agree with Sheldrake that learning may be inherited as shown in the above examples. Furthermore, I hypothesize that the intent (or mental “push”) behind learning sometimes produces heritable genetic effects in biotic systems via influence of the organism’s (posited) information/probability (IP) field. (Obviously these effects are, by definition, non-genetic in pre-biotic systems.)

An example of Sheldrake’s thinking in relation to inherited learning is provided by the following experiment (Sheldrake, 1981, p. 186). Rats (poor rats again) were placed in a flooded cage. There were two gangways for escape, a lighted one that, unfortunately for the rats, produced a shock when chosen, and an unlighted one. Eventually the critters learned to choose the unlighted exit. When fresh rats of the same species were put in the cage, they learned the task more readily than the first rats. So far basically the same as the maze experiment. Not surprisingly, given that prior experiment, the rats’ descendents also learned to find the exit faster than their forbearers. When a genetic explanation for this was formulated, the experiment was changed so that only the offspring of the stupidest rats (who found the exit least successfully) were tested. But even these found the exit faster than earlier generations, seemingly exhibiting shared learning across generations. Thus, in Sheldrake’s view, information was passed from one generation to the next in a non-genetic manner. His explanation is that “morphic fields” (which I would translate as IP fields) are formed and passed along, these fields constituting non-genetic inheritance of the descendents.

While it is slightly off the main thrust of my argument here, I want to note one thing. Per Sheldrake these fields should build up generation upon generation. And, as described earlier, there is evidence of this with, for example, people getting better at IQ tests over time (as self-described debunker of pseudo-science, Michael Shermer, noted in his talk at one of the TED conferences viewable on the web). But there are also counter-examples. After the fall of the Roman Empire, people seemed to lose a whole host of abilities, from perspective drawing to engineering, for a thousand years or more. One possible explanation for this loss is that these abilities were an expression of a more complex hierarchically negentropic system, in normal English, a more advanced civilization. By this tentative hypothesis, Rome had more layers of



hierarchical negentropy than Medieval society, and shared learning was disrupted when that hierarchy became shallower, since the fields were an expression of the deeper negentropic hierarchy. (This would correspond to Wilber's [1995, p. 44] view that holons break down holoarchically, in the reverse order from which they were formed.) Another possible explanation is that the generations-long shock accompanying the collapse of Rome traumatized people so much that they were unable to retain this knowledge. The simplest explanation is that there was just no one around to teach these skills to the next generation. However, in the above experiment, one generation of rats did not teach the exit-finding skills to the next generation. In any event, it's clear that there are instances where cumulative non-local shared learning breaks down.

11. *The partial non-locality of hierarchically negentropic systems exists in terms of both time and space.*
12. *The deeper the hierarchy in hierarchically negentropic systems, the more non-locality is evident.*

### *Space*

Non-locality in terms of space was illustrated with the Sheldrake examples under tenets 9 and 10. Rats in New York learn, non-locally, from their New Zealand or Australian "mates." (Whether this is totally non-local – would rats on the other side of the universe benefit like their New York brethren? – is something about which I don't speculate.)

### *Time*

Non-locality in terms of time mostly concerns "retro-causality" since "forward causality" is normally what we mean by the term. So, to retro-causality. Lynne McTaggart in her book, *The Field*, has a number of examples. Here is one (McTaggart, 2002, p. 170). If you remember back to tenet 8, there was mention of the work of Robert Jahn and the ability of people to influence the output of "heads" or "tails" in random number generators. Now what if the RNG was let run by itself, with no attempt to influence it via intent, and with the results stored on magnetic tape. In this case a "head" could be a click in the right ear when played back, and a "tail" a click in the left. The question is whether a subject in the experiment could go back some days later, play back the tape, and get more "heads" (or "tails") than chance allows. The answer is that people can in fact do this and that therefore some kind of retro-causation appears to exist in this case. (Amit Goswami [2008, p. 170] reports in his *Creative Evolution* that a similar experiment, with similar results, was conducted with the results printed out onto paper as opposed to being recorded onto audio tape). Thus at least people, if not less advanced hierarchically negentropic systems, appear to be able, in some instances and to some extent, to influence the past as well as the future. (Per personal communication with Dean Radin, there is experimental evidence for non-humans affecting RNG's, apparently extending down as far as cockroaches and even plants).

Another example is being laboratory tested with the results not known at the time this paper is written. John Cramer, a physics professor at the University of Washington (Seattle), is testing whether an entangled "wave-acle" (wave/particle) that is forced to act one way or the other (wave or a particle) can force its "mate" to act in the same manner. If that is successful, the next step will be to see whether a wave-acle in the present can affect its mate in the past (Cramer). This will be done by sending one down a short fiber optic cable and another down a long one. If

the experiment succeeds, forcing the one that comes out of the long cable, slightly later, to behave as a particle (or wave) will force its mate, in the slightly distant past, to assume the same form. (Naturally, this experiment is more complex than described here; however, I believe I am giving the gist of it, namely retro-causality by entangled particles.)

The third example references the “double slit” experiment of quantum physics, which is explained under tenet 14 below. The essence of that experiment is that the observation of a quantum particle (wave/particle) affects the character of that wave/particle and that observation of it at time  $t$ , can cause the collapse of the wave function associated with the “wave-acle” at time  $t-1$ , which is to say, in the past.

A fourth example explores whether people sometimes react to a shocking picture before they have seen it. This is termed “presentiment” and Dean Radin explores this issue in his books, *The Conscious Universe* (1997) and *Entangled Minds* (2006). A randomly chosen picture, either of a calm nature (nature scenes, cheerful people) or of a shocking nature (murder victims, erotica), is shown to a person. As expected the subject’s galvanic skin response is high when they are shown the shocking pictures and subdued when they are shown the calm pictures. However, the interesting thing is what happens slightly before the picture is seen. Subjects react, albeit not as strongly as when they are actually observing the image, to the shocking picture even before it is seen by them. Once again the future seems to be affecting the present. Alternately, the subjects are (unconsciously) viewing the near-future, which amounts for my purposes to much the same thing.

A final phenomenon to take note of is that a network of Random Number Generators (which for this purpose were renamed Random Event Generators: REGs) has been running for a number of years at locations around the world. These were put in place to investigate the possibility that the REGs might register changes correlated to events in the world. Interestingly, exactly such a correlation was found, for instance with the funeral of Princess Diana and the announcement of the verdict in the OJ Simpson trial, both widely-broadcast and therefore focused-on events. The (tentative) conclusion is that collective human attention on certain events moves REGs. Considering the results of the Jahn studies at Princeton cited earlier, perhaps this is not too surprising. What is surprising (or more surprising) is that these REGs registered the devastation of the Indian Ocean tsunami of 2004 before (supposedly 24 hours before) the earthquake that caused it occurred! Likewise they supposedly anticipated the 9/11 terror attacks in the USA. This then appears to be a future event “casting a shadow” on the present state of electronic devices, the REGs.

### *Depth*

As for deeper hierarchically negentropic systems embodying greater degrees of non-locality (tenet 12), this is one of those “looks right” statements, but there is evidence on either side of this proposition. Entangled electrons are certainly not as deep a HN system as a person, and yet they appear to display perfect non-locality. And if we compare people and their companion animals, is it generally true that it is the people which are more “psychic”? Among Rupert Sheldrake’s more recent books is one entitled, *Dogs that Know when their Owners are Coming Home* (1999). The title of the book pretty much states his findings. Note that it’s not the owners who know when the dogs are coming home, though. So at least on that score, the shallower HN systems (the

dogs) seem to have the edge. The third counter example concerns the Indian Ocean tsunami. It was found that no elephant keepers were killed in that disaster. When their handlers were interviewed, it seems that the animals sensed danger and took to the hills, taking the handlers with them. (Unfortunately I have lost the sourcing for this claim. Of course, even if it is accurate, it may have a more mundane explanation, such as acute hearing in the relevant octaves. Also it would be interesting to know when the animals became uneasy. Was it prior to or following the earthquake which caused the tsunami?) And of course there are the REGs associated with this event mentioned earlier.

And yet, and yet ... albeit without too much data to back me up, I continue to believe that the most attuned people exhibit a greater degree of non-locality than our animal friends (not to mention our entangled electron buddies). One possible example of this is in the area of “distant energy healing.” Of course this presupposes that one believes such a thing exists, but, in keeping with my *modus operandi*, I am not going to explore here the evidence pro and con, and just state that it does. Talented people are able to become a conduit of healing for others, even others in distant places. This skill requires a tuning in to the other as if space did not exist. In other words, one embraces non-locality. And although certain people can do this, there is no evidence that any other species is able to do so. Thus I confer the prize for non-locality to the species with the deepest hierarchically negentropic status on the planet. That would be us.

Now I realize that these examples are a long way from establishing tenet 12. However, if deeper HN systems have more interiority, which under the model they do, and if interiority correlates with independence from space and time, which psi effects suggest, then this tenet is likely true. On the other hand, it may be that this tenet has not been established to the full satisfaction of the reader (or, for that matter, the author). But there’s an old saying in aeronautics, “If it looks right, it is right.” As stated earlier, this looks right, at least to me. Whether it will fly or not, well, we shall see.

13. *Lower levels of the hierarchy in hierarchically negentropic systems have causal affects on higher levels and vice versa.*
14. *Also, causal affects operate from exterior to interior and interior to exterior.*

Down to up causality is just normal old scientific materialism. It is what Francis Crick was referring to when he said,

You, your joy, your sorrow, your memories, your ambition, your personal identity and your free will are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules.

As a good reductionist, he would then deconstruct molecules into atoms, atoms into sub-atomic particles, etc. Whatever’s at the bottom affects things above but not vice versa. We act, but since we are robots, our actions are just the workings out of sub-atomic particles. That’s the view.

By the way, the view of people such as Richard Dawkins is slightly different than this, at least in emphasis. From their perspective the principle unit of causality is the “replicator,” which would be the gene in biotic systems. Everything the organism does can, in principle, be explained by these “selfish” actors (selfish, petulant, and, it’s not going too far to say, positively Hitlerian). The phrase “at least in emphasis” in the above sentence is meant to indicate that they are nonetheless on board with the enterprise of deconstructing the gene further into more basic actors. Dan Dennett explains this approach as reductionism (the gene is the principle actor) vs “greedy reductionism” (attempting to explain human behavior in terms of the quark or whatever).

In any event, the view here is that causality runs both ways. If you’ve got a headache, you can take an aspirin and that may solve it. Matter to mind. On the other hand, if you meditate you may be able to relax your body and the headache may go away. Mind to matter. A materialist would say that “you” “deciding” to meditate is just the working out of sub-atomic articles, which is why trying to argue all this out with a committed materialist is probably no more likely to succeed than arguing about the reality of evolution with a committed fundamentalist. Collingwood would say that they are exhibiting their “absolute assumptions.” These assumptions often exhibit what I sometimes refer to as “viewpoint lock.”

There's a question, a certain question I want to discuss with you. It's a political question ... the question of marriage.

It's a political question?

Well yes. Everything's political. Like everything else the relationship between a man and a woman has a socio-economic basis. Marriage must be based on mutual beliefs, a common attitude and philosophy towards society.

And affection.

Well, yes, of course that it is also necessary. Such a relationship can have positive social value when two people face the world with unity and solidarity.

And affection.

At any rate I personally am in favor of such a socio-economic relationship.

– from *Fiddler on the Roof*

A committed Marxist sees everything in terms of politics. A committed Freudian sees everything in terms of sex. A committed reductionist sees everything in terms of simpler units of matter. In the view here causality goes downward because higher levels of the negentropic hierarchy contain more interiority and interiority, at any level, “wants” to become more so. Thus the lower “wants” to conform to the higher (thereby becoming more negentropic) and is therefore amenable to “suggestions from above.” As others have conceptualized it, the organism (the higher negentropic system) imposes a probability field on lower levels of the hierarchy (organs, cells), causing these levels to probabilistically conform to this field. So upper to lower changes the probability of events “down there,” causing them to become less random and more patterned. Note that upper to lower does not eliminate randomness, only reduces it. Note also that the upper will typically delegate most of the action, and decisions, to the lower. You may be able to lower your heart rate via meditation, but typically you just let it do its thing. And in all likelihood you don’t even know what your spleen does, let alone how it does it. And it generally

doesn't need any suggestions from you, the higher negentropic system, to do its thing (whatever that may be).

The same general analysis applies for out-to-in and in-to-out. The aspirin mentioned above can either be considered down-to-up or out-to-in. The most famous example of in-to-out causality is the "observer effect" of quantum physics. I take this effect to be the essence of this field of study for those of us not immersed in the daunting mathematics and laboratory techniques of this discipline. Stated simply, the observation of a quantum system affects the system. Since all matter is ultimately made up of quantum systems (wave/particles), this can be stated as, *The observation of the universe affects the universe*. Merely the act of you (and perhaps your cat—or or Schrödinger's ☺) observing a system affects it. (Thus to Laplace's contention that were one to know the condition of everything in the universe, it would be possible to predict everything that came thereafter, the counter-statement is that the mere knowing, i.e., observation, of this would therefore change it. And if it is changed, one no longer fully knows it.) Many excellent popular books have been written on this subject, so I won't recapitulate the material here. But let's just take the most basic experiment, that of the double slit, for review. Nobel Prize winning physicist, Richard Feynman: "The experiment with two holes ... contains the only mystery ... of quantum mechanics" (quoted everywhere).

The protocol is that one has a light source, then a blocking screen with two thin slits in it, and then an observing screen on which one can observe the light after it passes the blocking screen. Because light is a wave (well, sort of), when it passes the blocking screen, it shows up on the observing screen as bands of light and darkness (assuming the slits are narrow enough), which are interference patterns. These are similar to interference patterns in a pond if you simultaneously throw two stones in the water. In some places the top of a wave from one stone will be in the same place as the top of a wave from the other, with the result that you get a big wave at that point, the addition of the two waves. In other places the top of one wave will be in the same place as the bottom of the other, and they will cancel each other out at that point. That's essentially what you observe on the observing screen, although the bands of light and darkness will be displayed horizontally, like a bar code.

Light consists of photons (which is why it's only "sort of" a wave) and these little "balls of light" can be shot one at a time through the blocking screen (although this is typically done with electrons). If you do that, you still get the interference pattern on the observing screen, which indicates that the photons are entangled across time (tenet 11). Now what happens if you observe which slit those little balls of light go through, that is, the left or the right slit? What happens is the interference pattern disappears and the resulting pattern is consistent, not with the interference of waves, but rather with what one would see if the little balls were actually little physical balls, say of paint. Observing the system affects the system. Even stranger one can observe the photons between the time they have left the blocking screen and before they have arrived at the observing screen, in mid-flight so to speak. So if they are waves, they have already passed through both slits (in order to create the interference pattern). Observing the photons in this manner, after the fact, causes their wave character to disappear and their particle character to reappear. This is called "collapse of the wave function," and it's about as much quantum physics as I'm going to present here. Bottom line: The observation of the universe affects the universe. Second bottom line: Observation now can affect the universe then:

“The universe is not [only] stranger than we know, its stranger than we can know.”

– Richard Feynman

One note: There are supposedly about a dozen models of quantum physics, one for every taste:

*First peasant:* Why should I break my head about the outside world? Let the outside world break its own head.

*Tevye:* He is right. As the Good Book says, “If you spit in the air, it lands in your face.”

*Revolutionary:* Nonsense. You can't close your eyes to what's happening in the world.

*Tevye:* He is right.

*Second peasant:* He's right and he's right? They can't both be right.

*Tevye:* (playing the role of quantum physics). You know, you are also right.

– from *Fiddler on the Roof*

In the model I am using here (“you are also right”) observation by a person (or cat) is not the only thing that collapses the wave function. Rather any flow of information from the quantum to the classical world does so. Otherwise the universe would have had to evolve for 14 billion years in super-position until a human (or similar) observer came along to flip it into classical space/time. A few quantum physicists subscribe to this model. But although all quantum models involve paradox, this is “a paradox too far” for my taste. Recall Paul Davies’ speculation about the reason the universe is bio-philic above: “consciousness did it.” In that speculation consciousness in the future (or at any time) affected (or affects) the very structure of the universe at the time of the Big Bang. If so, then sufficient interiority may be “baked in” to the structure of hierarchically negentropic matter to account for spontaneous collapse of the wave function (“objective reduction”). So in the model of quantum physics adopted here, leak of information from a quantum particle/wave equals measurement of that particle/wave equals observation of that particle/wave by a hierarchically negentropic system. (Thus another title for this essay could have been *Evolution and the Observer Effect*.) This is because observation (interiority) is an inherent aspect of hierarchically negentropic systems. I suppose paradoxes are like eggs for breakfast. You order ‘em the way you like ‘em.

15. *As reductionism only fully recognizes the former affects (lower to higher and exterior to interior), it is wrong, or at least incomplete.*

16. *Idealism, while not a major force in today’s world, makes the opposite mistake.*

### *Reductionism.*

Reductionism was briefly dealt with above (when I said it wasn’t worth arguing with a person holding such a view: “At any rate I personally am in favor of such a socio-economic relationship”). The examples I gave were intended to establish that effects go both ways, lower to higher and higher to lower, as well as exterior to interior and interior exterior. Nonetheless, I echo the view of McFadden on this issue:

All ideas have their time and I expect that the twenty-first century will see the flowering of quantum biology. Its roots can be traced back to Schrödinger’s (1944) “What is Life,” but

though that slim volume stimulated many scientists (such as James Watson) to consider life's physical basis, reductionist biology needed to run its course and dissect living cells down to the level of fundamental particles before its full implications could be appreciated. I believe we are now on the brink of a new adventure which will bring about the synthesis of physical and biological sciences through quantum mechanics. (McFadden, 2000, p. 265)

### *Idealism.*

Idealism comes in several flavors. The most extreme version says that everything is mental and nothing is real except perception. In other words all objects are mental objects. Amit Goswami, a quantum physicist, espouses a variation of this view when he says that the moon doesn't exist except when we (or presumably someone else) is looking at it – albeit, in his view, it does exist as a mass of zillions of quantum objects in super-position (Goswami, 1993, p. 59). That's pretty extreme. And, needless to say, it is not falsifiable, although, to give him his due, none of the various schools of quantum physics can be ruled out (falsified). It does no good to say, "That's crazy." They're all crazy.

Do not keep saying to yourself, if you can possibly avoid it, "But how can it be like that?" because you will get "down the drain," into a blind alley from which nobody has yet escaped. Nobody knows how it can be like that.

– Richard Feynman

Most idealists, though, do not deny the existence of independent objects in the world. They just say that those objects are not *ultimately* real. God, mind, consciousness, or an equivalent is the only ultimate reality. So most religions are forms of idealism in this sense. And as with the hard-core reductionist, there's not much point in getting into an argument with someone about their God. ("At any rate I personally am in favor of such a socio-economic relationship.") Once again, the view here is that, either for all practical purposes or for real, interiority is a co-equal to matter/energy. And, once again, I don't ultimately try to figure out "who's on first."

Who?

Yes.

I mean the fellow's name.

Who.

The guy on first.

Who.

The first baseman.

Who.

The guy playing ...

17. *Up-to-down and in-to-out causality are, to some extent, the same thing, since systems with deeper levels of hierarchical negentropy embody greater degrees of interiority.*

18. *Likewise down-to-up causality is, to some extent, the same thing as out-to-in causality.*

These tenets follow from the previous ones. Tenet 17 appears to embody the opposite property of these systems as laid out by Ken Wilber in SES in which he, following Francisco

Valera (a sometime collaborator with Evan Thompson), asserts that lower holons “see” their upper counterparts as being outside themselves (Wilber, 1995, p. 59), while here I am saying that such physical holons (hierarchically negentropic systems) “see” their upper counterparts as inside themselves. I suppose, according to Wilber’s philosophy, the difference between these points of view would be that Valera is talking about the exteriors and I am talking about interiors.

In any event, as mentioned several times previously, the idea is that upper level HN systems impose something like an *information/probability (IP) field* on lower level HN systems. Exactly *how* this is done is “beyond my pay grade.” How does gravity work? Until Einstein the answer was, *It just does*, and I’m no Einstein. (And for that matter, and in a similar vein, Darwin had no idea where heritable variation came from.) A problem is that while individual particles, such as a proton, can reside in super-position and thus can be amenable to a field effect from cells, for example (upper level to the proton), cells themselves are fully classical systems and thus cannot, in our current understanding (or at least in my current understanding), reside in super-position (unless they are cooled to near absolute zero, at which point they aren’t of course living cells any more). (One could nitpick this and say that nothing is a fully classical object, but the above is close enough for my purposes.) So how does the an organ (like the heart) or the whole organism itself (like a cat) project its influence downward to the cell? Luckily this is a paper on natural philosophy rather than science, so hopefully I can get away with *It just does*. That’s my plan anyway.

Okay, okay, I’ll speculate. One possibility is that each level of an organism (advanced hierarchically negentropic system) has its own mind (or, if you prefer, “mind”) associated with it. Single celled organisms have no brain, but they exhibit intelligence, a mind-like quality, in seeking food, avoiding prey, reproducing and the like. Likewise we may speculate that a “gut feeling” exhibits the “mind” of one’s “gut” (i.e., the digestive region). A property of mind, it would seem, is to hold possibilities in super-position. When I am trying to decide something difficult, it feels like I am levitating the possibilities in mid-air and preventing them from collapsing to earth prematurely: “I could do this or do that or the other thing.” So my speculation is that super-position at the atomic level is referred upwards via the various levels of mind (or “mind”), which also holds them in super-position. How? It just does. And, just to make speculation even more speculative, when we are trying to figure out something new, for example, the calculus pre Newton, possibly we refer it upwards to a “level of mind” above our own. At least that’s what it feels like to many artists and scientists when the answer materializes in “mid air” so to speak.

A contrasting, more conservative, view on this particular issue is provided by Johnjoe McFadden. He states that “life is a system that uses internal quantum measurement to capture low-entropy states that sustain the state of the system against thermodynamic decay” (McFadden, 2000, p. 258). So far, so good. But while it’s not totally clear to me whether he sees that internal measurement extending upwards from the level of cells to that of organs, and then to that the organism itself, my best read is that, in his view, it doesn’t. However, he does see quantum processes linked to human consciousness. So in this view quantum effects are turned on (basic life operations), then off (level of the organs), then on again (consciousness) as one rises



in the biotic hierarchy. Maybe. In any event, as stated above, the view here is that quantum observation/measurement does extend upwards.

By the way, compare McFadden's definition of life with the following definition by Amit Goswami.

A living being consists of tangled hierarchical quantum measurement apparatuses that are representations of the vital blueprints of biological functions including, but not restricted to maintenance and reproduction. Such a being is capable of self-reference because in the process of quantum collapse involving it, consciousness identifies with the being. (Goswami, 2008, p. 129)

Pretty close, and because this book does not reference McFadden's, presumably independently arrived at.

19. *Taken to its logical end point, the ultimate hierarchically negentropic system would theoretically be totally non-local as to time and space and share an interiority common to all such systems lower in the hierarchy, including all life forms. The overlap between such an ultimate hierarchically negentropic system and what the religiously inclined call "God" is reasonably evident.*
20. *Because life continues to evolve, such an ultimate hierarchically negentropic system would logically also continue to evolve.*

I am not saying that there are any hierarchically negentropic systems above the human level. On the other hand, I don't see why there shouldn't be. Do we really think we're the best thing this old universe can come up with? If more advanced HN systems do exist, and if we are part of them, it's only speculation as to what form they might take. Perhaps the picture of a colony of cells, like a jellyfish colony, forming a single organism over evolutionary time provides an analogy. And possibly the internet might represent the hardware for the nervous system of such an organism's mind, a "precipitation" out of quantum space of a primitive world brain. As with the jellyfish prior to a united organism being formed, it may be that this upper level exists as a "virtual" or "implicit" system, an "attractor" that pulls the colony towards it. Further, if interiority is to any extent non-local, then it's just another jump to imagine that this world mind, if it exists, might form a cell in a universe mind, with other inhabited planets forming other neurons within the brain of this higher level mind (or, if you prefer, higher level being).

Naturally this is the purest of pure speculation, but it does, at least indirectly, come into play when I consider below how upper level hierarchically negentropic systems direct and create the "probability space" for their lower level counterparts. A premise of this paper is that this work, creating the "space" from which natural selection can choose, is the property of the HN system itself. This premise is in contrast to both neo-Darwinism (the creative, or option-producing, process is totally random) and to Intelligent Design (ID; God, or an equivalent, is the creative agent). However if interiority accumulates upwards, if, per Emerson, we are all part of some great cosmic ocean of consciousness in the deepest reaches of our being, then the view presented here is not totally incompatible with a *radically* liberal construction of the ID view. By analogy it

is somewhat like the difference between a super-computer as a giant, unified hunk of iron (HAL in the movie, 2001, the ID view), or as a giant network of fairly dumb regular old personal computers chained to some purpose (the view here). The later is the standard way to create super-computers these days, and in some ways the internet is the ultimate version of this model (though, unlike a super-computer, the internet is not centrally directed... well, not unless Google has somehow secretly taken over our computers!).

The model here has intelligence distributed to the utmost extent, down to the atomic level and below. Which then accumulates upward, at which point the upper acts as an “attractor” on the lower (and, as speculated above, may do so even if the upper level is not yet formed but only exists in a virtual, implicit, or quantum form). So if there is such a system above the human level (or if it exists as an implicit form), then it may be directing a teleological “pull” on humanity. But, as I said, this is all total speculation, and all I want to do it to put it out there as a logical possibility. The system here allows, but does not require, it. (Similarly quantum physics allows for something like mysticism—remember Max mind-is-the-matrix-of-all-matter Planck—but does not require it.)

One major difference between even a radically liberal construction of Intelligent Design and the view presented here is that ID, in concert with the Modern Evolutionary Synthesis sees no biological creativity at the cellular level: “Cells are robots” per Michael Behe, prominent ID theorist (2007, p. 19). The neo-Darwinian view is similar: “Each one of us is a machine” (Dawkins, 1996, p. 3). The view here, in contrast, is that each level of a hierarchically negentropic system has, along with a degree of interiority, its own creativity. And the assumption is that these two, interiority and creativity, are linked for the purpose of maintaining or increasing negentropy.

One more thing. Prominent contemporary objectors to religion and to the idea of God such as Messrs. Dawkins (2006), Dennett, Hitchens and Harris (2004), most basically object to the idea of a supernatural Entity (or entities). If the laws of physics don’t allow changing water directly into wine (whether Chablis or Chardonnay) then we can’t credit stories of chaps doing exactly that. In other words, their books on this subject essentially object to pre-rational, bronze-age thinking, of which they lovingly recount many florid examples. Fine. But what I am talking about here is something else. It is whether interiority is a byproduct of matter at a certain level of complexity (their view), or alternately whether the embrace of interiority and negentropic matter goes back to first principles in somewhat the same sense that mass and spin go back to first principles. And, if this latter view is correct, as I and many others claim, then what might be the implications for evolution? The first view envisions the evolution in the universe, by analogy, as a tumbler of dice connected to a machine. The second, echoing Sir James Jeans in a quote above, sees nearly the opposite: “The universe begins to look more like a great thought than a great machine.”

## The Picture

Such are the tenets, but I haven’t really sketched a picture of how these might actually operate in evolution. For a start, my view is that the Darwinian proposition, that natural (and sexual) selection drives evolution, is largely correct. But I argue here that neo-Darwinism, under which

random mutation alone creates the design space from which natural selection picks and chooses, is too narrow to account for the data at hand. This is not to deny that an “arms race” (Dawkins) between genes takes place at their level. It does. It’s just that there is more going on, on more levels, than that metaphor allows for. I will start out with an example that illustrates a problem with both the neo-Darwinist (MES), and the Intelligent Design (ID) approaches. This example is taken from *Quantum Evolution* (McFadden, 2000, pp. 271-272).

Tuberculosis (TB) is an extremely deadly pathogen. Initially, it was successfully treated with streptomycin. However, in time TB developed a resistance to this antibiotic. This is explained straight-forwardly since a resistant mutant will generally be found in one in every  $10^8$  bacilli. However, the human body can harbor  $10^9$  of these bacteria, so it’s just a matter of time before a successful mutation will take hold and multiply. The response to this was to start treating patients with multi-drug therapy. If mutations in TB conferring resistance to a drug A occur in one of every  $10^4$  bacteria, and to drug B in one of every  $10^5$  bacteria, then a mutation that successfully withstands both drugs should occur in one of every  $10^4 \times 10^5$  or  $10^9$  bacteria ( $10^9 = 1,000,000,000$ , or one billion). With four drugs combined one would expect a successful mutation in one of  $10^{24}$  bacteria. This is about 2.2 billion pounds worth of TB, way more than exists in the world, let alone in any one patient, obviously. According to standard neo-Darwinist theory, it’s useless for a TB bacillus to develop resistance to just one drug, since it won’t pass along any progeny to develop resistance to the second drug. It’s like an obstacle course (except that you, as a tuberculosis bacillus, can take obstacles in any order you wish). If you get eliminated by the wall-climb, you (or actually your progeny) don’t get to go on to the ropes, etc. Therefore multi-drug resistant TB should never develop because all TB bacilli should be eliminated after the second or third “obstacle.” Yet it does, and it’s a major health problem throughout the world. This phenomenon is sobering when one contemplates its unfortunate implications for the development of permanently-efficacious antibiotics.

This is a very simple biological problem and yet, unless further research indicates otherwise (which, obviously, it could do), neo-Darwinism can’t successfully solve it (a statement to which I would not expect assent from the biological orthodoxy). And according to McFadden the same analysis can be applied to cancer (McFadden, 2000, p. 273), another health scourge. So the Modern Evolutionary Synthesis appears to be in trouble, even if this isn’t generally acknowledged. Naturally this example is not much solace to proponents of Intelligent Design either, at least if God is the presumed agent that overcomes “irreducible complexity,” of which multi-drug-resistance is an elementary example. We would have to imagine a God Who is working overtime to loose pathogens on the human race. (Perhaps a cousin to the Sociopath of the Old Testament? Strangely enough, Michael Behe in *The Edge of Evolution* actually entertains such a morbid viewpoint when he asserts, “Malaria was intentionally designed” (Behe, 2007, p. 237). Yes, it’s conceivable (if just barely), but it doesn’t seem likely. Following a dictate of Achem’s Safety Razor (sic), we should probably endeavor to keep miracles to a minimum, especially if they are the type that kill us.

The next example concerns the work of Harvard biologist John Cairns and colleagues, who, in the 1980’s, studied a strain of Escheri Coli bacteria. Normally this particular strain is unable to metabolize lactose. But when they exposed the bacilli to lactose and deprived it of all other foods, the bacteria became the beneficiaries of a mutation allowing lactose metabolization, while

a control group, not deprived of other foods, had no such beneficial (to the organism) mutation. This appeared to be directed (or “adaptive”) mutation in defiance of neo-Darwinian principles, under which all mutation is random. When these results were published in the prestigious journal, *Nature*, it set off a furor. (Of the resulting papers my favorite title asks, *Has the Unicorn Landed?*) Following that uproar Cairns did back off somewhat in his initial claim as to the degree with which mutation was (or appeared to be) directed, subsequently claiming only (only?) that the rate of mutation was preferentially directed to a particular *region* in the genome. In other words, one address of the genome, an address relevant to the environmental stress the organism was encountering, was made to mutate faster than it normally would, and faster than addresses on either side of it.

Others such as Professor Barry Hall at Rochester University have also detected adaptive mutation in a variety of bacterial systems. In one of his most recent experiments, Hall measured the mutation rates in non-growing E.Coli cell for two different DNA bases in the same gene. When neither gene was beneficial, then mutations occurred at the same rate, but when one conferred a selective advantage, then its mutation rate was enhanced. (McFadden, 2000, p. 263)

While these examples are not as dramatic as (my understanding of) Cairn’s original claim, they still appear to represent an organism shaping and directing its genome. We might call this “soft” directed mutation. What is clear is that there is *some* level of downward causation going on here. It’s simply a matter of degree. As alluded to below, the view of McFadden is that these mutations happen in quantum space, and then are precipitated out when they can be utilized by the bacteria to aid in their survival.

Another similar example of what may be adaptive mutation is recounted by Brown University biologist Ken Miller in his book, *Only a Theory* (2008, p. 80), in which he recounts the story of bacteria which apparently adapted to metabolizing nylon in the absence of other foods. Miller, who doesn’t deal with adaptive mutation in his book, offers this as an example of general biological creativity in evolution. In contrast to the Cairns experiments (and despite language in the book to the contrary) here the bacteria were apparently not facing starvation but rather something more like prolonged hunger (personal communication), and thus more normal MES principles may have been in play.

As suggested in the opening of this essay, the Cairns experiments may represent a kind of Michaelson-Morley experiment for our time. To repeat, that former experiment ruled out the luminiferous ether (or at least put a couple of torpedoes in its hull), and set the stage for Einstein’s relativity theory. The Cairns experiments, in the view of some (if by no means most) scientists, rules out the heart of the Modern Evolution Synthesis formulated in the first decades of the twentieth century, as the sole mechanism of genetic adaptation. Per the result of Cairns (and others), genetic mutation is, in part, directed by the organism (or the organism and its environment) and is therefore not totally random as required under neo-Darwinism. Therefore these researchers have demonstrated downward biological causation (see one take on this here [http://www.kenarenson.com/uploads/Memo\\_re\\_Directed\\_evolution.pdf](http://www.kenarenson.com/uploads/Memo_re_Directed_evolution.pdf) ).

The next example is somewhat similar to the above. However, it demonstrates beneficial (to the organism) mutation in a body of cells not exposed to a toxin, apparently picking up information on selection pressure from a subset of these cells that are exposed to it (Hill, 2000). The head researcher was Miroslav Hill from the Medical Faculty, Brno, Czech Republic. As best I understand the protocol, Hill and his colleagues grew hamster cells in culture, separating a portion of the culture in each period, and exposing them to a toxin, with the main body of the culture remaining unexposed. The reason for doing this was to simulate a much larger body of cells exposed to the toxin. In this way, the researchers could determine what percentage of cells randomly mutate to confer resistance, as under the MES. At first all the cells in the separated portion (those exposed to the toxin) died. After a number of repeats a few cell colonies resisted the toxin, then many did so. Interesting. And even more interesting, the main body of cells, which were never exposed to the toxin, *also* acquired resistance to the toxin. This is totally in conflict with neo-Darwinian principles. This example, emailed to me by Dr. Sheldrake, indicates how his proposed morphic (information/probability) fields may fit together with neo-Darwinian genetic evolution (although he has not, as far as I know, formally developed this line of reasoning). Namely (this is my interpretation) the unexposed cells may share a dilute version of the environment experienced by the exposed cells. Vaguely similarly to the way we can acquire resistance to polio or the flu by being exposed to a dilute version of these pathogens, so the unexposed cells may be “inoculated” by virtue of the experience of their exposed “brethren.” Thus some form of at least partial non-locality (entanglement) seems to be connecting the cells either by a “morphic” (information/probability) field, or by some other means. (For a fuller description of Hill’s findings see the 2009 revision of Sheldrake’s *A New Science of Life*, pp. 258-262)

The final example is what amounts to a kind of folk observation. And that is that camels, kangaroos, and people, among other species, all have calluses where they need them, and nowhere else. Are we to imagine that a callus-conferring gene was established and then started slapping areas of thick skin on the bodies of camels higgley pigiley, with natural selection sorting out that a callus on the top of one foot or the inside of its intestine isn’t of much adoptive value? Which is more likely, that totally random mechanism, or one where some kind of feedback loop exists between the animal and its genes (phenotype to genotype), that is, some kind of neo-Lamarckian mechanism? (Darwin, quoted earlier: “From the facts alluded to in the first chapter, I think there can be little doubt that use in our domestic animals strengthens and enlarges certain parts, and disuse diminishes them; and that such modifications are inherited.”)

I think the answer is reasonably evident. However, neo-Darwinists don’t see it the way Darwin did. Richard Dawkins devotes a number of pages in his *The Blind Watchmaker* (p. 298 onward) to debunking what he identifies as this “myth.” His main point is that genetics is a recipe (mix two cups of flour with a tablespoon of yeast, etc.) as opposed to a blueprint (e.g., of a house). So there is no one-to-one correspondence with a genetic trait (calluses on the bottom of feet) and a gene. (Of course Mendel found exactly such one to one correspondences, but this is not important for the argument here; we can concede that these correspondences don’t normally exist.) Therefore there might be a gene (or series of genes) that say, in effect, “If a patch of skin gets rubbed, make it thicker.” This would then explain thicker skin where kangaroos are abraded, but it leaves out any explanation of why a “joey” (baby kangaroo) would have appropriate calluses “in utero.” If we imagine an “uhr-kangaroo” with no calluses as a joey but with thicker

skin as an adult, how does it come to pass that this trait gets transmitted to the unborn infant? Once again, under the neo-Darwinist (but not Darwinist) viewpoint it would seem that evolution must have slapped calluses here and there and let natural selection work things out. The trait for forming calluses where needed seems straight-forward, but the trait for pre-formed calluses, in the absence of phenotype to genotype feedback, does not. In my mind anyway, Dawkins and his cohorts have not made the case. (This may be another instance of, “If all’s you’ve got is a hammer....”)

McFadden, a minority of other biologists, and the quantum physicist Amit Goswami, among others, believe that instances of partially directed mutation exist. And while this seems fairly evident from the work of Cairns and others, it is nonetheless not accepted by most biologists, wedded as they are to neo-Darwinism orthodoxy. As mentioned earlier, per McFadden the mechanism for this phenomenon is quantum measurement of atoms along the DNA molecule by the cell and its environment. I provisionally accept his proposed mechanism, but I am not going to even attempt to explain it here except to say that the general idea is that in quantum, as opposed to classical, space, the genome can explore myriad different permutations all in “superposition” prior to measurement and precipitation into classical space, which happens once a genome is able to replicate (e.g., by being able to metabolize lactose). As I have alluded to previously, in his view this process is confined to single-celled evolution, with neo-Darwinian processes taking over at the multi-celled level. (For details see McFadden’s *Quantum Evolution*).

But here I am casting my net somewhat wider, albeit in a less “nailed down” scientific way, and more in a way compatible with the term, natural philosophy. First of all, I surmise that the same process implicated in directed mutation is also at work in novel molecules crystallizing (and in protein folding) a la Sheldrake. I also surmise that, much as a cell may precipitate a directed mutation, or a series of them, out of quantum space, so the same general process is at work when someone, and very often two people simultaneously, precipitate a new idea out of who-knows-where (the noosphere? the quantum multiverse?): Darwin and Wallace (evolution by natural selection), Newton and Leibnitz (the calculus), Freud and Jung (the unconscious), the list goes on.

As suggested earlier, it may be that what McFadden sees as an act of “quantum measurement” is simply the outside of what from the inside is “perception” by the interiority of a hierarchically negentropic system. This is more or less Goswami’s view, although he tends to conflate that interiority with “quantum consciousness” in the largest possible sense, that is, with God. In his view things can be made to fall in place “when God-as-quantum consciousness is recognized as the organizing principle of creative evolution in biology” (Goswami, 2008, p. 44). My preference is to limit use of the “g” word, as I find it generally just confuses things (gather a thousand people and you will likely get a thousand different definitions for god). So in the tentative formulation envisioned here, higher levels of a HN system perceive (measure) lower levels, which prior to this perception (measurement) exist in a state of indeterminacy, and thus the upper level chooses, or at least probabilistically influences, the lower level into a preferred (by the organism), more negentropic, state. Once again I am not attempting to posit the mechanism of this perception/measurement except to speculate, as above, that lower HN systems may have a kind of proto-mind (or “mind”) of their own, which has the effect of suspending “virtual” states in super-position. (I would also note in passing that according to the traditions of Idealism east

and west, there *is* no mechanism, just as there is no “mechanism” for the charge or spin of a particle. This correlates with the view presented here that interiority is an inherent aspect of hierarchically negentropic systems, that hierarchical negentropy and interiority are basically the same thing as seen from different perspectives).

So when a high level hierarchically negentropic system intends an outcome from an indeterminate future, what it may be doing is perceiving/measuring one among perhaps trillions of outcomes super-positioned in an indeterminate quantum space. And by actively perceiving it, causing (or, more likely, probabilistically influencing) it to happen. (Thus the admonition to not focus on outcomes you don't want to come into your life, which, of course, has to be balanced against noticing that truck bearing down on you).

## The Hypothesis

So, my hypothesis is as follows: Hierarchically negentropic systems are associated with partially non-local information/probability fields. These fields entail or express interiority and carry information, in the form of solutions, to other similar HN systems directly (“entangled learning”). In biotic forms of HN systems two additional factors come into play. First, this information is carried in particular to progeny, which process could be considered to constitute non-genetic (or “Sheldrakian”) evolution. Second, the field effect of this information causes otherwise random mutation to become somewhat non-random, thus partially directing genetic evolution via quantum observation/measurement. Evolution in all domains is best understood from a dual “inside” (observation) and “outside” (measurement) perspective.

Regarding genetic evolution, Richard Dawkins has said,

We can imagine (just) a form of mutation that was systematically biased in the direction of improving the animal's adaptedness to its life. But although we can imagine it, nobody has ever come close to suggesting any means by which this bias could come about. (Dawkins, 1986, p. 312)

My speculation is that the above information/probability field effect may be that means.

## Kauffman and Thompson

Reviewers of earlier drafts of this essay suggested that I should contrast the views presented here with those of Stuart Kauffman and Evan Thompson. For the former I refer to his *Investigations* (2000) and *Reinventing the Sacred* (2008). For the latter I refer to his *Mind in Life* (2007). I am not attempting a comprehensive critique of these writings, nor I am claiming to have fully mastered the theory of either writer. Kauffman appears to believe that autonomy and interiority vanish below the level of autocatalytic sets, and Thompson similarly believes that they do so below the level of autopoiesis, whereas I am saying that “entangled learning” and presumptively interiority exist at least at the molecular level, if not lower. Autocatalytic sets are chemical reactions which are self-creating. So if we have four chemicals and they are related such that

A → B → C → D → A

then these are autocatalytic. Autopoiesis adds the conditions that the set is bounded in a membrane and that it reproduces itself as a set. So to self-creating, add self-reproducing. Both gentlemen believe that below either autocatalysis (Kauffman) or autopoiesis (Thompson) it's "all just physics," by which I mean that the principles embodied in the Abstract at the beginning of this essay do not obtain:

It is hypothesized that hierarchically negentropic systems (defined herein), including organisms, are associated with partially non-local information/probability fields which, a) entail or express interiority, b) engender "entangled learning" with similar negentropic systems, and c) cause otherwise random processes, including mutation in biotic systems, to become somewhat non-random.

I am saying the evidence seems to indicate that even molecules (and presumptively more basic constituents of matter) "learn" (Sheldrake), and that this "learning" appears to have the same non-local characteristic which is associated with conscious learning of, for instance, rats or people. In particular I am suggesting that the DNA molecule participates in this kind of "learning," and that it is amenable to being affected by the consciousness of organisms of which it is a constituent part. Furthermore, I am saying that hierarchically negentropic systems of all sorts, not just organisms, embody something akin to consciousness, namely "interiority," which is associated with this learning.

Both Kauffman and Thompson profess "emergent" views, which is to say that at some level, for instance autopoiesis, something emerges that was not present before. In a general sense this is obviously true. Cats clearly act differently than rocks. On the other hand, if rocks are totally mechanical, fully explainable in terms of physics, then where does this "something" come from? A very, very complex machine is, after all, still just a machine. Neither Kauffman nor Thompson answer this question. With others, I am saying that qualities we identify with living systems, interiority among others, exist, at some dilute degree, even in matter at its most basic level. In a sense I am saying, as against Kauffman and Thompson, that there is no such thing as totally "dead," "insensate" matter. Furthermore it appears to me that quantum processes are implicated in interiority (and vice versa). And as a concluding generalization I would say that, with others, my model embodies a vision of mind/interiority that is joined to hierarchically-organized matter at a much deeper level than envisioned by either Kauffman or Thompson

## The Model

With tenets introduced and discussed, and my hypothesis given, it is time to present the model. Parts of the model presented below are based on evidence. Other parts are conjectural.

Organisms, advanced hierarchically negentropic systems, attempt to survive, to maintain their negentropy, both in themselves and through their progeny, as well as, to a lesser extent, through genetically related organisms (and perhaps through other organisms related in some other way, co-religionists for instance). They also feel a teleological pull towards greater negentropy, and towards greater interiority (the same thing seen from the "outside" and "inside"). These



dynamics are at play both at the genetic level (“selfish genes” want to propagate themselves as portrayed in sociobiology), at the level of the organism, and at the level of the species (and perhaps higher). Every hierarchically negentropic system is attempting to maintain or increase its negentropy. Thus genes direct the organism, but the organism also directs the genes via partially “adaptive” mutation (Cairns). This is done via the creation of an information/probability (IP) (morphic) field by the organism. And genes as well as other hierarchically negentropic systems, such as organs, also create their own IP fields (and thus have their corresponding levels of interiority).

There is “something that it’s like” to be in such a field. This feeling is the interiority, or proto-consciousness of the organism, projecting outward into the environment, and downward into its organs, cells, and genes (and further downward to atoms, etc.). When the field maintains itself, life is maintained. Same thing. When the teleological “pull” of the next higher field (i.e., from a higher level negentropic system, which may only exist as an “implicit” reality in super-positional quantum space) comes into play, this is the action of directed evolution. (For those familiar with his writings, this is an example of Dan Dennett’s prohibited – by him – “sky hooks.”) If the “feeling” of this higher field could be translated into human language (which it can’t be, and which of course represents outrageous anthropocentrism), it might be something like, “I wish I could swim faster” or whatever (“thought” by millions of fish). In other words, it’s not just an abstract thought (to the extent that the organism—or molecule for that matter—in question can formulate a thought), but a “thought” backed by desire, the desire to live, to strive against entropy, which is the most basic desire of any organism (or other hierarchically negentropic system). So organisms “push” against, and shape, their “genome space” in the same general manner that people can “push” against the probability field of a Random Number Generator, causing it to become slightly non-random.

If a gene is precipitated out of the quantum genome space, which is useful in helping the organism to survive better, then this “solution” (the gene) becomes more likely to be precipitated by other similar, or identical organisms elsewhere. There’s “something in the air” concerning a solution, and these related organisms then become more likely to “chance upon” the same mutation. This mutation may pop up simultaneously, or near simultaneously, at various locations around the world. And the more it precipitates, the more likely it becomes to do so. (This is an extrapolation of Sheldrake’s finding.) At the same time, normal neo-Darwinian processes are at work, and those organisms that acquire the lucky mutation from their parents likely will have more offspring. And on it goes.

As explained earlier, in McFadden’s view quantum evolution, roughly the process described above (albeit without reference to the “inside” interior dimension of things) ends where Darwinian evolution begins, which he sees being with multi-cellular organisms. The view presented here is contrary to his in this respect since I speculate that macro-evolutionary jumps—for example, mammals take to water and breath through their backs—need the “juice” of quantum superposition. In this respect, the view expressed here is similar to Goswami’s, who sees a swing between neo-Darwinian (micro) and quantum (macro) evolution when big jumps happen. However, what exactly the mechanism for this might be is unspecified here. If the view here, that quantum evolution continues after Darwinian evolution gets traction, is correct, then perhaps the “butterfly effect” (that tiny changes in one place can cause large effects elsewhere),

may be a part of the mechanism. In other words, tiny (initially quantum) changes may be amplified upwards into macroscopic morphological changes. After all, even in the standard MES view, changes in a few genes can produce these large kinds of effects.

So, at certain times in evolutionary history greater challenges (or opportunities) will arise. In these cases it isn't just one gene that would allow a biological jump to be made, but perhaps a whole family of genes. These are the "irreducible complexities" of Intelligent Design proponents (although most of the examples these proponents cite, such as the development of the eye, probably have satisfactory gradualist, neo-Darwinian explanations). In this case a whole series of super-positioned genotypes have been propagating in quantum space (alternatively, in the multiverse). When one of these "hooks up" to the phenotype (the organism) in such a way as to increase negentropy (and replicability), then this "quantum genotype" is precipitated out. In short order (geologically speaking) fish take to land, land animals to water, dinosaurs to the air, organisms learn to navigate great distances, they become warm blooded, produce live young and acquire the means to suckle them, acquire opposable thumbs, their brains grow explosively, and the list goes on. (If species on the top of negentropic "hills" are ever separated by entropic "valleys," then something like this must necessarily be involved since the MES requires each genetic change, if it is to be propagated, to be "higher" than the adjacent phenotypic space. It is unclear to me whether evolution presents such a "hilly" landscape.)

Moving down the evolutionary scale to the pre-biotic, the same kind of process happens when novel molecules learn to crystallize for the first time, only this time genes are obviously not involved. The molecule "wants" to crystallize, and it projects a probability field with this "desire" (outrageous anthropocentrism again). This projection pushes on the quantum version of the molecule, which is going through perhaps trillions of permutations all at once, all in quantum super-position, until, finally one, with a local energy minimum, precipitates out into classical space, and the molecule crystallizes.

This exploration in quantum space may be random, or non-random. As covered earlier under the double slit experiment, an aspect of quantum reality is that these processes can't be directly perceived since perception causes them to become non-quantum. Therefore, the question of random vs. non-random may be impossible to determine one way or the other. (This fact allows Brown University biologist Ken Miller [1999], devout Catholic and Intelligent Design debunker mentioned earlier in relation to the evolution of nylon-eating bacteria, to tuck God into quantum space, behind the "Planck Curtain," so to speak.) If it is random, then this exploration is more-or-less neo-Darwinian, only transposed from classical to a quantum reality. As Dawkins says, "mutation is not systematically biased in the direction of adaptive improvement" (1986, p. 308). So likewise here in a random exploration within quantum space (i.e., if the exploration is random). Besides the (hypothesized) fact that this process is happening in quantum vs. classical space, the other difference is that, while under the MES the sorting out is done via natural selection (which, of course, has no applicability to the pre-biotic world of molecules) here it is done via entanglement of a "virtual" (quantum) molecule and classical reality in which a precipitated version of that molecule conforms to an energy minimum. This is basically the same process McFadden covers in his description of how quantum versions of gene mutations become entangled with classical reality once the corresponding classical version becomes capable of replication.

Once this crystallization happens, other identical molecules “tune in” to this solution and begin to crystallize in the same way (Sheldrake). And the more it happens, the more it happens, until they all crystallize similarly. Thus the atomic properties of a molecule do not constitute all the information contained in (or perhaps around) it. A molecule that has “learned” to crystallize is different than an atomically identical molecule that has not. Where that information resides is a question for which I don’t provide a hypothesis other than to surmise that it presumably must be in some kind of partially non-local quantum space. Actually this is not-dissimilar to the standard notion (beloved most especially by mathematicians and theoretical physicists) that the laws of nature reside in a kind of “Platonic” realm, so that they were in place from the “git go” 14 billion years ago. (Sheldrake explores this in *The Presence of the Past*, in which he speculates that perhaps the laws of the universe could more accurately be termed “habits” of the universe. I don’t know. Of course, if they are habits, they must be formed according to some laws, so we can’t escape more or less Platonic law altogether.)

Moving to the other end of the evolutionary scale, to *homo sapiens*, the same process is also at work but, as with molecules crystallizing, again largely not genetically (although neo-Darwinism remains in place). People learn a skill, say taking intelligence tests. Of course, there are no appreciable genetic changes from one generation to the next, and yet people get better and better at taking these tests (Shermer, mentioned earlier). Are they getting smarter? Unlikely. More likely they are altering the energy fields permeating their heads so they can perform these tests better. When one person does it, that makes it easier for the next to do so. If a million people learn to do calculus, or to skateboard, or to operate a computer, or whatever, this makes it that much easier for the millionth and first person to accomplish the same task (Sheldrake). This may represent post-genetic evolution (although non-genetic evolution may be a better term since it is shared with, e.g., pre-biotic molecules).

## The End

Likewise with *satori* experiences of “at oneness” with the universe. The more people have them, the more people have them. Of course these, like all experiences, come and go. But they also leave a residue. After such an experience things are not quite the same. The idea that we all share the same consciousness in our deepest interior ceases to be ridiculous and starts to seem like a perfectly reasonable concept. The idea that life after the death of the body is like another country vaguely sensed beyond the broad horizon of the earth seems at least plausible, if not really explicable. As does the concept that one could be a conduit for healing of another, drawing on the energies of the universe, the conscious universe, the conscious, loving universe. Infinite negentropy somewhere. In one’s deepest soul. It’s a thought that remains, sometimes in the form of a sketch for a New Model of Evolution.

Well, there it is. Like any sketch, this one is a little rough. After all it *is* a sketch, not a fully formed picture. But I intend to start work on the picture in due course, having bought a canvas and the oil paints, and having moved these into the drawing room. In the meantime, if any readers find egregious errors in fact or logic in what was presented here, I would appreciate having these pointed out to me since I want to paint the subject as accurately as I can, “warts and all.”

"I want to know God's thoughts; the rest are details." – Albert Einstein

"You can explain things for people, but you can't understand for them." – Felix Rohatyn

"Science progresses one death at a time." – Niels Bohr

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**Don Padelford** (pa DEL ford) lives in Seattle with his pediatrician wife and two children (one away at college). He is a retired businessman (real estate) and investor. He has been a student of integral theory since reading Ken Wilber's "Sex, Ecology, Spirituality" in 1995. He is interested in philosophy, evolution, quantum theory and consciousness, among other things. As the kids leave home, he is contemplating taking up hang gliding again. He can be reached at POB 2846, Seattle, WA 98111 or via email. The email address is [xyz@dfpnet.net](mailto:xyz@dfpnet.net), except substitute "dfp07" for "xyz." (This circumlocution is an attempt at preventing spam-bots from reading the address.)