Article

Why Materialists' Evolution Is False & Quantum Platonic Evolution Is True

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Abstract

Coyne is an ardent materialist and his brand of evolution 'theory' is materialist, and as such he must assert the existence of a material world which is independent of all acts of observation. He must also believe in a 'local' reality, which is a reality within which aspects of the 'material' world do not have what Einstein called 'spooky' instantaneous interconnections between vastly distant elements of reality. Both of these claims are shown to be false by the core discovery of quantum theory which is termed 'entanglement'. Very precise quantum experiments have been carried out over and over again testing an inequality called 'Bell's inequality'. It is clear that new evolutionary forms can take shape within 'hidden' quantum levels of the evolutionary process of reality. And because the quantum realm has access to non-local information and mechanisms such as the quantum 'look-ahead' algorithm, the quantum levels of evolution can 'feel' out the future nature of evolving environments and thereby quantumly prepare the evolving quantum template of an animal to 'fit' the environment it is about to inhabit. This is the quantum Platonic perspective on the process of evolution.

Keywords: Coyne, Dawkins, materialism, Darwinism, Zurek, quantum Darwinism, quantum potentiality, consciousness, nonlocality, intelligent design (ID), Stapp, Mensky, Extended Everett Concept.

Jerry Coyne's 2009 book *Why Evolution is True* (hence forth designated as *WET*) was greeted by the eager ranks of the neo-Darwinian, or ultra-Darwinist, academics with delight. Richard Dawkins, for instance, drooled with praise, bristling with antagonism for opposing views:

> I once wrote that anybody who didn't believe in evolution must be stupid, insane or ignorant, and I was then careful to add that ignorance is no crime. I should now update my statement. Anybody who doesn't believe in evolution is stupid, insane, or hasn't read Jerry Coyne. I defy any reasonable person to read this marvellous book and still take seriously the "breathtaking inanity" that is intelligent design "theory"…[1]

And Steven Pinker was tickled too:

> Scientists don't use the word 'true' lightly, but in this lively and engrossing book, Jerry Coyne shows why biologists are happy to use it when it comes to evolution. Evolution is 'true' not because the experts say it is, nor because some world view demands it, but because the evidence overwhelmingly supports it. There are many superb books on evolution, but this one is superb in a new way — it explains the latest evidence for evolution lucidly, thoroughly, and with devastating effectiveness.[2]

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As usual the claims and implications of the Materialist ultra-Darwinist (there are various designations for this perspective, neo-Darwinian, ultra-Darwinist etc. – I shall use the acronyms MUD and MUDs, standing for Materialist Ultra Darwinist/Darwinian and Materialist Ultra Darwinists/Darwinians, or, alternatively, Mindless Ultra Darwinist/Darwinian(s)) lobby indicate that they think that their man is a rigorous, 'lucid' and clear thinking paragon of science, taking on possibly 'insane' hoards of thoroughly deluded 'unscientific' purveyors of falsehoods. However, as we shall see, nothing could actually be further from 'the truth.'

An important issue which needs to be dealt with at the outset is that of establishing exactly what views and positions are in question. The Dawkins' quote above tails off because I have left off the final piece; the quote actually ends:

> I defy any reasonable person to read this marvellous book and still take seriously the "breathtaking inanity" that is intelligent design "theory" or its country cousin young earth creationism[3]

Now here we see a common tactic adopted by MUDs, which is to conflate a reasonable perspective with a clearly ridiculous one and pretend that they amount to the same thing. Young earth creationism is defined on Wikipedia as:

> the religious belief that the Universe, Earth, and all life on Earth were created by direct acts of the Abrahamic God during a relatively short period, sometime between 5,700 and 10,000 years ago. Its primary adherents are those Christians and Jews who believe that God created the Earth in six 24-hour days, using a literal interpretation of the Genesis creation narrative as a basis.[4]

Clearly such a view is entirely inconsistent with science in many ways and is completely unacceptable to any reasonable person who holds science to be the primary method for discovering the 'truth' about the process of reality. Intelligent Design, however, may be given a minimum definition as:

> The theory of intelligent design holds that certain features of the universe and of living things are best explained by an intelligent cause, not an undirected process such as natural selection.[5]

In other words 'Intelligent Design' asserts no more than the fact that there is 'intelligence' internal to the process of reality which leads to the apparent design which we find within the multifarious phenomena within the universe. There may be writers and interested parties who wish to draw various theological conclusions, but such extensions go beyond the central claim of ID.

For my own part I believe that a coherent ID claim must also make the claim that what appears to be a 'material' world is derivative from a deeper ontological basis of the process of reality which itself must have Mind-like qualities. We shall see that such an ID perspective is the only conclusion that can be drawn from *all* the evidence of modern science, whereas the kind of crude MUD perspective proclaimed by Coyne is thoroughly *unscientific*.

It is important to be quite clear that Coyne's version of Darwinism is based on the metaphysics of materialism, which involves the claim that 'matter' is the primary 'stuff' of the process of

reality and that the qualitative realm of 'mind' is in essence nothing more than matter doing its stuff. In *WET* Coyne writes about the supposed wonders of natural selection and says:

> Selection is both revolutionary and disturbing for the same reason: it explains apparent design in nature by a purely materialistic process that doesn't require creation or guidance by supernatural forces.[6]

We should note here the *assumption* that if a "materialistic" explanation cannot be found then any alternative must be a 'supernatural' one. This, like many assumptions that Coyne makes as a matter of course, is in fact unjustified, as will become quickly apparent. Coyne adds to his materialist credentials in his article '*Intelligent Design: The Faith that Dare not Speak Its Name*' where he writes that:

> …intelligent design is part of a cunning effort to dethrone materialism from society and science and replace it with theism.[7]

Now, as we shall see, in so far as ID is an attempt, cunning or otherwise, to 'dethrone materialism' it is mightily *scientific* because our most detailed and advanced scientific knowledge of the process of reality, which is enshrined in quantum theory, tells us that materialism, as quantum physicist Henry Stapp puts the matter, is '*known-to-be-false*.'[8] The issue of the theological implications of the 'known-to-be-false' status of materialism will be addressed in detail at a later point. For the moment, however, it is worth noting that the Discovery Institute, the primary promoter of ID in America and target of the venom of MUDs, have on their website a document entitled '*Does intelligent design postulate a "supernatural creator?"*' which states that:

> Intelligent design does not address metaphysical and religious questions such as the nature or identity of the designer.[9]

Such claims, however, are viewed by MUDs as all part of a nefarious, devious and 'cunning' plot.

Coyne tells his readers that the notion of natural selection is "not hard to grasp". And this *is* true, although materialist natural selection as an ultimate explanation of evolution is *not true.* In fact the way in which Coyne presents the notion of natural selection is childishly easy to grasp precisely because it is a childish concept:

> If individuals within a species differ genetically from one another, and some of those differences affect an individual's ability to survive and reproduce in its environment, then in the next generation the "good" genes that lead to higher survival and reproduction will have relatively more copies than the "not so good" genes. Over time, the population will gradually become more and more suited to its environment as helpful mutations arise and spread through the population, while deleterious ones are weeded out. Ultimately, this process produces organisms that are well adapted to their habitats and way of life.[10]

We need to get this simplistic picture clear in our minds in order to be able see just how ridiculously untenable it is in the light of the evidence of quantum physics, as well as other recent discoveries such as Evo-Devo (Evolutionary-Developmental Biology) and the emerging field of quantum biology.

According to Coyne's hard-core MUD account, every member of a particular species has a set of special ultimate bits of 'matter' called, of course, 'genes'. These ultimate units are considered to supply all the information for the development of the organism. In the materialist worldview such genes, conceived of as ultimate units, are considered to be self-enclosed units of materiality each with their own independent bits and pieces of 'on-board' information. These bits and pieces of information can combine and affect each other but their ultimate nature is conceived of as being independent of each other. The MUD worldview does not consider that such material 'genes' actually might 'know' about each other or interconnect at a deeper level of reality, for them genes are the ultimate self-enclosed bits and pieces of matter driving evolution.

Coyne then proceeds with more simplicity:

> Here's a simple example. The wooly mammoth inhabited the northern parts of Eurasia and North America, and was adapted to the cold by bearing a thick coat of hair (entire frozen specimens have been found buried in the tundra). It probably descended from mammoth ancestors that had little hair - like modern elephants. Mutations in the ancestral species led to some individual mammoths - like some modern humans - to be hairier than others. When the climate became cold, or the species spread into more northerly regions, the hirsute individuals were better able to tolerate their frigid surroundings and left more offspring than their balder counterparts. This enriched the population in genes for hairiness. In the next generation, the average mammoth would be a bit hairier than before. Let this process continue over some thousands of generations, and your smooth mammoth gets replaced by a shaggy one. And let many different features affect your resistance to cold (for example, body size, amount of fat, and so on), and those features will change concurrently. The process is remarkably simple. It requires only that individuals of a species vary genetically in their ability to survive and reproduce in their environment. Given this, natural selection - and evolution – are inevitable.[11]

The image here is, as Coyne says, simplistic. The organic structure of any particular species is determined by the 'on-board' information carried by the genes, which are conceived of as ultimate units of inheritance. Added to this situation is the assertion that from time to time genes 'mutate' in a random fashion. Coyne explains this later in the book:

> Where does this genetic variation come from? Mutations –accidental changes in the sequence of DNA that usually occur as errors when the molecule is copied during cell division. Genetic variation generated by mutation is widespread: mutant forms of genes, for example, explain variation in human eye color, blood type, and much of our - and other species' - variation in height, weight, biochemistry and innumerable other traits.[12]

So then we have two realms of randomness. Firstly the development of the environment, randomly, and 'chaotically' according to some recent materialist perspectives[13], produces differing environments according to the mindless materialist laws of nature, and, secondly, we have randomly mutating genes occasionally producing altered traits which confer an advantage in certain environments. According to the topsy turvy MUD perspective this meeting of two random processes is said to produce a 'lawful' process of evolution:

> Evolution by selection, then, is a combination of randomness and lawfulness. There is first a "random" (or "indifferent") process - the occurrence of mutations that generate an

> array of genetic variants, both good and bad…; and then a 'lawful' process - natural selection - that orders this variation, keeping the good and winnowing the bad … [14]

The notion that the meeting of completely random mechanical systems must also be a 'random' process is vigorously resisted by MUDs.

According to the MUD account there is no absolutely no 'inner' connection between the gene mutations which lead to the process of evolution and the environment within which their organisms are located. There cannot be any such hidden connection because according to the MUD account mutations are entirely random. Gene's cannot anticipate the type of environment they are about to confront so to speak. In the MUD perspective each gene is independent of other genes and also do not have any way of attaining information about the environment. There is no internal 'hidden' ground level interconnection with the environment. We shall see, however, that quantum theory suggests that there might be an anticipatory 'hidden' connection. Quantum theory, furthermore, tells us that there are instantaneous quantum links between 'entangled' 'particles', and at a deep level all phenomena are entangled.

This kind of worldview, which involves the assumption that all phenomena, such as genes considered as morphogenetic 'building blocks', are separate and cut off from all other phenomena, was called by the quantum physicist David Bohm 'the mechanistic attitude' which he described as follows:

> …physics has become almost totally committed to the notion that the order of the universe is basically mechanistic. The most common form of this notion is that the world is assumed to consist of a set of separately existent, indivisible and unchangeable 'elementary particles, which are the fundamental 'building blocks', of the entire universe.[15]

Atoms, of course, are one example of what some people, mistakenly, might think of as such elementary 'building blocks'. Indeed it would seem that Coyne thinks along these lines for in his introduction to his book he writes:

> Why then do we need a book that gives the evidence for a theory that long ago became part of mainstream science? After all, nobody writes books explaining the evidence for atoms, or for the germ theory of disease. What is so different about evolution?[16]

Well the fact is that evolution is, indeed, not different from atomic theory in the issue of whether or not it is indicative of an ultimately and independently 'real' realm or process of reality, if we mean by 'real' a fully independent and self-sufficient process entirely dependent upon equally fully independent and self-sufficient 'material' entities,. Stapp summarizes the view of Heisenberg, one of the 'founding fathers' of quantum theory, of the nature of 'atoms' as follows:

> The central idea in Heisenberg's picture of nature is that atoms are not 'actual' things. The physical state of an atom, or of an assembly of atoms, represents only a set of 'objective tendencies' for certain kinds of 'actual events' to occur.[17]

In the same way we shall find that what appears to be a materially based process of evolution, as interpreted by people devoid of understanding of the subtle, yet undeniable, evidence of quantum theory, is an illusion. As Bohm pointed out:

> …one finds, through a study of quantum theory, that the analysis of a total system into a set of independently existing but inter-acting particles breaks down in a radically new way. One discovers, instead, both from consideration of the meaning of the mathematical equations and from results of the actual experiments, that the various particles have to be taken literally as projections of a higher-dimension reality which cannot be accounted for in terms of any force of interaction between them.[18]

And we shall find that, in the same way, what appears to be a material process of evolution turns out to be nothing of the sort, it derives instead from higher-dimension reality, which is a field of energetic quantum potentiality which has an internal mind-like quality. If it really is the case that MUD "long ago became part of mainstream science", then this is a blot on science, or rather more likely a blot on practitioners of the biological sciences who seem to be unable to proceed beyond the worldview of the nineteenth century prior to quantum discoveries.

Before we examine some of Coyne's bizarre, and utterly unscientific, notions regarding the latest findings of quantum theory, something it turns out he knows nothing about, we need to bear in mind conclusions that many significant physicist have come to. Stapp has pointed out that:

> One might try to interpret the 'matter' occurring in this formula as the 'matter' that occurs in classical physics. But this kind of 'matter' does not exist in nature.[19]

Or Bohm:

> …variables can no longer provide us with a definite, unique and unambiguous concept of matter in the quantum domain. Only in the classical domain is such a concept an adequate approximation.[20]

Or physicist Roger Penrose:

> Quantum theory provides a superb description of physical reality on a small scale, yet it contains many mysteries. Without doubt, it is hard to come to terms with the workings of the theory, and it is particularly difficult to make sense of the kind of 'physical reality' – or lack of it – that it seems to imply for our world.[21]

Or physicist Brian Greene:

> …because experiments confirm that quantum mechanics does describe fundamental physics, it presents a frontal assault on our basic beliefs as to what constitutes reality.[22]

Or physicist Robert Oerter:

> The laws of physics were saying that matter as we know it simply can't exist. It was time for some new laws of physics.[23]

Or physicist Frank Wilczek:

> Matter is not what it appears to be. … The mass of ordinary matter is the embodied energy of more basic building blocks, themselves lacking mass.[24]

Or Bernard d'Espagnat:

> The doctrine that the world is made up of objects whose existence is independent of human consciousness turns out to be in conflict with quantum mechanics and with facts established by experiment.[25]

Or the famous twentieth century physicist John Wheeler:

> Directly opposite to the concept of universe as machine built on law is the vision of *a world self-synthesized.* On this view, the notes struck out on a piano by the observer participants of all times and all places, bits though they are in and by themselves, constitute the great wide world of space and time and things.[26]

Or Max Planck, the instigator of quantum theory:

> 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.[27]

Or Erwin Schrödinger, discoverer of the fundamental quantum equation:

> Mind has erected the objective outside world … out of its own stuff.[28]

Or Einstein:

$$E = mc^2$$

Einstein's equation tells us that matter is congealed energy. And an aspect of reality which is a 'congealed' something else is not an ultimately foundational 'stuff' of reality. This is why Wilczek says "Matter is not what it appears to be". At the moment of the big bang there certainly was no matter around. According to Steven Hawking and Leonard Mlodinow:

> We are the product of quantum fluctuations in the very early universe. [29]

And what kind of 'stuff' does the quantum field consist of? Well one thing we do know is that it is immaterial and insubstantial. As Jonathan Allday points out in a recent book on quantum theory:

> Now, from a philosophical point of view, this is rather big stuff. Our whole manner of speech … rather naturally makes us think that there is some stuff or *substance* on which properties can, in a sense, be glued. It encourages us to imagine taking a particle and removing its properties one by one until we are left with a featureless 'thing' devoid of properties, made from the essential material that had the properties in the first place. Philosophers have been debating the correctness of such arguments for a long time. Now, it seems, experimental science has come along and shown that, at least at the quantum level, the objects we study have no substance to them independent of their properties.[30]

All this incontrovertible evidence from quantum theory and quantum field theory, the most spectacularly precise and relentlessly validated scientific theory, indicates that the ultimate 'stuff' of reality is immaterial. It seems, however, that Coyne considers the most up to date findings of science to be 'immaterial' in another sense entirely.

Coyne seems very proud of the scientific method and seems to encourage its universal and rigorous employment. He also seems to think that his version of evolution theory is as solid as atomic theory:

> …in science, a theory is much more than just a speculation about how things are: it is a well-thought-out group of propositions meant to explain facts about the real world. "Atomic theory" isn't just the statement that "atoms exist": it's a statement about how atoms interact with one another, form compounds, and behave chemically. Similarly, the theory of evolution is more than just the statement that "evolution happened": it is an extensively documented set…[31]

But, as we have just seen, atomic theory is not materialistically 'solid' at all. It is actually a useful yet fleeting stage on the way to quantum theory wherein the material world dissolves into quantum insubstantiality, an insubstantiality which is entangled with consciousness.

But when Coyne is confronted with the incontrovertible evidence of quantum insubstantiality and the effect of consciousness on the apparently 'material' world, he seems to lose his enthusiasm for the scientific method. It seems that his commitment to scientific method only goes as far as the bits of it which he thinks can be adapted to appear to support his unscientific materialist prejudice.

The following is an overview, with amplifications, of a discussion between Alex Tsakiris, who produces the podcast 'Skeptiko - Science at the Tipping Point', and Coyne. Tsakiris says to Coyne:

> ..there certainly is a lot of silliness out there in terms of the culture war debates and some of the arguments from people who come at it from a purely religious standpoint and have a hard time accepting evidence that contradicts their worldview. I think one of the angles I wanted to take in this show was also talking about how that cuts both ways sometimes.
>
> You mentioned Materialism and that is a cornerstone of a lot of these ideas. Materialism, as we've explored, isn't on quite as solid of ground, especially lately, as it has been. Is there a valid concern about oversimplifying the case for Materialism, Reductionism, Determinism, all those 'isms' that really seem to be challenged by some of the newest and latest physics data out there?[32]

Here Tsakiris is indicating his awareness that some religiously motivated perspectives ignore scientific evidence for their own purposes, young earth creationism would be an example of such a case. But, he suggests, materialists are equally guilty of such unscientific simplistic falsity. The latest findings of physics, as indicated above, clearly undermine the materialist claim, and Tsakiris suggests this fact to Coyne.

At this point Coyne loses scientific credibility as he shows a complete ignorance of the findings of quantum theory as well as a willful determination to avoid the relevant evidence. He also loses philosophical credibility as he displays a complete incompetence in the arena of coherent logical reasoning. In response to Tsakiris' suggestion Coyne replies:

> So even the phenomena of quantum mechanics has been found out through reductionistic materialistic investigation by scientists, so I don't see a problem with the

> basic foundations of science being … inherently Deterministic. Determinism is found not to apply at least from physics at the quantum level. So it doesn't mean that we're constrained to be complete Determinists although I think most macro - phenomenon are in terms of Materialism and Naturalism, yeah. Those are solid things. That's the way we find out stuff in science. We've never found out anything by rejecting those approaches so I don't know what you mean when you say they've been undercut.

This response entirely misses the point and also is incorrect.

Materialism is the assertion about the ultimate nature of the stuff of reality. It basically asserts that somewhere the analysis of reality ends with solid little bits and pieces of 'material' stuff. Material stuff was defined by Descartes as being solidly extended 'stuff' which has no traces of, or potentiality for mind. Cartesian type material 'stuff' cannot even interact with mind by definition, and there has been no generally agreed new definition of 'matter' within Western science and philosophy, although physicists implicitly have an entirely different view of the 'stuff' of 'matter.' If you look at the various assertions about the nature of 'matter' above, all made by significant physicists - and more could be added, it is clear that the concept of 'matter' within physics is entirely different from the Cartesian type, which is the kind of 'matter' conceived of by 'classical', which is to say pre-quantum, physics. As Stapp says: 'classical' type 'matter' "does not exist in nature."

The first part of Coyne's reply concerns the *scientific method* and is actually irrelevant to Tsakiris' point, which concerns *the discoveries made using that method*. However it reveals much about Coyne's conceptual incompetence so is worth investigating. Coyne's point is that science started out with a "reductionistic materialistic" and "deterministic" metaphysical framework and using this very method discovered "the phenomena of quantum mechanics." This is, of course, correct. But Coyne's next move is entirely fallacious. In essence he asserts that *because the assumption of the ultimate truth of materialism led to the discovery that materialism is false must mean that materialism is true!* The fact that he could even consider such an absurd suggestion indicates a severe lack of conceptual clarity and a deficit of logical reasoning capabilities.

In logical philosophical reasoning, as most people know, there is a method called 'reductio ad absurdum'. This method of reasoning assumes a certain position and derives a logical contradiction in order to indicate that the assumption is false. For a philosopher to suggest that because the original assumption allowed the contradiction to be discovered must mean the assumption is true would be laughable. But this is in essence what Coyne is suggesting.

Science started out with the assumption that the world of materiality consisted, at least somewhere in its structure, of solid, internally continuous and unbreakable 'material' 'stuff'. This was the assumption underlying the 'classical' pre-quantum worldview. This is actually the fundamental mater-ialist metaphysical worldview. Once physicists got down to the quantum level internal to atomic structure, however, this assumption was found to be false. And this discovery was an enormous shock because, of course, an unreflective 'common sense' approach to our experience of the world leads us to think in such terms. The notion that there is actually no 'material' substantiality at the core of what appears to be a 'material' world was shocking.

In this context it is worth considering the response of the early twentieth century physicist Robert Andrews Millikan. Millikan was a very significant physicist who "made numerous momentous discoveries, chiefly in the fields of electricity, optics, and molecular physics"[33]. His most famous discovery was that of the accurate determination of the charge of an electron, using an elegant "falling-drop method" in which a tiny oil drop is suspended in an electric field. Millikan was awarded the 1923 Nobel Prize for this work.

When Einstein published his seminal 1905 paper on the particle theory of light, which was the start of the quantum discovery of wave-particle duality, Millikan was convinced that it had to be wrong because of the vast body of evidence that had already shown that light was a wave. The physicist and science writer John Gribben writes concerning this:

> … he only succeeded in proving that Einstein was right … In the best traditions of science, it was this experimental confirmation of Einstein's hypothesis (all the more impressive since it was obtained by a skeptic trying to prove the idea wrong) that established clearly, by about 1915, that there was something in the idea of light quanta.[34]

Towards the end of his life Millikan commented on this episode:

> I spent ten years of my life testing that 1905 equation of Einstein's and contrary to all my expectations, I was compelled in 1915 to its unambiguous verification in spite of its unreasonableness.[35]

Quantum theory was discovered not by physicists who were trying to discover it, the reverse is the case; to begin with physicists thought there must be something wrong because at this level the material world vanishes into a realm of potentiality. Heisenberg, one of the founding fathers and the inventor of quantum matrix mechanics once lamented:

> Can nature possibly be as absurd as it seems to us in these atomic experiments?[36]

Quantum physics is as scientific as scientific can be. It's experimental accuracy and precision is astonishing. Physicist Robert Oerter describes the accuracy required for these investigations as that 'you would need to shoot a gun and hit a Coke can – if the can were on the moon'[37]. Richard Feynman, one of the most significant physicists of the twentieth century, compared the accuracy of quantum experiments to measuring the distance between New York and Los Angeles to the precision of the width of one human hair![38] Feynman also said that:

> It is not a question of whether a theory is philosophically delightful, or easy to understand, or perfectly reasonable from the point of view of common sense. The theory of quantum electro-dynamics describes nature as absurd from the point of view of common sense. And it agrees fully with experiment. So I hope, you can accept nature as she is - absurd.[39]

And one fundamental aspect of this 'absurdity' is that there is no 'matter' or 'materiality' where one would expect to find it, at the root of the apparently 'material' world. All 'matter' derives its appearance of materiality from the insubstantial Higgs field.

So it turns out that from the basis of the assumption that there really are solid bits and pieces of matter somewhere 'out there' in the 'external' world physics has proved without a doubt that this is not the case. As the famous twentieth physicist John Wheeler pointed out:

> The universe does not 'exist, out there,' independent of all acts of observation. Instead, it is in some strange sense a participatory universe.[40]

And this is because physics has shown quite clearly that consciousness is involved in some way with the manner in which the material world 'emerges' from an insubstantial realm of quantum potentiality.

In this situation Coyne's claim that: "although I think most macro - phenomenon are in terms of Materialism and Naturalism, yeah. Those are solid things" is beyond absurdity. Coyne's "solid things" are actually 99.9999999999999% empty space, and that is without taking quantum theory into account. So even at a non-quantum atomic level of reality Coyne is already talking nonsense. From the point of view of 'classical' atomic theory the apparently 'material' world is far from 'solid'.

The next section of the discussion gets a bit heated. In order to clarify the issue by getting more precise Tsakiris continues:

> Okay let me give you an example and make sure we're talking about the same thing. I think one of the big nails in the coffin that a lot of people point to as being the beginning of the end of Materialism is a paper in no less than Nature, April '07, titled "An Experimental Test for Non-Local Realism." This paper has been cited over and over again as the final nail in the coffin of Materialism. In it they say, "Most working scientists holdfast to the concept of Realism, a viewpoint according to which an external reality exists independent of observation. Quantum physics has shattered some cornerstone beliefs. Here in this paper we show by both theory and experiment that a broad and rather reasonable class of such non-local Realistic theories are incompatible with experimentally observable quantum correlations." So I don't think this is too out-there, woo-wooish, fringy...

To which Coyne replies:

> Well, I don't know that paper so I can't comment. But you're talking about quantum mechanics again, in which there may be observer effects but as far as I know there's still a lot of controversy about that. How that deals with the Theory of Evolution is completely mystifying to me. I don't know why you bring up this paper. I mean, if you want to use that paper to attack evolution, go ahead. But there's no connection as far as I can see.

Now there are a couple of significant issues here, and unfortunately Tsakiris doesn't pick up on them but gets things slightly wrong as we shall see.

One issue which is worth noting immediately is Coyne's obvious dislike of getting involved with quantum mechanics, as if taking the evidence of the most rigorous scientific physical theory, a theory which has been validated to an extraordinary level of precision, into account is dubious. This is a common ploy within the MUD camp, a ploy which is *utterly unscientific.* There is a

clearly unacceptable, because of being unscientific, tendency within the materialist worldview to treat quantum physics with suspicion, presumably because it undermines MUD claims. This tendency sometimes reaches bizarre heights, as when, for example, purveyors of the MUD perspective suggest that using the evidence of quantum mechanics as being significant in a debate about ultimate issues concerning the process of reality is a fundamental misunderstanding of science! According to an irrational website calling itself 'Rational Wiki' taking quantum mechanics as being significant should be considered to be a "misunderstanding of how science works."[41]

In reply to Coyne's claim to be unable to see any connection between the latest discoveries in physics and the materialist theory of evolution Tsakiris says:

> I think the connection is that they're saying that this whole idea of random mutation has a new spin on it and that new spin is consciousness and that it's all about the observer...

At this point Coyne, feeling threatened, launches an attack, without any concern to question the evidence it any detail. The next few exchanges are as follows:

Dr. Jerry Coyne: Whoa whoa, whoa! Who said the theory of random mutation has a new spin on it? I don't think those authors did.

Alex Tsakiris: Well, I think that's exactly what they said.

Dr. Jerry Coyne: Sorry?

Alex Tsakiris: I think that's exactly what they're saying when they're saying...

Dr. Jerry Coyne: No, you quote me from the paper where they say that. Not that you think that's exactly what they're saying. They're talking about quantum mechanical effects. We have no idea whether those apply on the mutational level. And we have even less idea even if they did whether that would render mutation random or not. … I'm waiting to hear your quote about mutation from this paper.

Alex Tsakiris: Well. I think I just did. They said that...

Dr. Jerry Coyne: No, you didn't. You said that you think they say that. You read me the quote from the paper about non-local effects in physics which I'll take your word that you're reading the abstract. But when you say it applies to non-random mutation I want you to quote me where it says that in that paper.

Alex Tsakiris: Okay, you're right. I can't quote you in that paper where they're tying...

Here it looks as if Coyne has unmasked a devious scheme on the part of Tsakiris. This unfortunate situation, however, has been generated by the fact that Tsakiris seems to imply that the paper he is referring to *explicitly* states that the discovery of quantum non-locality, with the attendant implication of a quantum role for consciousness, has important implications for the theory of random mutation. The paper, however, only implicitly has this implication.

The passages of the paper which contain the clear *implicit* indication that the fundamental discovery of quantum non-locality and its attendant phenomena do have serious implications for an entire worldview, which includes the MUD worldview, and its notion of random mutation, are in the very first paragraph. It is very unfortunate that Tsakiris was not able to press this point

home with more force because it destroys the entire fraudulent worldview promoted by Coyne and his MUD cronies. Once one appreciates the full significance of the subtleties of quantum discoveries, it becomes apparent that most of the ridiculous claims of MUD evolutionary theory are laughable.

The relevant parts of the first paragraph of the paper are:

> Physical realism suggests that the results of observations are a consequence of properties carried by physical systems. It remains a surprising fact that this tenet is very little challenged, as its significance goes far beyond science. Quantum physics, however, questions this concept in a very deep way. To maintain a realistic description of reality, non-local hidden-variable theories are being discussed … we perform an experiment that excludes for the first time a broad class of non-local hidden-variable theories.[42]

These observations validate Tsakiris' assertion that the evidence of quantum mechanics (quantum theory) suggests that the "whole idea of random mutation has a new spin on it and that new spin is consciousness and that it's all about the observer."

The most crucial point is actually contained in the very first sentence: "physical realism suggests that the results of observations are a consequence of properties carried by physical systems." Quantum physics has now demonstrated, on the basis of numerous precise experiments, that *it is not the case that the fundamental properties of the physical world are independent of the observations made upon it*. We are not talking only about 'secondary qualities' such as sound, colour and so on but fundamental ones, right down to independent existence. Now any kind of MUD account of evolution which asserts independent bits and pieces of reality which are supposed to carry independent properties which randomly mutate of their own accord, so to speak, is contradicted by this fundamental quantum discovery. The paper's reference to 'hidden-variable theories' refers to attempts by physicists to find theories which restore in some way 'hidden' independent properties which can restore a 'realistic' world of independent material bits and pieces. Such attempts, however, are shown by experiment to be untenable.

It is quite obvious that the authors of the paper are unlikely to pick out one particular aspect of science which this fundamental discovery affects because they clearly indicate that the significance of this quantum feature of reality "goes far beyond science." It should be quite clear to any intelligent, rational interested party that this discovery, which indicates that prior to observation there are no 'real' fixed and independent properties in an independent 'external' reality, will have serious implications for the crudely materialist worldview of MUD which asserts the existence of a self-enclosed independent world, an independent realm which is supposed to contain independent material bits and pieces with their own properties which are entirely separate from mind and consciousness.

But the remarkable fact is that, although Coyne presents himself as, and presumably thinks of himself as, a thoroughly respectable scientist, he is not an interested party, although he should be. He is not an interested party because perhaps he knows in his bones so to speak that the emerging quantum worldview does threaten at its core his outmoded crude materialism, a worldview which belongs to the nineteenth century. And because of this he cannot do what a scientist interested in the truth should do, which is, of course, to examine the evidence carefully

to determine its relevance. Instead, he adopts pugilistic avoidance tactics to protect his emotional investment in a mistaken worldview, along with his academic status and career. So, instead of looking into the implications of the paper cited by Tsakiris, Coyne insists that unless Tsakiris can find a quote from the paper *explicitly* saying that quantum non-locality has serious implications for the theory of random mutation. Because the paper does not explicit indicate this Coyne feels justified in ignoring Tsakisis' suggestion, and he says to Tsakiris:

So you're making it up basically, right?

Alex Tsakiris: Well, Jerry, let's be fair. I don't want to get antagonistic or anything like that but this is…

Dr. Jerry Coyne: Well, you are. Yes, go ahead.

Alex Tsakiris: I'm just saying if they're saying at the fundamental level of physics non-local theories are incompatible with what we observe, then I think it calls into question the things that we're talking about in terms of Materialism, Determinism. Isn't that the direct implication of what they're saying?

Dr. Jerry Coyne: No! No, because they're talking about what happens in a very, very tiny micro level. It does not mean that you can't predict what happens when billiard table for which Newtonian mechanics is perfectly applicable. It's as if you're saying we can't play billiards and we can't shoot rockets to the moon because of this stuff that happens on a micro level. The fact is that assuming that these phenomena apply on most of the levels of reality that we deal with renders everything wrong is simply incorrect. For most macro phenomenon, Newtonian or classical mechanics works fine. For most micro-phenomenon you're turning to quantum mechanics. It works fine. And in terms of evolution I don't see how this quantum mechanics affects evolution at all. I mean, maybe it can affect mutation. You said that these people say that but that turned out to be something you made up. I don't see how it can and even if it did it would not by any means render mutations non-random in the way that evolution has to mean that they're random.

Here, once again, Coyne show an extraordinary lack of grasp of fundamental issues. The fact that we can use Newtonian mechanics to *predict* macro-level phenomena does not make Newtonian mechanics true as an *ultimate* explanation of the nature of reality, and evolution is presented as an *ultimate* explanation. According to quantum physicist Wojciech Zurek for instance the ultimate stuff of reality is quantum "dream stuff" and the material world is produced through the 'epiontic' amplificatory processes of perception. [43] Quantum 'dream stuff', which has an internal connection with consciousness, is the ultimate stuff of reality and materiality is derivative. Furthermore the process of mutation would have to occur at the molecular level which is essentially quantum in nature. Once again one can only conclude that Coyne is full of ignorant bluster.

One thing which is deeply shocking about this attitude is that the paper referred to is not a borderline curiosity dealing with some recondite but largely insignificant aspect of quantum theory. The paper actually deals with the central discovery of quantum theory that there is no independent 'real' world existing independent of sentient beings apparently inhabiting it. The phenomenon of quantum non-locality has prompted a vast amount of scientific and philosophical investigation and literature devoted to exploring the deep metaphysical implications of this

quantum discovery for our understanding of reality and, in particular, the nature of the apparently 'material' world and its relation to consciousness. Coyne, however, seems haughtily oblivious to this scientific debate prompted by deeply shocking scientific discoveries, he seems to have no interest. It is an astonishing attitude for someone who considers himself to be a scientist in search of 'truth'. Tsakiris' remarks are entirely appropriate:

> You know, I've found that a lot of skeptics - one of their big push-backs to this show is that guests aren't properly given the opportunity to review the research. I find that such a shallow excuse. I mean, if you're really a broad thinker in this area, shouldn't you be aware of some of the basic questions surrounding consciousness? Surrounding mind equals brain? Should we really allow people to retreat to the "I don't know. I haven't read that," kind of excuse? Especially when we're talking about basic stuff about quantum entanglement and how that might affect consciousness. I think most people are tuned into at least the debate there.

Tsakiris is absolutely correct here. The crucial and fundamental phenomenon of quantum entanglement has produced probably the most significant current metaphysical discussion within science and philosophy concerning the nature of the apparently 'material' world. And yet Coyne claims he knows nothing of any of this, it is a laughable situation.

And, shockingly, the crucial quantum phenomenon is not the only hugely important twentieth century discovery Coyne claims not to have any knowledge of. He also tells us that he is entirely unaware of the discovery of neuroplasticity:

Alex Tsakiris: One of the articles that I sent you that I was hoping I could get you to comment on—I hope it isn't too much of a stretch from this—but I think the research of Jeffrey Schwartz at UCLA is extremely relevant to this discussion. He's a guy who studied OCD, obsessive-compulsive disorder in patients and he found that their self-directing thought could actually rewire their brain, something called neuroplasticity, and even the physical form of the brain. So it fits into this broad category of research that shows that intention, mental thought, can actually change the physical form that we experience, that we live. Doesn't that have an impact on the overall picture of evolution?

Dr. Jerry Coyne: Well, I don't know this research. As I told you when we vetted my appearance here I'm not really qualified to answer questions about research that I'm not familiar with. So you're asking me to say whether or not a piece of research I'm not familiar with justifies or not justifies free will. I haven't read that so I can't really comment on that, you know?

Alex Tsakiris: Okay, the broader category of neuroplasticity, you reference that modern neuroscience is pointing us in the direction of understanding that there is no free will. I thought that was in that general category of neuroplasticity, but if you feel that's not something you're comfortable to comment about then…

Dr. Jerry Coyne: I'd have to be convinced by reading this article that brains can change themselves without any external inputs from either the other parts of the body or the environment. I'd have to see the article before I could comment on that. I haven't.

Yet, despite this self-confessed ignorance of the hugely significant modern discovery of the fact that consciously deployed intentionality directly rewires the brain, Coyne feels quite happy pontificating, on the basis of self-confessed abject ignorance, on the issue of free-will:

> Free will is, I believe, an illusion that we have that we can some-how affect the workings of our brain and free them from the laws of physics. My answer to that is no, we can't arrange the subject of the laws of physics because they're material entities.

But how can Coyne possibly have any reasonable basis for such a belief? By his own admission he is completely ignorant of the relevant research. In fact it seems that Coyne is completely ignorant of the most relevant research concerning the crucial issues that he regularly misleads the public about, and yet he considers himself to be a 'scientist.'

Coyne is an ardent *materialist* and his brand of evolution 'theory' is *materialist*, and as such he must assert the existence of a material world which is independent of all acts of observation. He must also believe in a 'local' reality, which is a reality within which aspects of the 'material' world do not have what Einstein called 'spooky' instantaneous interconnections between vastly distant elements of reality. Both of these claims have been shown to be false, not just by the paper referred to by Tsakiris, but by the core discovery of quantum theory which is termed 'entanglement'.

Very precise quantum experiments have been carried out over and over again testing an inequality called 'Bell's inequality'. John Bell was an influential quantum physicist who wanted to find a way of determining whether Erwin Schrödinger's assertion that quantum reality, which is in fact 'Reality', must be 'spookily' interconnected in a way that defied 'classical' and 'materialist' worldviews, was correct or not. Quantum entanglement means that there is some kind of instantaneous communication between the quantum entangled particles, no matter how distant from each other they are. This aspect of the quantum world is termed 'non-locality'. It demonstrates that there are, contrary to what classical physics predicted, non-local, instantaneous connections and interdependencies across vast reaches of space. This was what Einstein referred to as 'spooky action at a distance'. Einstein hated the idea and spent a great deal of time trying to refute it. However, it was eventually confirmed experimentally by the demonstration that Bell's inequality is violated. Greene remarks that:

> Numerous assaults on our conception of reality are emerging from modern physics … But of those that have been experimentally verified, I find none more mind-boggling than the recent realisation that our universe is not local.[44]

In order to convey the 'mind-boggling' nature of the quantum phenomenon of non-locality David Lindley, in his book *Where Does the Weirdness Go*, presents the situation in terms of a pair of gloves. Suppose someone buys a pair of gloves and then sends the left glove to someone in Hong Kong and the right to someone else in New York. This represents the 'common-sense' situation under the 'locality' view that we are familiar with from our everyday macroscopic world. The 'leftness' of the Hong Kong glove is 'local' to Hong Kong and the 'rightness' of the other glove is 'local' to New York. There can be no instantaneous interconnection between the two gloves which affects their handedness at the moment that one of the packages containing either glove is opened. But if these gloves were quantumly entangled then both gloves would be in a state of hovering between 'leftness' and 'rightness' until one of the packages containing the individual gloves was opened. When one of the packages is opened the gloves would magically adopt a definite 'leftness' and corresponding 'rightness.' If the opened package were found to be a left glove the other distant glove will become a right one instantaneously. Thus there is a non-local instantaneous interconnection between the gloves, an interconnection involving observation

which defies 'common sense.' Quantum physicist Giancarlo Ghirardi, in his brilliant book on quantum physics *Sneaking a Look at God's Cards* discusses this phenomenon in a section entitled 'Telepathy or a Cheap Trick' and concludes that the fact of an instantaneous quantum interconnection between entangled distant entities is a kind of quantum 'telepathy.'

This notion that there is some kind of instantaneous 'telepathic' inter-connection between all phenomena at the quantum level is so strange and unexpected, being completely at variance to our everyday conceptions, that one of the first physicists to investigate Bell's theorem, John F. Clauser, expected to find that his experiment would *disprove* quantum non-locality and entanglement. As Anton Zeilinger, a physicist who has explored quantum entanglement in great detail, points out in his book *Dance of the Photons*:

> It is quite remarkable by the way, that Clauser expected that the experiment would show the opposite. He expected that Bell's inequality would not be violated. He did not consider it possible at all that the world could be so crazy that local realism could be wrong. It is actually the sign of an excellent experimentalist that he is able to discover something unexpected in the laboratory. Clauser did not only *not* expect the results he got; he expected exactly the opposite to happen![45]

Like Millikan before him, Clauser proved quantum weirdness whilst expecting to disprove it.

These quantum discoveries are so spectacular and unexpected, completely undermining 'materialist' views, that it is shocking that any 'scientist' is unaware of them. But Coyne does indeed seem outrageously ignorant of this evidence. His assertion that "there's still a lot of controversy" about the fact of the entanglement of consciousness at the quantum level is just not true and it shows that he is completely out of touch with an area of science which, as a 'materialist', he should be aware of. Coyne and other materialists generally tell us that it is important to be aware of the necessary evidence before coming to conclusions but they regularly flout their own rules when it suits them. Coyne is clearly completely oblivious to the quantum discoveries which indicate that consciousness is operative at the quantum level and, whilst there is controversy about the exact nature of this connection, the fact of the interconnection is accepted by the great majority of physicists. This is why Zeilinger, one of the authors of the paper mentioned by Tsakiris, has written in appreciation of John Wheeler's work of Wheeler's:

> …realisation that the implications of quantum physics are so far-reaching that they require a completely novel approach in our view of reality and in the way we see our role in the universe. This distinguishes him from many others who in one way or another tried to save pre-quantum viewpoints, particularly the obviously wrong notion of a reality independent of us.[46]

Here Zeilinger indicates that what appears to be an independent 'material' reality is not independent of the observations made by all sentient beings.

This is by no means an extreme view; it is mainstream. In an article in the New Scientist (23rd June 2007) Michael Brooks, commenting on quantum entanglement experiments carried out by teams led by Markus Aspelmeyer and Zeilinger, tells us that the conclusion reached by the physicists involved is that:

> … we now have to face the possibility that there is nothing inherently real about the properties of an object that we measure. In other words measuring those properties is what brings them into existence. [47]

And Professor Vlatko Vedral, quantum researcher at the University of Leeds commented that:

> Rather than passively observing it, we in fact create reality. [48]

The headline for the article proclaims that:

> To track down a theory of everything, we might have to accept that the universe only exists when we are looking at it… [49]

This dramatic conclusion is prompted by recent extremely delicate experimental investigations of the interaction of the observations being made and the nature of the resulting experimental outcomes.

According to all significant current interpretations of quantum theory, such as for instance the 'Theory of Everything' proposed by Steven Hawking and Leonard Mlodinow in their recent book *The Grand Design: New Answers to the Ultimate Questions of Life*, 'observer-participants', a term used by Wheeler, are in some way involved in 'choosing' which quantum potentialities are brought into manifestation. Quantum theory, then, has immense implications for our understanding of the process of evolution. In particular it indicates that the notion that mutations are completely random cannot be correct, mutations must depend upon consciousness in some way. In the Hawking & Mlodinow scenario for instance all the possibilities for the future evolution of the universe, including the possible sentient beings that can evolve are potential at the moment of the big bang and are 'chosen', even backwards in time, through the operation of a kind of collective consciousness operating through the quantum level:

> Quantum physics tells us that no matter how thorough our observation of the present, the (unobserved) past, like the future, is indefinite and exists only as a spectrum of possibilities. The universe, according to quantum physics, has no single past, or history. The fact that the past takes no definite form means that observations you make on a system in the present affect its past. [50]

This is the astonishing proposal required by quantum theory. From the timeless point of creation a spontaneous universal 'creative' act, a 'creative' act without an independent 'creator', projects all possible futures into a universal possibility or potentiality space. At the point of creation everything that possibly can happen becomes potential, so at the point of creation all possible future histories of the universe come into 'existence' as potentialities:

> In this view, the universe appeared spontaneously, starting off in every possible way. Most of these correspond to other universes …. Some people make a great mystery of this idea, sometimes called the multiverse concept, but these are just different expressions of the Feynman sum over histories. [51]

The spontaneous creative burst creates the multiverse of possible worlds. But a hugely significant feature of this presentation is the fact that the "observers are part of the system"[52] and observers have serious work to do:

> The histories that contribute to the Feynman sum don't have an independent existence, but depend on what is being measured. We create history by our observations, rather than history creating us.[53]

In other words the observers, or what Wheeler called 'observer-participants,' are able to weed out possible universes, and thereby select those which remain in the possibility mix, even backwards in time. Thus one of the central chapters in *The Grand Design* is entitled 'Choosing Our Universe':

> The idea that the universe does not have a unique observer-independent history might seem to conflict with certain facts that we know. There might be one history in which the moon is made of Roquefort cheese. But we have observed that the moon is not made of cheese, which is bad news for mice. Hence histories in which the moon is not made of cheese do not contribute to the current state of our universe, though they might contribute to others. This might sound like science fiction but it isn't.[54]

In his book *Life Without Genes* Adrian Woolfson, founder and chief executive of ProteinLogic, and clinical medical supervisor at the University of Cambridge, endorses this viewpoint:

> In the beginning there was mathematical possibility. At the very inception of the universe fifteen billion years ago, a deep infinite-dimensional sea emerged from nothingness. Its colourless waters, green and turquoise blue, glistened in the non-existent light of the non-existent sun … A strange sea though, this information sea. Strange because it was devoid of location …[55]

Ignoring the apparently endemic misguided notion that a vast realm of the process of reality and experience can magically arise from complete absence, Woolfson's, suggestion is that there must have been some kind of field of potentiality at the inception of the universe This field can only be the universal quantum field of potentiality that contains:

> …all possible histories … through which the universe could have evolved to its present state…[56]

In the beginning, of course, the quantum potentiality field of the universe would contain all the future evolutionary possibilities:

> The information sea is thus a quantum mechanical sea, composed from infinite repertoires of entangled quantum descriptions.[57]

From out of the vast entangled web of infinite possibilities for manifestation only certain privileged members will actually make it into reality, so to speak:

> An information space of this sort would furnish a complete description of all potentially living and unrealizable creatures…[58]

It therefore follows that there is a sort of 'design' woven into the potentialities for evolution; it is a vast complex design of all possible manifestations written into the quantum field of potentiality for the universe standing on the very edge of time.

Furthermore, if Hawking & Mlodinow, Wheeler, Stapp and many other physicists are correct then consciousness in some way plays a role in unfolding which bits of the potential design becomes actual design. This is a metaphysical vision of the process of reality and evolution,

derived from quantum theory, which is wildly at variance with Coyne's completely random mindless-materialist mechanistic vision. And, dramatically, there is empirical evidence that something like this is the correct vision, rather than the 'blind watchmaker' lack of vision!

The evidence of quantum physics clearly suggests that the potentialities for all possible manifestations reside as latencies within the quantum field underlying the process of reality. This quantum metaphysical perspective, which includes quantum features of biological evolution, suggests that, in contrast to the ridiculous random mutational materialist fantasies that Coyne indulges in, wherein there cannot be any evolutionary anticipation or planning for future biological unfoldments of potentialities, we should expect to find within the evolutionary process structural anticipations of, and convergences towards, quantum design potentialities.

And it turns out that if the evidence, *all* the evidence that is, is examined, without bringing dogmatic preformed, nineteenth century fossilized MUD prejudices to the investigation, this is precisely what is found. In his excellent work *Life's Solution: Inevitable Humans in a Lonely Universe*, Simon Conway Morris, Professor of Evolutionary Palaeobiology at the University of Cambridge, gives the following example:

> To give one example: the central nervous system of amphioxus is really rather simple. It consists of an elongate nerve chord stretching back along the body, above the precursor of the vertebral column (our backbone, consisting of a row of vertebrae) and a so called brain. The brain can only be described as a disappointment. It is little more than an anterior swelling … and has no obvious sign in terms of its morphology of even the characteristic threefold division seen in the vertebrate brain of hind-, mid-, and fore-sections. Yet the molecular evidence, which is also backed up by some exquisitely fine studies of microanatomy, suggests that, cryptically, the brain of amphioxus has regions equivalent to the tripartite division seen in the vertebrates.
>
> The clear implication of this is that folded within the simple brain of amphioxus is what can almost be described as a template for the equivalent organ of the vertebrates: in some sense amphioxus carries the inherent potential for intelligence.[59]

This 'molecular evidence' indicates the tripartite division within the brain which emerges within evolution much later is somehow written into the molecular structures of the simplest organisms as a kind of template for future development. And this molecular anticipatory structuring must have a quantum origin, there is nowhere else it can come from, molecular arrangements are determined by quantum potentialities. Conway Morris provides convincing evidence that the spectacular convergences upon similar 'solutions' within evolution also suggest internal patterning templates.

Coyne, however, does not seem to want to know about any of this. He does not want to consider the evidence and instead seems simply concerned about salvaging academic credibility *without seriously considering very potent and significant evidence*. In fact his behaviour suggests someone willingly setting out to ignore the evidence of quantum physics and examples from biology and quantum biology.

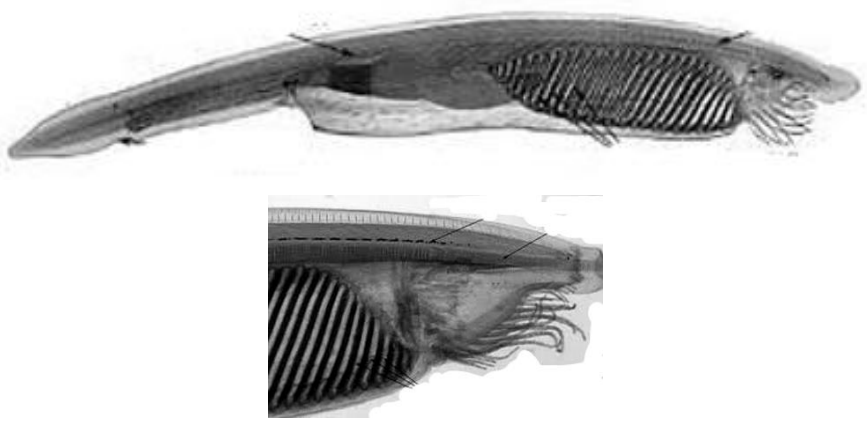

Figure 1 – The amphioxus animal.[60]

According to Coyne "we have no idea whether [quantum mechanical effects] apply on the mutational level." However, the idea that quantum effects would not be operative at the molecular level of DNA 'mutation' is highly implausible, and there is now significant emerging evidence that quantum mechanisms may be crucial in all fundamental processes of life. However, it must be said that in his summing up Tsakiris is much too enthusiastic about the amount of research in the area of quantum biology:

> I would encourage you to go and Google "quantum entanglement in biological systems." You'll find just thousands and thousands of links to dozens and dozens of papers that suggest what you probably already knew, and that's that quantum entanglement is being found in larger and larger biological systems. So when Jerry wants to hold on to this really outdated idea that quantum entanglement only matters at the sub-atomic level and has only been demonstrated there, that's just easily provably false.

This assertion is actually overoptimistically incorrect. This Google search produces a page or so of entries. In case this chapter should ever fall into Tsakiris' hands I would like to take the opportunity to suggest that it is very, very important that researchers into these cutting edge issues refrain from over stating the evidence because it only provides ammunition for MUDs, who will jump on any perceived apparent mistake, however insignificant (such as treating obvious typographical errors as devious attempts to alter meaning[61]), in the presentation of the newly emerging quantum-life paradigm in order to try and undermine its credibility, usually with ill-researched and conceptually incoherent abuse.

Examples of this are also provided by some comments in a section in support of Coyne and the MUD worldview on a blog-site called 'Pharyngula'[62], which was set up by the biologist and pugilistic anti-ID activist P.Z.Myers. The blog starts out with some hard-core MUD-slinging:

> I could have warned him. Jerry Coyne had an interview on Skeptiko, that nest of feeble-minded credulity, that was a hilarious collision of reason with idiocy.

A comment on the blog which directly addresses Tsakiris' "quantum entanglement in biological systems" remark is:

> Just follow Tsakiris' advice and google on "quantum entanglement in biological systems." You will quickly notice that this applies to phenomena like photosynthesis, exactly where we should expect find it. Thus Dr. Coyne's "really outdated idea" is only confirmed.
>
> "that's just easily provably false."
> Which begs the question: how stupid is Tsakiris exactly?
>
> "did this guy publish on this date?"
> What about following your own advice and do some googling, Mr. Tsakiris? Or consulting Wikipedia?
> One again: how stupid is Tsakiris exactly?

Now a question which immediately arises is: why exactly would one *expect* to find quantum entanglement operating in photosynthesis? The discovery that quantum effects were involved was very recent. Up until a few years ago it was thought that the mechanism simply involved the exchange of an electron. The central puzzle of the process was the high efficiency, nearly 100%. According to an article '*Ultrafast Quantum Dynamics in Photosynthesis*' in a peer reviewed collection of scientific articles *Quantum Aspects of Life*:

> One of the fundamental and long standing questions about these early steps in the photosynthetic process concerns the extent to which quantum coherent phenomena might play a role in the high efficiency transfer …. The issue is tremendously controversial.[63]

If experts in this field consider that the issue of the quantum mechanism is "tremendously controversial" then how seriously should we take the blog commenter's opinion that we should 'expect' to find quantum mechanisms operating in photosynthesis?

It is worth having a look at some of the comments on this blog in order to get an idea of the quality of insight derived from lack of rigorous research of the relevant sources:

> The first couple dozen comments on the Skeptiko link are beautiful. A ton of people (some possibly from here?) swooped in to assist Jerry in ripping up this Alex dude. It's truly a wonderful showcase of badass skeptics tearing into a very, very woo-inflicted little man.

'Woo', in case you did not know, is the MUD's blanket term for anything they consider contrary to the materialist MUD worldview. And these "badass sceptics" really get a kick out of offering their opinions based on deep and profound ignorance. The following is a gem:

> I only heard any of this Alex guy because of Monster Talk and he was bad enough there. But on this one he's cemented that impression of a supercilious arrogance of ignorance toolbox. He's always going to that "I'm a nice guy! I'm just asking questions!" tone while dismissing everything you're saying out of hand and elevating alternate theories with nothing more going for them than he likes them better. Is there a really good wiki or article or something that shows all of this new age quantum bollox up? 'Cause that's what he's doing here; some quantum paper in Nature proves 'reality' doesn't exist as we know it, there's other forces at work etc. Quantum physicists probably think there's no need to address the idea that this doesn't apply at all scales, or whatever. But these clowns will jump on these ideas all the same. How do we tell them?

The question which arises from this revealing comment is: exactly how has this person come to the conclusion that what he calls "new age quantum bollox" *is* "bollox"? After all it looks as if he has not done much in the way of research because he is asking for someone to point out an article which shows that it *is* "bollox"!

He asks "how do we tell them?" Well the first step would be to do the relevant research. And it is necessary to do a lot, *and I mean a lot.* Review all the relevant literature outlining the views of major quantum physicists: Planck, Bohr, Schrödinger, Heisenberg, Pauli, Bell, Stapp, Everett, Wheeler, d'Espagnat, Linde, Zeh, Zurek, Zeilinger, Penrose, Hameroff, Hawking, Rosenblum & Kuttner, Smolin, Susskind, Seth Lloyd, Vlatko Vedral - that's just a selection. I doubt whether the contributors to this blog have heard of most of these significant physicists. One needs to be fully conversant with the basic formulism of the Schrödinger equation and have a good grasp of quantum entanglement, which means one needs to be able to understand the metaphysical issues involved in the paper cited by Zakiris, and other papers and books on the subject, and its implication of the involvement of consciousness at the quantum level.

In this context the following comment from the Pharyngula blog site is revealing:

> …the moment I heard Tsakiris talk about the Observer Effect, I realized that he doesn't understand exactly what that is. Specifically: The Observer Effect has nothing to do with consciousness. The fact that Tsakiris brings up the Two-Slit Experiment proves it: No consciousness observes the photon. It's all done mechanically. In fact, there is an extension to it where you can introduce another mechanism to the experiment that removes the results of the observation of the photon and the interference pattern re-emerges. All of this is done without a single consciousness taking part. Yes, the Observer Effect is real, but it has nothing to do with consciousness.

This comment shows a complete lack of understanding of the quantum situation. The first thing one might say is: if consciousness is not involved why is it called 'the observer effect,' and why do the majority of major physicists, not new age fanatics, but physicists, conclude that consciousness is involved in some measure. For example in their book *The Anthropic Cosmological Principle* John D. Barrow and Frank J. Tippler write that:

> Quantum mechanics involves observers in subtle and controversial manner.[64]

This observation indicates that it is the "manner", or the details, of the involvement that is controversial. Physicist Amit Goswami pithily sums up the phenomenon of the 'observer effect', or 'collapse of the wave function':

> In quantum physics, objects are depicted as possibilities (a possibility wave); yet when an observer observes, the possibilities collapse into an actuality (the wave collapses into particle, for example). This is the observer effect.[65]

A 'wave function' is a mathematical function which describes the way in which the immaterial quantum potentialities, or "possibilities", behave prior to some kind of observation being made. When an observation is made the appearance of materiality, a particle for example, emerges from the quantum ground of potentiality. Recently two industrial strength physicists Bruce Rosenblum and Fred Kuttner, in their book *Quantum Enigma: Physics Encounters Consciousness*, state that:

> …physics' encounter with consciousness, demonstrated for the small, applies to everything. And that 'everything' can include the entire Universe.[66]

Quantum cosmologist Andre Linde says regarding the 'observer effect':

> Thus we see that without introducing an observer, we have a dead universe, which does not evolve in time. This example demonstrates an unusually important role played by the concept of an observer in quantum cosmology. John Wheeler underscored the complexity of the situation, replacing the word observer by the word participant, and introducing such terms as a 'self-observing universe.'[67]

Does Linde conclude that this is nevertheless a purely mechanical process with no trace of consciousness being involved? Not at all:

> Is it possible that consciousness, like space-time, has its own intrinsic degrees of freedom and that neglecting these will lead to a description of the universe that is fundamentally incomplete? What if our perceptions are as real as (or maybe, in a certain sense, are even more real) than material objects?[68]

Sir Roger Penrose, in his massive tome *The Road to Reality* tells us that:

> As far as I can make out, the only interpretations that do *not* necessarily depend upon some notion of 'conscious observer' … require some fundamental change in the rules of quantum mechanics…[69]

And anyone who is familiar with the details of quantum mechanics knows that a "fundamental change" is nowhere on the horizon. Penrose is not a deranged 'new age' hippy who is "infected with woo". Anyone who has read all of his books investigating and trying to provide a solution to the quantum conundrum would know that Penrose was not comfortable with the notion that consciousness is in some sense primary and he tried to reach other conclusions. However he was forced in this direction *by the evidence*:

> …at the large end of things, the place where 'the buck stops' is provided by our *conscious perceptions*. …[70]

A point reiterated by quantum decoherence theorist Erich Joos:

> …the last and final evidence comes in the form of perceptions made by some observer.[71]

And perceptions made by observers clearly require the presence of consciousness. As Bernard d'Espagnat tell us:

> The doctrine that the world is made up of objects whose existence is independent of human consciousness turns out to be in conflict with quantum mechanics and with facts established by experiment. [72]

Many more examples of statements of the sort from serious and significant physicists could be adduced and, contrary to some statements by materialist apologists, hardly any, if any, to the contrary, which indicates that Coyne, and his apologists, have not got a clue what they are talking about.

Our intrepid, but out of his depth, MUD blogger demonstrates his lack of knowledge when he speaks of "an extension to [the double slit experiment] where you can introduce another mechanism to the experiment that removes the results of the observation of the photon and the interference pattern re-emerges". In this context his lack of knowledge resides in the fact that in the experiment he is referring to the emergence or not of the interference pattern depends upon the potential state of knowledge of the people doing the experiment. Admittedly this is very subtle, but then would you really expect the secret of life and the universe to be as crude as MUD. The point here is than the interference pattern 'emerges' when there is no way that an experimenter can gain knowledge of the path taken by a quantum 'particle'. The way in which quantum reality manifests depends upon the potential states of knowledge of the consciousnesses of the experimenters.

The following is our penultimate MUD sling:

> Yeah, the interviewer doesn't know what the heck he is talking about. How does non locality and quantum entanglement defeat materialism? They are both real world phenomenon that happens to things that are real, and that can be described by quantum mechanics. Also, I am sick and tired of people going like: quantum mechanics, therefore consciousness mumbo jumbo!!

Here is an example of someone basically saying that because he is "sick and tired" of a certain conclusion he is going to reject the evidence without bothering to look at it. Furthermore, what does he mean by the "real world". Has he does any research into the quantum implications for our notions of reality. Does he know that quantum researcher Jim Baggott has concluded on the basis of both a general philosophical investigation into the process of reality, quantum theory in particular, that:

> We must now come to terms with the fact that there is no hard evidence for this common sense reality to be gained from the entire history of human thought. There is simply nothing we can point to, hang our hats on and say *this is real*.[73]

Or that quantum cosmologist Lee Smolin has concluded from quantum physics that:

> How something is, or what its state is, is an illusion. It may be a useful illusion for some purposes, but if we want to think fundamentally we must not lose sight of the essential fact that 'is' is an illusion.[74]

Or that Penrose has pointed out that:

> …it makes no sense to use the term 'reality' just for objects that we can perceive … denying that the term can apply at some deeper underlying level. Undoubtedly the world is strange and unfamiliar at the quantum level, but it is not 'unreal'. How, indeed, can real objects be constructed from unreal constituents? [75]

Or that Zeilinger has proposed that the quantum violation of Bell's inequality might mean that:

> … the reality assumption is not correct. This would mean in principle that the property of a particle observed in a specific experiment is not an element of physical reality before the measurement is performed. In the end, this means that reality depends on the decision of the observer - of the experimentalist - about which measurement to perform. The breakdown of realism would mean that the measured result does not reflect

> any kind of property that existed before and independently of observation. … The other possibility would be for us to give up the picture of a world that exists in all its properties independent of us. That would mean that we have a very essential influence on reality just by deciding which measurement to perform. There are indeed hints that this might be the message we have to accept.[76]

Of course not, such MUD-blogging comments are nothing more than assertions of dogmatic ignorance. The use of the word 'real' here shows no metaphysical insight whatsoever; it is muddled MUD metaphysics which simply refuses to take the nature of the quantum ground of potentiality into metaphysical account.

Quantum physicist Wojciech Zurek, the instigator of the quantum 'Darwinism perspective' has stated that:

> …quantum states, by their very nature share an epistemological and ontological role – are simultaneously a description of the state, and the 'dream stuff is made of.' One might say that they are *epiontic*. These two aspects may seem contradictory, but at least in the quantum setting, there is a union of these two functions.[77]

In other words the essential 'stuff' of the quantum realm is immaterial quantum 'dream-stuff' of potentiality which is organised into manifestation through the operation of the epistemological-perceptual function creating the ontology of the apparently 'material' world. The fact that epistemological–perceptual activity produces ontology is indicated by the word 'epiontic'. Zurek calls this process 'quantum Darwinism', a perspective we shall look at shortly.

Our final MUD inspired muddying of intellectual waters is:

> It's odd because most of them actually attempt to approach the question from a scientific viewpoint. They all agree that evidence is required to believe things; it's just that they have no desire to actually examine the evidence with a critical eye. If it fits their preconceived notions, it's good science no matter how shitty it actually is. It's very frustrating.

It is indeed "very frustrating" that someone could make such a manifestly false, absurd, ridiculous and stupid comment. For in obvious truth it is Coyne who avoids important evidence by not knowing, or claiming not to know, anything about quantum entanglement and the clear implications of the falsity of materialism, the primacy of consciousness at the quantum level of the process of reality, or anything about the importance of the evidence of neuroplasticity for our ideas regarding free will, something which Coyne pontificates about. The claim that the quantum perspective represented in this case by Tsakiris citing of a significant paper by Zeilinger and associates is "preconceived" is refuted by the fact that early quantum physicists did not accept the conclusions happily and they set out, unsuccessfully, to refute them. Now, however, the anti-materialist implications of quantum theory are incontrovertible.

The MUD avoidance of accepting established scientific facts is one aspect of the desperately implausible nature of the MUD worldview. Another shocking aspect is the sheer absurdity of some of the claims made. And is also a shocking fact that often 'educated' people who take the MUD worldview to by unchallengeable are not even aware of such absurd claims. I was once discussing the validity of the MUD worldview with an established lecturer in philosophy who

told me that materialist evolution was incontrovertible scientific fact. I asked him if he really believed the ridiculous notion that a hippo-like creature actually took to the water and materially transformed, excruciating millimeter by excruciating millimeter into a whale. He replied that evolution did not make that claim, which indicated that he clearly did not have the facts to make draw a conclusion. I pointed out that this *was* an emphatic claim made by MUDs, which is why MUD expounder Steve Jones had written a book with the title *Almost Like a Whale.* I could see he was momentarily taken aback by the sheer implausibility of the scenario, but then he said: "Well I guess it could have happened very gradually." One of the enthusiasms of this 'philosopher' was how to reason coherently! The notion that a hippo-like creature transformed in miniscule steps, its nose gradually migrating backwards, its breathing organs and blood-chemistry transforming in order to dive to great depths, *all in a fully coordinated manner*, through random gene mutations is not just absurd, it verges on the insane.

In his discussion of the ridiculous MUD notion that whales evolved directly and materially (i.e. according to this view there are no immaterial quantum-informational levels involved) from a cow-like animal Coyne begins by telling his readers about a lecture he once attended which was delivered by the American fundamentalist Baptist creationist Duane Gish:

> How, he asked, could such a transition occur, since the intermediate form would have been poorly adapted to both land and water, and thus couldn't be built by natural selection? … To illustrate the point Gish showed a slide of a mermaid like cartoon animal whose front half was a spotted cow and whose rear half was a fish. Apparently puzzled over its own evolutionary fate, this clearly maladapted beast was standing at the water's edge, a large question mark hovering over its head. The cartoon had the intended effect: the audience burst into laughter. How stupid, they thought, could evolutionists be?[78]

We do not have to share Gish's creationist beliefs to wonder at the stupidity of MUDs, because there is a much more 'natural' account which is entirely in accord with the evidence of quantum theory, and which does not require suspension of one's sense of absurdity. In this account we take account of the fact that quantum theory tells us that all potentialities reside in the quantum ground of p otentiality which is 'existent' as quantum potentiality but not manifested as experienced reality, at the dawn of time – the moment of the big bang. This means that the 'designs', or 'templates', for various body plans, various means of sensing, various modes of locomotion, and so on are already potential. These designs are then manifested through a process of 'quantum Darwinism', to adopt a terminology derived from Wojciech Zurek (although not to follow his presentation in entirety), in which the potentialities are unfolded by an internal energetic and primordially intelligent pressure towards manifestation. Such a view has presented in detail by the Russian physicist Michael Mensky in his development of what he calls the Extended Everett Concept (ECC) which involves the understanding that consciousness is a fundamental energetic and qualitative aspect of the quantum realm.

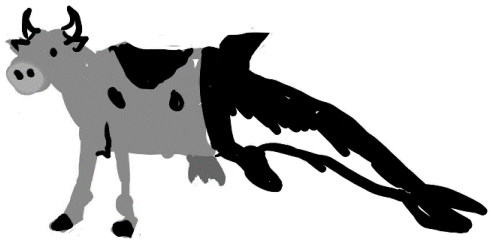

Figure 2 – Cow-whale transitional animal![79]

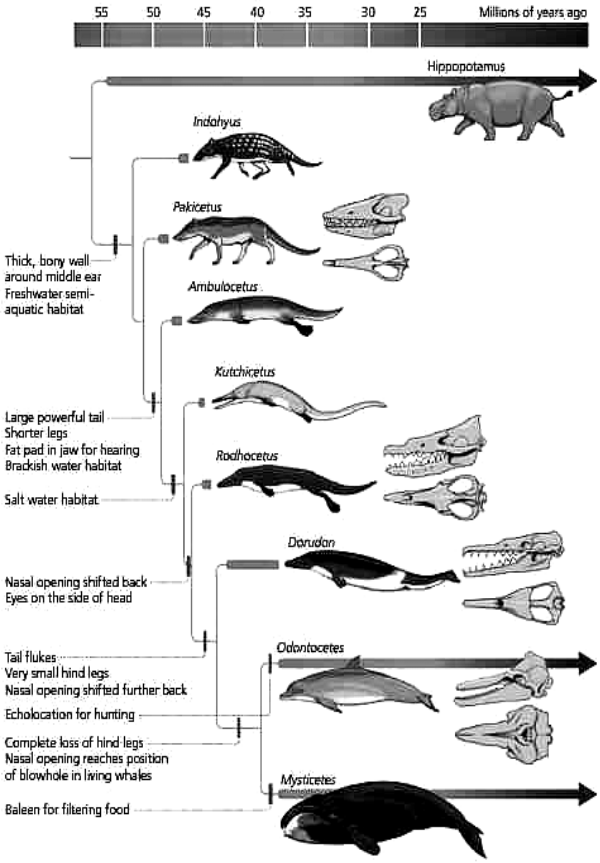

Figure 3 – MUD version of evolution of whales.[80]

Returning for the moment to the hippo-like creature to whale MUD absurdity. According to Richard Monastersky, writing in *Science News*:

> Only 24 years after Charles Darwin rewrote the book of life with his theory of natural selection, a fellow Victorian scientist named William Flower trained this powerful new idea on one of the toughest problems in zoology: the whale. Natural historians had long before recognized that whales are mammals, but that was about as far as they had come in understanding the origins of cetaceans. How evolution had managed to craft such a unique beast presented a mystery as vast as the creature itself. In 1883, Flower offered an idea that--on the face of it–seemed positively daft. The legless leviathans, he suggested,

> had evolved from mammals known as ungulates, a group whose best-known characteristic is a set of hoofed feet. In other words, dolphins, porpoises, humpbacks, orcas, and all other whales are close kin of cows, horses, pigs, and related barnyard stock.[81]

Such a notion does seem, and, as we shall see, *is*, utterly ridiculous. So how come it is currently accepted? A simplistic answer, avoiding entering into sociological and political dimensions, is that prior to the extraordinary new twentieth century insight that there was an entirely immaterial quantum level background to the material world there seemed to be only two equally ridiculous possible accounts of the origin of the variety of organic life. The first is the creationist account which requires some form of pre-existing creator 'God' and the second is that of MUD, which asserts a purely materialist type of 'natural selection'. In the absence of the deeper quantum understanding of the nature of the process of reality, and also without any knowledge of the Evolutionary Development (Evo Devo) evidence, the Darwinian account gained the upper hand, and a bunch of hardy and committed materialists fought, and still fight, to keep it in the ascendant.

The crude creationist account clearly does not accord with the evidence. The MUD version, on the other hand, does *appear* to fit the evidence collected by the fossil record, DNA analysis, the evidence of vestigial organs and appendages, biogeography and so on. The problems for the MUD version however can be listed:

1. It has obvious internal incoherences, not to say absurdities, such as the notion that there is a direct lineage of fully materialized animals linking aquatic crustaceans with gills to winged insects, the gills miraculously transforming into wings; or that land animals take to the water and slowly transform into whales[82]; or that birds directly and materially evolved from reptiles. Such notions are just absurd. No matter how suggestively the fossil evidence might suggest such a notion, it should be obvious to any intelligent and rational person that half a wing really is absolutely no use for very much, certainly not for flying, and that the existence of a transitional form of insect taking the odd gulp of air with its as yet useless wing is highly unlikely.
2. The Evo Devo, or Evolutionary-Development, paradigm which itself developed during the 1980s discovered and presented a very different picture of the evolutionary process than that of MUD. In his seminal work on the Evo Devo worldview, *Endless Forms Most Beautiful*, the evolutionary biologist Sean B. Carroll writes that:

   > The first shots in the Evo Devo revolution revealed that despite their great differences in appearance and physiology, all complex animals - flies and flycatchers, dinosaurs and trilobites, butterflies and zebras and humans - share a common "tool kit" of "master" genes that govern the formation and patterning of their bodies and body parts. … [This] discovery shattered our previous notions of animal relationships and of what made animals different, and opened up a whole new way of looking at evolution.[83]

   MUD orientated biologists tend to try and fit this new evidence into their MUD perspective. However, the most natural conclusion of this new perspective, which fits with the newly emerging understanding of the extraordinary deep interconnectedness of

completely disparate species, is that there is a deep level of quantum patterning underlying the process of evolution.

3. As we have seen in great detail above, the metaphysical materialism of the MUD account of the process of evolution is completely invalidated by quantum theory, the fundamental theory of reality which has been validated to breath-taking levels of rigor and precision.

4. The newly emerging discoveries of quantum biology are pointing to the fundamental significance of quantum mechanisms in fundamental biological processes. The quantum nature of photosynthesis, the most fundamental process of life, as is indicated by the fact that the first organisms were, as Coyne tells us, "simple photosynthetic bacteria"[84], is now established. A recent article in *New Scientist* (15 July 2010) entitled '*Quantum entanglement holds together life's blueprint*' tells us that:

> In recent years, animals have been shown to use quantum processes to their advantage. For example, some birds' eyes use quantum trickery to "see" the Earth's magnetic field, and light-harvesting molecules in algae and bacteria rely on quantum processes to transfer energy efficiently. Now it seems the blueprint of life could also owe its functioning to such phenomena.[85]

Important evidence is now being discovered that indicates that the functioning of DNA has a fundamental quantum basis:

> It could be that the propagation of life is able to make use of the quantum nature of reality to project itself in subtle ways, as has been hinted at in previous experiments. Alternatively, it could be that life itself is a complex projection of these quantum phenomena and utterly depends on them in ways not yet understood because they are incredibly hard to detect.[86]

Professor Jerry Coyne, as well as his MUD-blogging supporters, however, avoids knowing anything at all about all this. How? He just doesn't bother, or wilfully avoids, reading the most cutting edge research available to him! It seems that for Coyne aspects of the process of reality which are 'hard to detect' can be treated as non-existent. Very scientific!

In his essay '*Intelligent Design: The Faith That Dare Not Speak Its Name*' Coyne, ignoring any of the above issues, asserts that:

> Every bit of information we have gathered about nature is consonant with the theory of evolution, and there is not one whit of evidence contradicting it. Neo-Darwinism, like the theory of chemical bonds, has graduated from theory to fact.[87]

And he gives the following summary of his version of MUD:

> *First*, evolution occurs; that is, living species are descendants of other species that lived in the past.
>
> *Second*, evolutionary change occurs through the gradual genetic transformation of populations of individuals over thousands or millions of years.
>
> *Third*, new forms of life arise from the splitting of a single lineage into two, a process known as speciation. This continual splitting leads to a nested genealogy of species, a "tree of life" whose root was the first species to arise and whose twigs are the millions

> of species living today. Trace back any pair of twigs from modern species through the branches and you will find that they share a common ancestor, represented by the node at which the branches meet.
>
> *And fourth*, much of evolution occurs through natural selection. Individuals carrying genes better suited to the current environment leave more offspring, causing genetic change in populations over time which improves the "fit" of the organism to the environment. It is this improving fit that gives organisms the appearance of having been well designed for their lifestyles.[88]

It is important to bear in mind here that Coyne is totally dismissive of the notion that any of this *apparent* process of transformation may have hidden 'hard to detect' quantum informational aspects. His viewpoint begins from the crude MUD notion that "Yeah. Those are solid things." In this case the "solid things" that he considers to be the ultimate bits and pieces of reality driving evolution are the "genes" which due to various random effects on occasion 'mutate' and thus change an "individual" organism slightly.

But if Coyne were to really think about his presentation there is already a huge problem here. Just how 'slight' an alteration is the mutation supposed to produce? Unless the alteration produces an evolutionary advantage, it will not be passed on to an increasing population of fortunate mutants. And it stands to reason that, given the supposed randomness of the process, the vast number of mutations will not be advantageous, far from it. And an important point that we must keep in mind is that:

> Mutations are changes in traits that already exist; they almost never produce brand new features. Evolution is like an architect who cannot design a building from scratch, but must build every new structure by adapting a pre-existing building, keeping the structure habitable all the time.[89]

But the magnificent architect-like designing capacity of random evolution does not only need to keep the mutated organism viable, these small changes must be *immediately advantageous* in some way otherwise they will not be passed on and then amplified. This should be obvious to any intelligent randomly designed person.

One mutation in a single individual, producing a tiny change of some sort, is hardly likely to be enough to start the process of splitting into different species. What kind of mutational change could possibly give a single individual such a vast evolutionary advantage that it prompts a splitting into new evolutionary lines? The kind of examples usually proffered, peppered moths and 'Darwin's finches' for example do not show splitting into new species at all, such examples indicate accommodations *within a species* to the nature of the environment. Moths remain months and all of Darwin's finches remain finches. Proponents of MUD do not dig too deeply into such uncomfortable details; they simply assume that hardcore Darwinian speciation must have happened because their interpretation of the fossil record requires that it *must* have happened, however great the implausibility.

But the implausibility is enormous. The following is a précis of the abstract for the paper *The Evolutionary Accessibility of New Enzymes Functions: A Case Study from the Biotin Pathway*:

> Enzymes group naturally into families according to similarity of sequence, structure, and underlying mechanism. Enzymes belonging to the same family are considered to be *homologs*--the products of evolutionary divergence, whereby the first family member provided a starting point for conversions to new but related functions. In fact, despite their similarities, these families can include remarkable functional diversity. Here we focus not on minor functional variations within families, but rather on *innovations*--transitions to genuinely new catalytic functions. Prior experimental attempts to reproduce such transitions have typically found that many mutational changes are needed to achieve even weak functional conversion, which raises the question of their evolutionary feasibility. … We infer from the mutants examined that successful functional conversion would in this case require seven or more nucleotide substitutions. But evolutionary innovations requiring that many changes would be extraordinarily rare, becoming probable only on timescales much longer than the age of life on earth. … this result and others like it challenge the conventional practice of inferring from similarity alone that transitions to new functions occurred by Darwinian evolution.[90]

In other words when the actual evidence is investigated within the limited domain of just enzyme mutation, let alone entire organism mutation, random "Darwinian evolution" does not seem up to the task. On this evidence, the notion of a hippo-like creature mutating into a whale is a whale of a leap imagination and fantastic speculation.

So how does Coyne deal with this issue? Non-random obfuscation is the answer! To the question: Of what use is half a wing? Coyne supplies the following answer:

> But if you think a bit, it's not so hard to come up with intermediate stages in the evolution of flight, stages that might have been useful to their possessors. Gliding is the obvious first step. And gliding has evolved independently many times: in placental mammals, marsupials, and even lizards. Flying squirrels do quite well by gliding with flaps of skin that extend along their sides - a good way to get from tree to tree to escape predators or find nuts. And there is the even more remarkable "flying lemur," or colugo, of Southeast Asia, which has an impressive membrane stretching from head to tail. One colugo was seen gliding for a distance of 450 feet-nearly the length of six tennis courts-while losing only 40 feet in height! It's not hard to envision the next evolutionary step: the flapping of colugo-like limbs to produce true flight, as we see in bats. But we no longer have to only imagine this step: we now have the fossils that clearly show how flying birds evolved.[91]

In the MUD worldview birds are generally thought to have evolved from small theropod dinosaurs in the mid-late Jurassic, over 150 million years ago. Figure 4 show the four stages of bird evolution from this fantasy point of view from a tree climbing reptile or theropod dinosaurs through a gliding phase, then suddenly getting a gene mutation which enables it to flex its flaps, and then down to the modern bird. Figure 5 is the image used by Coyne showing what are considered to be the starting point, the carnivorous theropod dinosaur *Compsognathus*, and the end point of a modern bird, a chicken in this case, and what is thought to be a transitional form, *Archaeopteryx*. However, all we actually have is three skeletons with clear similarity of structure, the first with arms, the second with wings which also have fingers, and the last with only wings. The notion that the middle one is a "transitional form" is, however, an assumption. There is

another account, which I will present shortly, *which fits all the facts, including quantum facts*, far more reasonably, and does not have the desperate implausibility of the MUD account.

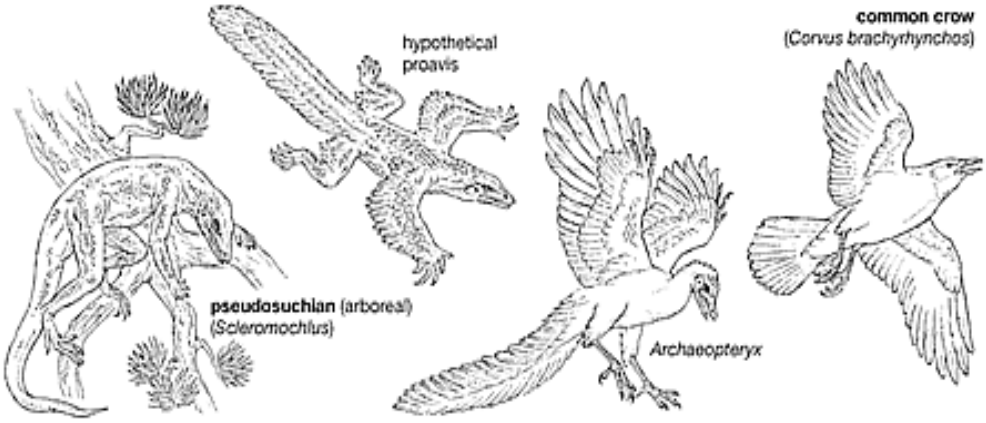

Figure 4[92]

The astonishing implausibility is not too difficult to see for someone not blinded by, or infected by, the MUD viewpoint. Remember Coyne's second point in his overview of key points of evolution theory: "evolutionary change occurs through the gradual genetic transformation." So what exactly would be the *gradual* transition from stage one of no gliding to the stage two of fully functional gliding (Fig. 6)? Do we really believe that a simple gene mutation causes an individual organism to suddenly sprout effective gliding apparatus together with the instinctual knowledge of how to employ its newly developed mutational enhancements? Even if such a remarkable gene mutation were to take place wouldn't figure 7 capture the situation of the unfortunate mutant? Or, perhaps evolution relies on enough of these mutants inadvertently falling out of the trees only to discover the wonderful new functionality they have randomly acquired!

However, despite such desperate and absurd implausibility, 'scientific' publications regularly publish fantasies about how a completely random, non-conscious, fully material, absolutely mindless, process is shot through with intentionality which co-opts variously and gradually evolved appendages and behaviours for remarkable new purposes. How *gradual* the actual co-option is, however, is not mentioned, but it obviously cannot be a flash of inspiration. Here is Michael Le Page employing all manner of imaginative scenarios, all requiring the imputation of a degree of intelligence to variously evolving creatures, misleading a gullible public in a *New Scientist* article '*Evolution myths: Half a wing is no use*':

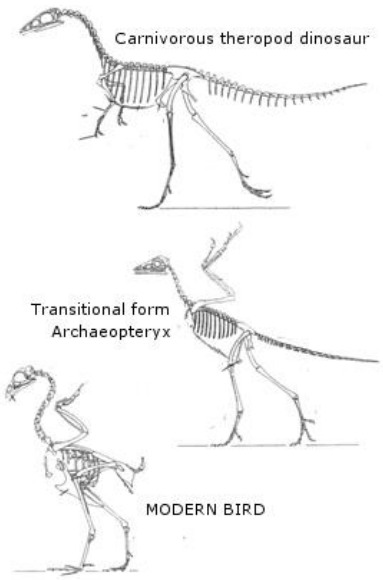

Figure 5[93]

Figure 6

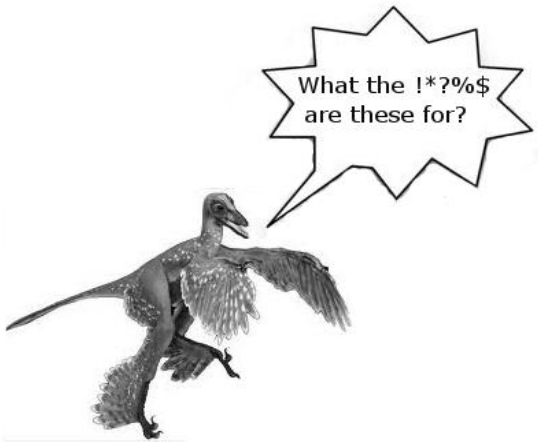

Figure 7[94]

> Ever used a newspaper to light fires or mop up spills? Stood on a chair to reach something? Or swatted flies with a rolled-up copy of New Scientist? Just as objects designed for a specific purpose can be co-opted for something quite different, so features that evolved to do one task can be used for another - and often are.
>
> But what use is half a wing? It's a question that those who doubt evolution first asked more than a century ago. When it comes to insects, rowing and skimming could be the answer. Stonefly nymphs have flapping gills for extracting oxygen from water. When standing on the water's surface, early insects could have used these gills for getting oxygen and propulsion rowing simultaneously. Some stoneflies still stand on the surface and "row" across water using their wings.
>
> Over time, flapping could have replaced rowing as the main means of propulsion, allowing insects to skim across the water's surface: low levels of friction on this scale mean proto-wings would not have had to generate much air flow to be useful for skimming.
>
> As these proto-wings became more efficient and specialised, early insects may have taken further steps towards flying. While some skimming insects keep all six legs on the water's surface, faster skimmers keep just four legs or two legs on the water. This surface-skimming hypothesis concerning the evolution of insect flight shows how flapping gills could gradually have turned into wings while remained useful at every stage.
>
> What about the wings of birds? In some dinosaurs, the scales covering their bodies evolved into hair-like feathers, most likely to insulate warm-blooded bodies or help keep eggs warm.
>
> Those dinosaurs with feathers on their limbs might then have started to exploit the aerodynamic properties offered by feathers, perhaps gliding between trees or running faster along the ground. Fossils show a gradual transition from downy, hair-like feathers into the rigid flight feathers that form the key part of birds' wings.
>
> Another idea that is gaining favour is that flapping forelimbs helped the ancestors of birds to run up steep slopes or climb trees - a technique many birds still employ today.[95]

Notice that the above suggestions are all speculative fantasies; the employment of the terms 'could be', 'might', 'likely to' and so on indicates the utter lack of foundation for any of these ridiculous proposals. People who use newspapers to light fires or mop up spills, stand on chairs to reach things or swat flies with a rolled-up copy of *New Scientist* are intelligent agents employing directed intentionality when they use various objects for novel purposes. Given the childish level of the fantasies involved here I would think that this issue of *New Scientist* was only 'fit' for swatting flies.

The reason that such absurdly implausible notions persist is that this story, desperately unlikely though it is, *seems* to be told by the fossil record. Thus when Coyne comes to the issue of the supposed evolution of whales in his chapter of *WET* entitled 'Written in the Rocks' he writes:

> But we don't just have to imagine how whales evolved by extrapolating from living species. Whales happen to have an excellent fossil record, courtesy of their aquatic habits and robust, easily fossilized bones. And how they evolved has emerged within only the last twenty years. This is one of our best examples of an evolutionary transition,

> since we have a chronologically ordered series of fossils, perhaps a lineage of ancestors and descendants, showing their movement from land to water.[96]

Figure 8 shows the illustration Coyne uses to show the sequence. According to Coyne *Indohyus* is not an ancestor but a close cousin. Next one up *Pakicetus* (figure 9) "looked nothing like a modern whale,"[97] but then there "follows in rapid order, a series of fossils that become more and more aquatic with time."[98] Fifty million years ago the *Ambulocetus*, which means "walking whale", came on the evolutionary scene (figure 10):

> …with an elongated skull and reduced but still robust limbs, limbs that still ended in hooves that reveal its ancestry of its time in shallow water, and would have waddled awkwardly on land, much like a seal. *Rodhocetus* (forty-seven million years ago) is even more aquatic. Its nostrils have moved somewhat backward, and it has a more elongated skull. With stout extensions on the backbone to anchor its tail muscles, *Rodhocetus* must have been a good swimmer, but was handicapped on land by its small pelvis and hindlimbs. The creature certainly spent most if not all of its time at sea. Finally, at forty million years ago, we find the fossils *Basilosaurus* and *Dorudon* - clearly fully aquatic mammals, with short necks and blowholes atop the skull. They could not have spent any time on land, for their pelvis and hindlimbs were reduced (the 50-foot Dorudon had legs only 2 feet long) and were unconnected to the rest of the skeleton.[99]

This assumed direct materially mutationally driven rapid evolution from walking land animal, through the assumed transitional form of the 'walking whale', to fully aquatic whale took place, Coyne says, "remarkably fast", only taking 10 million years, which is "not much longer than the time it took us to diverge from our common ancestor with chimpanzees, a transition that involved far less modification of the body."[100] But all this wild speculation is quite clearly merely imputed onto three skeletons which display some similarities.

Why a land animal, supposedly having dragged itself gasping for air from the sea to evolve in various directions upon the land, decided to go back to aquatic life is not known although, predictably, "there are several ideas." And, as so often with MUD accounts, they have a cartoon book flavour in which a subtle intentionality is imputed wherein there should only be mechanistic mindless randomness:

> But why did some animals go back to the water at all? After all, millions of years earlier their ancestors had invaded the land. We're not sure why there was a reverse migration, but there are several ideas. One possibility involves the disappearance of the dinosaurs along with their fierce marine cousins, the fish-eating mosasaurs, ichthyosaurs, and plesiosaurs. These creatures would not only have competed with aquatic mammals for food, but probably made a meal of them. With their reptilian competitors extinct, the ancestors of whales may have found an open niche, free from predators and loaded with food. The sea was ripe for invasion. All of its benefits were only a few mutations away.[101]

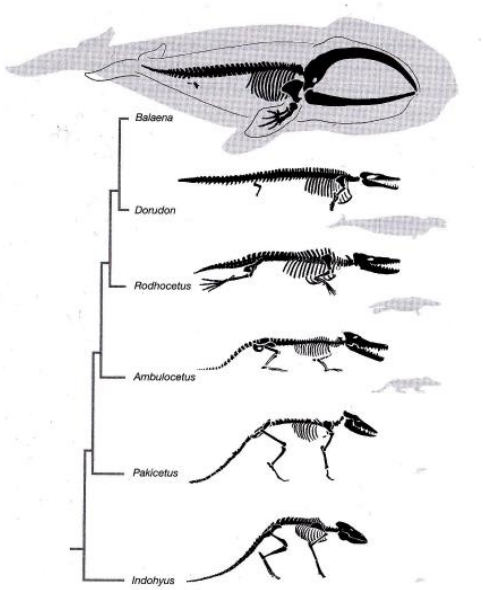

Figure 8 – Transitional forms in the evolution of modern whales[102]

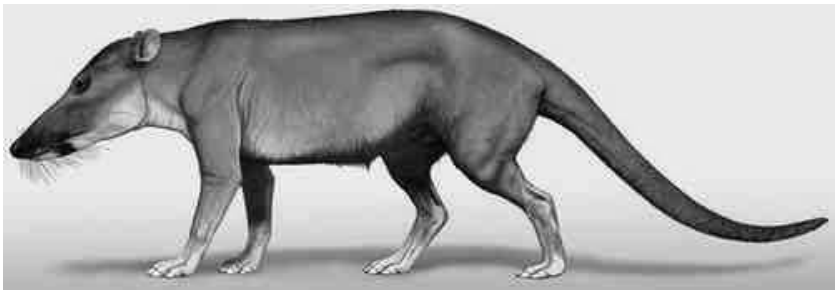

Figure 9 - An artistic rendering of Pakicetus[103]

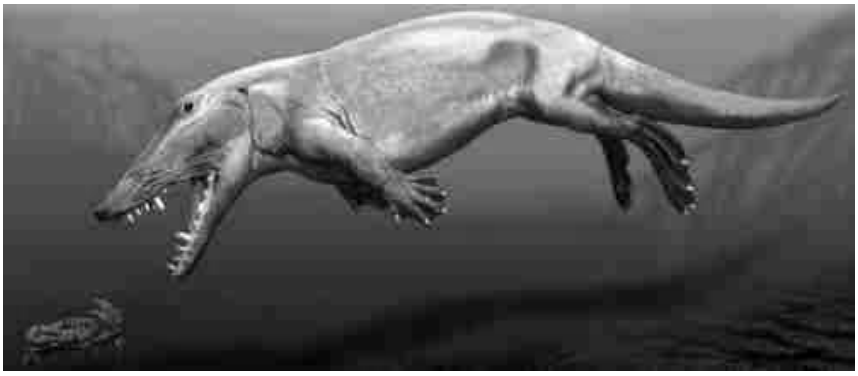

Figure 10 - Ambulocetus[104]

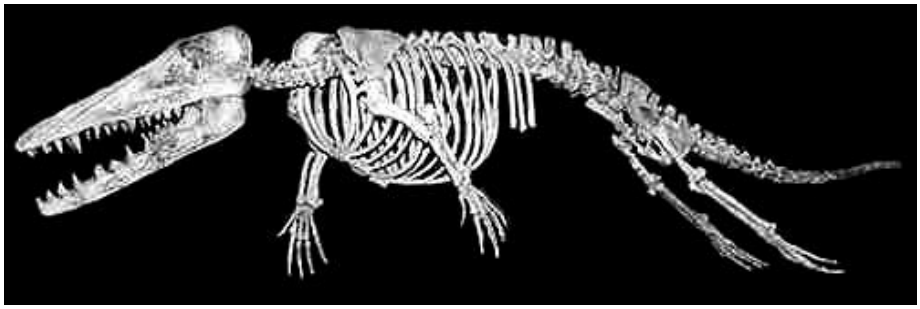

Figure 11 - An articulated composite skeleton of *Ambulocetus*, the "walking whale"[105]

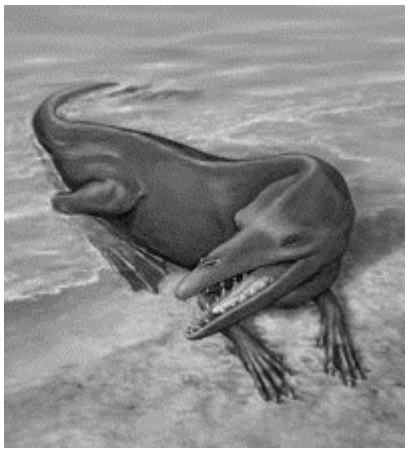

Figure 12 - Rodhocetus[106]

Figure 13 – Basilosaurus[107]

In other words Coyne wants us to take seriously the notion that whale ancestors randomly noticed that the disappearance of fish-eating mosasaurs, ichthyosaurs, and plesiosaurs meant that there was more fish in the sea and so hung around for a 'few mutations' in order to get an aquatic feast. This really is cartoon book science!

The crucial question which we must ask is whether there is a more plausible explanation of the fact that there does indeed appear to be a succession of related forms linking land animals to whales, an explanation which both avoids the massive implausibility of the MUD account and also takes into account all current scientific knowledge, including the increasing evidence of quantum biology.

The MUD version of the ultimate nature of the process of reality and evolution is that all started with utter random material mechanical mindlessness and, through some mindless material magic, organic life gets randomly organised into material structures each of which are desperate to survive, although where the desperation for survival comes from we are never told. The various forms that evolve via the mindless random process of evolution are, so to speak, a surprise to evolution itself because they are utterly novel. They were in no way anticipated, if the environments had been different then significantly different forms would have developed. Steven J. Gould expressed this by saying that "rerunning the tape of life will always give different outcomes."[108] On the MUD view there were no 'templates' of potentiality for organic development at the dawn of life.

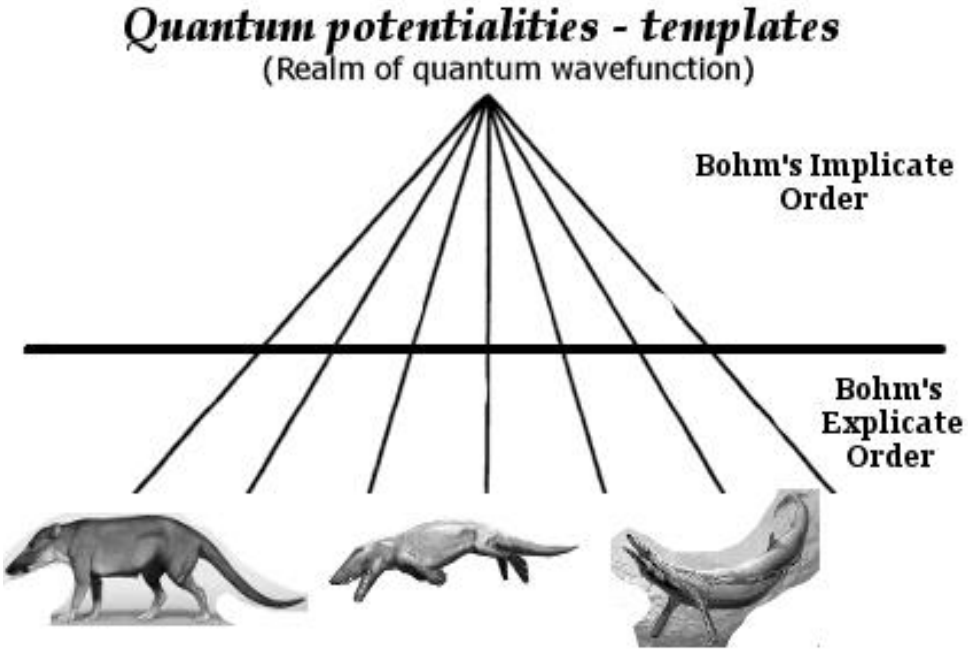

Figure 14

The QDE (Quantum Darwinism Evolution) perspective of the process of evolution, which is also a 'quantum Platonic' perspective, that I am proposing, on the other hand, suggests entirely otherwise. As we have seen the quantum perspective requires that everything that can come into manifestation must be contained as quantum potentialities from the moment of the big bang. This means of course that (restricting our discussion to the evolution of whales for the moment) that all of the forms of the animals in the sequence *Pakicetus* through *Ambulocetus* down to whales were already potentialities within the quantum ground of potentiality. This gives a very different picture of evolution in which potentialities are 'unfolded' from a quantum realm of potentiality through an internal 'unfolding' mechanism which is connected with consciousness, a view which concords with the quantum perspectives surveyed above. This would mean that, rather than there being a step by step fully materialized transition from *Pakicetus* through *Ambulocetus* down to whales, the supposed links are actually different 'expressions' of a basic potentiality, or combination of potentialities, which pre-exist as potentiality within the quantum 'implicate order' which are 'expressed' into the 'explicate order' (figure 14), using the terminology introduced by David Bohm.

A crucial aspect of this view is that it accounts for the *appearance* of a materialist evolution. Forms are related by the common quantum 'implicate' origin. For example we the *Science Daily News* for April 20th 2001 announced that:

> Partial skeletons of ancient whales found in Pakistan last year resolve a longstanding controversy over the origin of whales, confirming that the giant sea creatures evolved from early ancestors of sheep, deer and hippopotami and suggesting that hippos may be the closest living relatives of whales. The new finds, reported in the Sept. 21 issue of the journal Science, are the first and only specimens known that combine sheep-like ankle bones and archaic whale skull bones in the very same skeletons.[109]

Such finds, however, only "resolve" such issues as suggested if the evidence is viewed exclusively through the MUD worldview. It is assumed that the discovery of "specimens known that combine sheep-like ankle bones and archaic whale skull bones in the very same skeletons" *must* indicate a direct gradual transformation from a land animal to a whale. However, for the QDE perspective this evidence indicates that a preexisting body plan template is modified according to the environment within the quantum implicate levels before it is expressed. Such a mechanism would also leave this kind of evidence, the quantum implicate modifications does not need to obliterate all signs of other employments within the overall body plan. The MUD claim that vestigial organs indicate direct material descent is also undermined in a similar manner by the QDE – ID perspective.

This consideration leads to a consideration of a common MUD argument against ID. Coyne, for example, in WET tells us that:

> Imperfection is the mark of evolution, not of conscious design. We should then be able to find cases of imperfect adaptation, in which evolution has not been able achieve the same degree of optimality as would a creator.[110]

Here, again, we find an argument which is targeted at hardcore creationism is also implicitly targeted at ID because it is assumed that ID involves "conscious design". Admittedly many proponents of ID are their own worse enemy in this respect because, as we have seen, a great deal of the language employed by them does give this impression. However, there is no reason for ID to hold make the assertions that the 'designer' must be a conscious agent, like an architect designing a building, and there is no reason that ID should claim its design is perfect. Even a badly designed building is still designed. The QDE version of ID suggests that the designing is actually done *unconsciously* by a deep level of primordial awareness within the quantum implicate reams underlying the manifested material world with its organisms. In this context the term 'conscious' indicates a fully individuated personal state of awareness. Quantum theory and other recently discovered phenomena such as neuroplasticity, however, reminds us that there are levels of more primitive consciousness beneath these, levels which interact and mold the material world. In this respect the QDE perspective is a much more coherent account of the evolutionary process of adaption, even imperfect adaptation, because it functions with a quantum look-ahead mechanism (elucidated below) which may not provide the most perfect solution. Furthermore the phenomenon of quantum entanglement, which means that all parts of quantum fields are interconnected and 'know' about each other, indicates that there can be an interconnection between the target environment and the form expressed, indicating the mechanism through which an organism is adapted, within quantum implicate orders, to the target environment. What the MUD account claims is the materialist 'natural selection' effect of the environment is actually the result of quantum anticipated interconnection between the form of the organism expressed and the target environment.

The agency of consciousness within this 'unfolding' process is, again, required by fundamental quantum theory. This perspective is presented in the work of Bohm which is being carried forward by Paavo Pylkkänen and Basil Hiley. Bohm calls the cosmic possibility soup the 'implicate order' and the actualized experienced world the 'explicate order':

> Bohm calls the implicate order the primary reality, this reality exists 'folded up' in nature and gradually unfolds as the universe evolves, enabling organization to emerge, in this way, the implicate becomes explicate over time.[111]

In his important book *Wholeness and the Implicate Order* Bohm gives an overview of his perspective as follows:

> Our overall approach has thus brought together questions of the nature of the cosmos, of matter in general, of life, and of consciousness. All of these have been considered to be projections of a common ground. This we may call the ground of all that is, at least in so far as this may be sensed and known by us, in our present phase of unfoldment of consciousness. Although we may have no detailed perception or knowledge of this ground it is still in a certain sense enfolded in our consciousness…[112]

This version endorses the view that there is a common fundamental ground which gives rise to the processes of life and it also emphasizes the necessary cognitive function of consciousness as fundamental.

According to Bohm the evolution of the universe and the life within it is the unfoldment of a vast energetic meaning-field of potentiality which has a nature embracing consciousness:

> We can say that human meanings make a contribution to the cosmos, but we can also say that the cosmos may be ordered according to a kind of 'objective' meaning. New meanings may emerge in this over all order. That is we may say that meaning penetrates the cosmos, or even what is beyond the cosmos. For example there are current theories in physics that imply that the universe emerged from the 'big bang'. In the earliest phase there were no electrons, protons, neutrons, or other basic structures. None of the laws that we know would have had any meaning. Even space and time in their present well-defined form would have had no meaning. All of this emerged from a very different state of affairs. The proposal is that, as happens with human beings, this emergence included the creative unfoldment of generalized meaning. [113]

Then:

> Later, with the evolution of new forms of life, fundamentally new steps may have evolved in the creative unfoldment of further meanings. That is, we may say that some evolutionary processes occur which could be traced physically, but we cannot really understand them without looking at some deeper meaning which was responsible for the changes. The present view of the changes is that they are random, with selection of those traits that were suited for survival, but that does not explain the complex, subtle structures that actually occurred. [114]

Here Bohm indicates the serious shortcomings of the materialistic and mechanistic view of the evolutionary process enshrined in the materialistic MUD vision of the Darwinian evolutionary process. In particular he is indicating that what *appears* to be a purely material process, in reality has a deeper source at the quantum level.

Conway Morris, in his book *Life's Solution*, investigates the issue of the remarkable effectiveness of the genetic code which, according to investigations carried out by Freeland and Hurst "might indeed be the best possible code"[115] which has been 'selected' from about 270 million possibilities, a selection which Conway Morris estimates must have occurred over a time period of at most two hundred million years. This would mean that evolution would have been blindly and randomly, through random protein mutation, testing out a new possibility every year. Conway Morris comments that:

> It is as if the Blind Watchmaker takes off her sunglasses and decides to visit her brother Chronos. Off she sets, crossing streets roaring with traffic driven by psychotics, through the entrails of the subway system of a megalopolis, and, after catching a series of intercontinental express trains with connection times of two minutes each, she arrives at Chronos' front door at 4 p.m. prompt, just in time for a relaxing cup of tea.[116]

Conway Morris's book is an extended and detailed investigation of the multitude of evolutionary convergences wherein the same 'solution' is arrived at by the process of evolution operating in widely separated species. The overwhelming picture that emerges is that there is a kind of 'template' toolkit, just like the picture that is emerging in the Evo Devo paradigm involving 'toolkit' genes, of 'solutions' which can be employed according to evolutionary necessity. As the

dust jacket blurb for the book says the "ubiquity of evolutionary convergence … unexpectedly reveals a deeper structure to life."

The recent emerging evidence indicates that such 'templates' are likely to be quantum in nature. In the introduction, entitled '*A Quantum Origin of Life?* to a recent collection of papers *Quantum Aspects of Life*, Paul Davies writes that:

> Quantum mechanics provides a way to drastically shorten the odds and fast track matter to life by exploiting the parallel processing properties of [quantum] superpositions. There is, however, a deep philosophical issue that must be confronted. I am defining "life" as a certain special state of low probability. Quantum mechanics allows the space of possibilities to be much more efficiently explored than a stochastic classical system. Now if there are branches of the wave function "containing life" (e.g. a quantum replicator), they will, by assumption, have very small amplitudes. We must therefore explain why the wave function of the system "collapses" onto one of these states … how does a quantum superposition recognize that it has "discovered" life and initiate said collapse? There seems to be an unavoidable teleological component involved: the system somehow "selects" life …[117]

A quantum 'wave function' is a superposition, or 'stack', of potentialities having a kind of ghostly potential, but not fully manifested, existence at the quantum ground of the process of reality. According to Davies, 'life' has a small potentiality, this is his assumption, however the potentiality for life 'exists' at the quantum level and, as Davies indicates, there is a teleological 'pressure' which acts to 'collapse' the wave function into the manifestations of life. This accounts for 'Anthropic' 'fine-tuning'.

The way in which this mechanism functions is through the quantum search, or 'look ahead' algorithm. The Russian physicist Michael Mensky has described this as the:

> … principal feature of living matter (of its consciousness): the ability to correct its state making use of the information (about the efficient way of survival) obtained from the future. It will be assumed that the evolution of living matter includes the correction providing survival at distant time moments. This correction leaves in the sphere of life only those scenarios of evolution which are favorable for life. Unfavorable scenarios do not disappear from the (quantum) reality but are left outside the sphere of life (absent in the picture appearing in the consciousness).[118]

In other words there is a kind of quantum 'look-ahead' mechanism which can gain information about the possible future states. This mechanism can work at the quantum level in the present *because the future potentialities are always present in the present at the quantum level*. It is this quantum 'look-ahead' evolutionary mechanism which enables quantum evolution to 'unfold' potentialities so that they 'fit' a future environment. And this QDE insight, which we shall explore in a little more detail shortly, completely overturns the MUD perspective and provides a coherent, non-comic-book, account of evolution.

The notion that quantum processes were fundamentally significant in biological processes, as with all revolutionary discoveries that threaten some people's academic niches, met stern

resistance, but now the evidence is slowly accumulating. According to a recent article in *Technology Review*:

> There was a time, not so long ago, when biologists swore black and blue that quantum mechanics could play no role in the hot, wet systems of life. Since then, the discipline of quantum biology has emerged as one of the most exciting new fields in science. It's beginning to look as if quantum effects are crucial in a number of biological processes, such as photosynthesis and avian navigation … Now a group of physicists say that the weird laws of quantum mechanics may be more important for life than biologists could ever have imagined. Their new idea is that DNA is held together by quantum entanglement.[119]

The first discovery of quantum look-ahead mechanisms in biology was in photosynthesis, the funda-mental driving force of life:

> The evidence comes from a study of how energy travels across the light-harvesting molecules involved in photosynthesis. The work has culminated this week in the extraordinary announcement that these molecules in a marine alga may exploit quantum processes at room temperature to transfer energy without loss. Physicists had previously ruled out quantum processes, arguing that they could not persist for long enough at such temperatures to achieve anything useful.[120]

The answer for the high efficiency of photosynthesis, a vital and fundamental mechanism of life, lies in the quantum mechanics of the process. A quantum wavelike electronic coherence allows a 'look ahead' in order to select the most efficient pathway:

> The wavelike characteristic can explain the extreme efficiency of the energy transfer because it enables the system to simultaneously sample all the potential energy pathways and choose the most efficient one.[121]

And this mechanism has been found to be fundamental for the light harvesting abilities of purple bacteria, one of the earliest forms of life on earth:

> Purple bacteria are great masters of harvesting light. Nearly all the energy gained by the absorption of a photon is transferred on to the reaction center. … purple bacteria exploit elegant quantum physics, the working of which were only fully understood recently after the discovery of the structures of light-harvesting complexes and investigations into their electronic excitations.[122]

If it is the case that DNA is held together by quantum entanglement, then the notion that quantum processes are not also operative at the level of DNA is just absurd. In fact, given that photosynthesis is quantum in nature, one would expect that the fundamental processes of the replication and evolution of life also must have a fundamental quantum nature, as Schrödinger predicted in his 1944 book *What is Life?*

The discoveries of Evo Devo clearly indicate the complete falsity of the random gene-mutation theory of evolutionary development and, as we shall see, supports the QDE perspective. But despite this obvious fact, biologists have remained strangely mute on this issue. For instance in a BBC documentary entitled *What Darwin Didn't Know*, evolutionary biologist Professor Armand Marie Leroi presents the new Evo Devo perspective as the ultimate validation of Darwinism, but

he said nothing about the fact that it completely falsifies MUD style neo-Darwinism with its emphasis on gene-mutation as being the sole driving force of evolution.

The notion that gene mutation is the primary motive force for the diversification of species, as proposed by Coyne in his untrue book about *Why Evolution is True*, must clearly mean that the genes within widely separated species would be entirely different. This was thought to be inviolable fact within the MUD worldview just twenty years before the Evo-Devo revolution. Thus the evolutionary biologist Ernst Mayr, ironically someone once described as "the world's greatest living evolutionary biologist", wrote confidently, dogmatically and mistakenly in the 1960's that:

> Much that has been learned about gene physiology makes it evident that the search for homologous genes is quite futile except in very close relatives. If there is only one efficient solution for a certain functional demand, very different gene complexes will come up with the same solution, no matter how different the pathway by which it is achieved. The saying "Many roads lead to Rome" is as true in evolution as in daily affairs. [123]

An excellent example of a pronouncement made on the basis of little evidence but a huge emotional investment in the materialist Darwinian worldview, an investment which can still be found in much 'scientific' writing. There was absolutely no solid evidence for this dogmatic assertion but it was taken as solid 'science' by those enamored by the MUD worldview.

However, this fundamentally mistaken assumption has now been shown by the evolutionary-development revolution in biology to be completely false; as Carroll writes in *Endless Forms Most Beautiful*:

> The first shots in the Evo Devo revolution revealed that despite their great differences in appearance and physiology, all complex animals - flies and flycatchers, dinosaurs and trilobites, butterflies and zebras and humans - share a common "tool kit" of "master" genes that govern the formation and patterning of their bodies and body parts. … The important point to appreciate from the outset is that this discovery shattered our previous notions of animal relationships and of what made animals different, and opened up a whole new way of looking at evolution.[124]

In other words, all animals, of whatever species whatsoever, share a fundamental genetic structure which underpins the development of different species. As we shall see, when this revolution in our understanding of the functioning of genes and the DNA components of genes is placed in the context of the other great twentieth century revolution in science, quantum theory, the only conclusion is some form of QDE.

The Evo Devo discoveries indicates that genetic mutation is not, cannot be, the driving mechanism of evolution, in fact a great deal of Evo Devo research was carried out by investigating mutations which produced quite clear abnormalities. This means that not only does quantum physics and theory indicate that there is something wrong with the notion of random mutational evolution, but also the Evo Devo paradigm of the 1980s also clearly indicated the falsity of the MUD worldview. Coyne, however, published the *clearly false* book *WET*, a book

warmly welcomed by Dawkins and other MUDs, in 2009! Is there something wrong with the 'scientific' establishment?

The Evo Devo perspective shows that developmental genes are part of a system which involves genetic switches that regulate other genes; it is an interconnected regulatory feedback system. During embryonic development these genetic switches initiate the cascade of gene expression that builds various structures. For example, the *Pax-6* developmental gene is part of a genetic switch that induces eye development. When *Pax-6* from a mouse was inserted into a fruit fly's genome, fruit fly eye structures were formed. The mouse gene was so compatible with its fly equivalent (even though these creatures supposedly diverged over 500 million years ago) that it induced the fly program for eye development!

Likewise, the *Distal-less* gene forms part of a master switch for limb development and the *Tinman* gene (named after Tin Man in *The Wizard of Oz*) is part of a master switch for heart development. These genes are invariant across all animals, so there is clearly a deep 'implicate' to borrow a term from Bohm, quantum set of 'templates' which are activated by more 'explicate' level operation of the gene system. This is entirely consistent with quantum non-local interconnectedness, which suggests that there is a background pool of potential information that is spread out over all regions. Embryonic development involves a vast array of master genetic switches that turn on the right program in the right place; the entire process as described by Evo Devo looks like a filtering and directing of deeper levels of informational energy, which can come from nowhere else than the quantum informational level.

The fact that the common developmental genes are shared across the animal kingdom indicates that they, or their essential structure, must have originated before the divergent evolutionary pathways of various animal species. In a section of his *Endless Forms* book Carroll headed, remarkably, 'Building a Mystery: Animals Before the Big Bang' refers to an hypo-thetical primordial animal which has been dubbed 'Urbilateria' meaning primitive bilaterian which "had a tool kit of at least six or seven *Hox* genes, *Pax-6*, *Distal-less*, *tinman*, and a few hundred more body-building genes." Carroll continues:

> It is intriguing to ponder just what so many genes were doing in Urbilateria. Was this really a featureless wormlike animal? What might the possession of so many genes signify in terms of anatomical and behavioral complexity? One way to account for the similar roles in different animals of genes in the tool kit is to posit some level of anatomical complexity in Urbilateria that was governed by these genes. That level is somewhat open to different interpretations but we can build up a picture of Urbilateria based on some reasonable inferences. For example, could Urbilateria have had eyes? Well, probably not the large pronounced eyes like those we find on trilobites later in the Cambrian. Something that had large, complex eyes would probably have turned up by now in the fossil record. But, because the role of Pax-6 and other genes involved in eye development is shared in both major branches of bilaterians, we can deduce that Urbilateria probably had at least some kind of eyespot or light-sensing organ made up of photosensitive cells arranged in some geometry. Using similar logic, we can ask if Urbilateria had limbs' Paleontologists can detect the traces of the meanderings of animals in fossil sediments yet they do not really become substantial until the Cambrian, so full-fledged limbs on Urbilateria are unlikely. But it did have the genes for making

> limbs. And we know that these genes are used for making all sorts of things that project out from the body. So, even if Urbilateria didn't walk or swim, it may have had structures that projected out from the main body, perhaps things that helped it detect (e.g., a sensory apparatus) or ingest (a mouth or tentacles) food. Later in the Cambrian the genes used for making these projections would be used for making bona fide walking and swimming limbs. If Urbilateria was certain to have had the tinman gene, did it have a heart? We would not expect a modern heart like ours. But it could have had some collection of contractile cells for pumping fluids around the body In addition, the number of different Hox genes suggest that at least the front, middle, and back end of Urbilateria may have been distinct. And, using gene and developmental logic, we can say that it certainly had a throughgut with a mouth and anus. We can also confidently say all sorts of cell types-muscle, nerve, contractile, photoreceptive, digestive, secretory, and phagocytic-existed because these exist in all descendants. The uncertainty about Urbilateria is the degree of organization of these cells into organs that we would call eyes, hearts, limbs, etc. The organization was complex enough to lock in the function of Pax-6, Distal-less, tinman, Hox genes, etc., into roles that have been preserved in all of this ancestor's descendants for more than 500 million years. I have to be tentative here because we can't and don't know for certain until we've find the fossils (and the search for new sites and types of deposits is ongoing). But the important new sketch that Evo-Devo has provided is that of an animal is that of an animal equipped with all of the necessary genes for building complex bodies and possessing some initial level of anatomical complexity.[125]

It is clear that Carroll is floundering in absurdity here. He conceives of a primordial animal lumbering around in the primordial landscape carrying around a full set of modern genes prior to the pre-Cambrian manifestation of arthropods. He is so brainwashed by the MUD materialist worldview that he doesn't figure out that any animal "before the big bang" is a quantum potential animal.

When viewed against the background of the quantum evidence that everything which can evolve into manifestation must be potential in the quantum field of potentiality which 'exists' as potentiality at the point of the big bang, the insights of Evo Devo support the QDE (Quantum Darwinism Evolution) perspective. Quantum physicist Wojciech Zurek has proposed his notion of 'quantum Darwinism':

> … the appearance of the classical reality can be viewed as the result of the emergence of the preferred states from within the quantum substrate through the Darwinian paradigm, once the survival of the fittest quantum states and selective proliferation of the information about them throughout the universe are properly taken into account.[126]

On this view the 'classical' level reality of the apparently 'material' world and the sentient beings contained within it is etched into quantum 'epiontic' 'dream-stuff' through the multitudinous perceptual activities of all sentient beings. The 'fittest quantum states' are the 'epiontically' (epistemology creating ontology) congealed 'perceptions' which acquire an internal momentum of their own and become a kind of 'advertising billboard' which is amplified by further perceptual investment:

> The main idea of quantum Darwinism is that we almost never do any direct measurement on anything … the environment acts as a witness, or as a communication channel. … It is like a big advertising billboard, which floats multiple copies of the information about our universe all over the place.[127]

If we ask where the quantum information underlying the production of this 'advertising billboard' of the psychophysical world we inhabit originally resides we must, from the evidence of quantum theory as presented in the most up to date formulations, conclude that all possibilities for manifestation reside as potentialities within the quantum field hovering on the edge of existing at the moment of the big bang.

Zurek, as well as H&M and John Wheeler, indicates that is the perceptive activities of sentient beings that are necessary to unfold potentialities. However this cannot be the fully story because there must have been a time when sentient beings themselves were only potentialities. It is Mensky's 'Life-Operator' which supplies the internal pressure for the process of unfoldment of the quantum potentialities. Once the organisms of sentience are unfolded they then become carriers of this perceptual pressure and subsequently the process unfold greater levels of complexity and more unfolded 'higher' levels of consciousness. In this way the primordial consciousness latent with the quantum fields of reality become aware of itself as self-awareness, a self-awareness which becomes more and more 'explicate' as organisms become more complex.

All the possible 'solutions' to the various tasks of putting together sentient organisms in various environments, as well as all possible environments, 'exist' as potentialities within the quantum field of potentiality. If we accept the consensus amongst quantum physicists such as Wheeler, Stapp, d'Espagnat, Everett, Penrose, Hawking and Mlodinow, Mensky and others, then we must also accept that there is some form of internal quantum cognitive 'pressure' which unfolds potentialities into actuality. This process will operate from deep 'implicate' levels of quantum informational 'dream-stuff' which then appear to become more manifestly 'solidified' and 'explicate' as an apparently material world containing sentient beings manifests. Mensky describes this as follows:

> If the picture of the world as it appears in consciousness were far from classical, then, due to quantum non-locality, this would be a picture of a world with 'locally unpredictable' behaviour. The future of a restricted region in such a world could depend on events even in very distant regions. No strategy of surviving could be elaborated in such a world for a localised living being. Life (of the form we know) would be impossible. On the contrary, a (close to) classical state of the world is 'locally predictable'. The evolution of a restricted region of such a world essentially depends only on the events in this region or not too far from it. Influence of distant regions is negligible. Strategy of surviving can be elaborated in such a world for a localised living being.[128]

Entangled quantum phenomena can instantaneously affect each other over vast cosmic distances. In fact distance does not seem to be an issue for this kind of entangled mutual determination. It follows, therefore, that in a non-classical, quantum-entangled scenario there would be no environments wherein environmental behaviour was determined purely by local events. Such environments would not be locally stable and predictable and consequently they could not support sentient organic creatures. So in order to produce a world of manifestation the non-local

quantum field of potentiality must 'localize' itself, thereby unfolding its internal potentialities. Furthermore, a central mechanism in this process will be the establishment of Sheldrakian 'morphic fields' which represent 'habits of nature' that become etched into quantum potentiality.[129] The more often a potentiality is activated more likely it is to be manifested at a later point. The apparently material world and the organism contained therein 'congeal' out of the 'dream-stuff' of quantum potentiality.

In quantum field theory there is a insubstantial quantum field of potentiality and it is through the operation of a primitive level of internal quantum-cognitive pressure that this quantumly entangled and interdependent field is localized through the quantum evolution of the 'classical' world of individualized sentience and materiality. Mensky indicates that the level of consciousness at which the process begins is:

> …the most primitive, or the most deep, level of consciousness, differing perceiving from not perceiving.[130]

The non-local quantum 'templates' for the material world and sentient creatures within it are activated by internal quantum cognition in a coordinated fashion. The very first movement towards manifestation is the mere internal quantum 'epiontic' perception that produces a prototype subject-object distinction at a deep quantum level. Because of quantum interconnectedness and the quantum 'look-ahead' mechanism, environments and inhabiting sentient beings manifest through a multitude of increasingly complex levels that are coordinated with each other.

This QDE perspective within which there is a quantum non-locally informational coordinated manifestation of environments and contained species is the only way in which the extraordinary interconnectedness between apparently widely separated aspects of any biodiverse environment can be accounted for. The MUD perspective cannot adequately account for the remarkable interconnections presented, for example, in the BBC's recent series *Secrets of Our Living Planet*.[131] The notion that the various features of any biodiverse environment come into being as entirely independent and separate creatures and elements of the environment, without interdependencies, and then 'evolve' into biodiverse interconnectness and interdependency is absurd. The astonishing interdependencies and inter-connectedness recently revealed by research into biodiversity must already be potential in the nonlocal quantum informational field of potentiality. Indeed the nonlocal interdependency which clearly resides within the quantum ground would lead one to expect exactly such a manifested interdependency. Even though the manifested world has to become 'local', this 'locality' does not destroy the quantum nonlocal background which is the hidden informational and interconnected source of all manifestation.

The starting point, at the very base of the hierarchical cascade of implicate orders into material manifestation is the glimmer of the division into perceiver and perceived. Within this division into the possibility of observer and an observed, a fundamental division which takes place at a deep hidden quantum implicate level, the universe becomes self-referring and self-observing, a process which now gives rise to what physicist Amit Goswami calls a 'tangled hierarchy' of internal quantum cognition:

> Behold the causal circularity of the role of the observer in quantum measurement. The observer, the subject, chooses the manifest state of the collapsed object(s); but without

> the manifest collapsed objects, including the observer, the experience of the subject does not arise either. This circular logic of the dependent co-arising of the subject and objects(s) is called a *tangled hierarchy*.[132]

This can be compared to Bohm's cascade of 'implicate orders', of self-observation and self-activation through which the fluid quantum nature of the fundamental ground becomes increasingly divided into quantum temp-late 'prototype' sentient beings and inhabited environments. *Most of the evolutionary development, then, will take place in 'hidden' quantum 'implicate' levels of manifestation before becoming at some point fully materially manifested.*

This viewpoint explains the fact of 'punctuated evolution', a truth revealed by the fossil record which is desperately resisted by those still clinging to unscientific notions of smooth gradual mutations. However just the fact of the Cambrian explosion indicates that punctuated evolution is a reality. Carroll has pointed out, for instance:

> Simon Conway Morris, one of the leading paleontologists deciphering the events of the Cambrian, has likened this early phase of diversification to a trail of gunpowder leading back into the "mists of time". 'Whatever the length of this trail, by the late Early Cambrian, it reached the powder keg and the diversity of forms exploded. This is not just the appearance of individual representatives of major groups, but a parade of variations on basic body types.[133]

The notion that this diversity of primitive organisms sprang from absolutely nowhere is ridiculous, their prototype forms were taking shape within quantum 'implicate' levels of evolution.

It is clear then that new evolutionary forms can take shape within 'hidden' quantum levels of the evolutionary process of reality. And because the quantum realm has access to non-local information mechanisms such as the quantum 'look-ahead' algorithm, the quantum levels of evolution can 'feel' out the future nature of evolving environments and thereby quantumly prepare the evolving quantum template of an animal to 'fit' the environment it is about to inhabit. Mensky, within his Extended Everett Concept (EEC) perspective, indicates that quantum theory suggests precisely this mechanism:

> In the present paper we shall introduce the mathematical formalism describing this principal feature of living matter (of its consciousness): the ability to correct its state making use of the information (about the efficient way of survival) obtained from the future. It will be assumed that the evolution of living matter includes the correction providing survival at distant time moments. This correction leaves in the sphere of life only those scenarios of evolution which are favorable for life. Unfavorable scenarios do not disappear from the (quantum) reality but are left outside the sphere of life (absent in the picture appearing in the consciousness).[134]

This feature of Quantum Darwinism Evolution (QDE), then, means that the ridiculous MUD notion of the gradual mutational evolution of animals on a fully materialized level, involving transitional forms of animals flying around with appendages they also use from time to time to extract a hit of oxygen from the sea, is not necessary because most of the gradualness of evolution takes place within implicate quantum levels of potentiality. This means that that,

although Coyne is correct in is his assertion that 'evolution occurs', most of the rest of his *WET* account of the process is manifestly false.

The insights of Evo Devo clearly converge on exactly this conclusion. Evo Devo supports the QDE perspective that there is an infinite pool of potentiality at the creative edge of time and that most of the processes of evolution take place within implicate nonlocal quantum levels. Evo-Devo enthusiast Sean B. Carroll, however, cannot go there, it would probably be academic suicide, he would certainly lose friends. So to maintain academic credibility he has to join in the MUD-slinging and uphold a viewpoint which is as clear as MUD:

> Developmental genetics has been shedding new light on the making of complexity and the evolution of diversity for twenty years. Creationists just plain refuse to see it. How is such overt evidence ignored or dismissed? I can't pretend to understand the psychological mechanisms that allow humans to deny reality. But I do understand the desperate political and rhetorical tactics of those who, holding a losing hand, refuse to accept it. In the creationist's case, it is to assert that evolution is just a theory, and there are other theories (creation or Intelligent Design)…[135]

Again note the equating of "creation or Intelligent Design" What can one say? I would say that I can't pretend to understand the psychological mechanisms that allow humans to deny the reality of their own discoveries. Evo-Devo clearly undermines the MUD worldview of neo- or ultra-Darwinism which in its crude form, which is its canonical form:

> The major tenets of the evolutionary synthesis, then, were that populations contain genetic variation that arises by random (i.e. not adaptively directed) mutation and recombination; that populations evolve by changes in gene frequency brought about by random genetic drift, gene flow, and especially natural selection; that most adaptive genetic variants have individually slight phenotypic effects so that phenotypic changes are gradual (although some alleles with discrete effects may be advantageous, as in certain color polymorphisms); that diversification comes about by speciation, which normally entails the gradual evolution of reproductive isolation among populations; and that these processes, continued for sufficiently long, give rise to changes of such great magnitude as to warrant the designation of higher taxonomic levels (genera, families, and so forth).[136]

There is absolutely no way any of this can account for primordial body-plans.

Professor Jerry Coyne, with his usual consummate ignoring of evidence, remains unconvinced by the Evo Devo discoveries: "the evidence", he said, "for this critical hypothesis, however, rests more on inference than on observation or experiment".[137]

In the next article we will look in more detail at the paper on quantum entanglement and nonlocality with which Tsakiris confronted Coyne.

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