QUANTUM PHYSICS: THE PHYSICS OF DREAMING

by Paul Levy

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1. INTRODUCTION

For the last few months, all I've wanted to do is to read about quantum physics.[1] I've been studying quantum physics off and on for decades, but have never gone as far down the rabbit hole as I have this time. It feels like I've gone through the looking glass to the point of no return. The more I contemplate what quantum physics is telling us, the more my mind gets blown into phantasmal traces of nonexistent subatomic particles. Studying quantum theory is like ingesting a mind-altering, time-release psychedelic. Taking in what quantum physics is revealing to us about the universe we inhabit is "psycho-activating" beyond belief, in that it activates the psyche, inspires the imagination and synchronistically dissolves the boundary between mind and matter. To say that quantum physics is the greatest scientific discovery of all time is not an exaggeration; its profound revelations and implications cannot be overstated. In discovering the quantum, physics has indisputably encountered consciousness, there is simply no avoiding this fact. Quantum theory demands a radical re-visioning of the role that consciousness plays in the unfolding of reality. Quantum physics is pointing out, in unequivocal terms, that the study of the universe and the study of consciousness are inseparably linked, and that ultimate progress in the one will be impossible without progress in the other.

A unique development in human history, the discovery of the quantum nature of our universe is a seismic, tectonic shift in the very foundation of physics and the roots of our scientific worldview, a change so momentous that it can literally transform the course of human history. This great change is already underway and yet there remains still a long way to go for the full transformational impact of the discoveries of quantum physics to be assimilated by

humanity. What quantum physics is revealing to us is so radical, with implications so far reaching that to call it merely revolutionary would not do it justice. The conceptual revolution of quantum theory has literally turned physics on its head; what it is revealing about our universe is turning right side up what had been inverted and upside down.

Quantum physics is introducing us to a radical new way of seeing and understanding which profoundly impacts human thinking, feeling, sensing, knowing and being. As if the universe itself is giving us a cosmic physics lesson, what quantum physics is revealing to us requires a completely new way of thinking about the universe, our place in it as well as ourselves. Quantum theory is teaching us that implicit in our very thinking are certain flaws and misperceptions that, unseen and taken for granted, unnecessarily limit our ability to apprehend the nature of nature, including our own. The founders of quantum physics, people such as Niels Bohr, Werner Heisenberg and Erwin Schrodinger have famously argued that quantum physics is first and foremost a new way of thinking. Indeed, the most far-reaching impact of quantum physics will be within the human mind.

The discoveries of quantum physics are truly a game-changer that requires a novel response in us which, when more fully understood and integrated, will irrevocably change us─both on the individual level and as a species─in the very core of our being. Speaking about the implications of quantum physics, John Bell, one of the most important physicists of the latter half of the twentieth century, is of the opinion that "the new way of seeing things will involve an imaginative leap that will astonish us." It is hard to imagine something truly astonishing that we wouldn't tend to initially rule out as preposterous. This new way of seeing things, this imaginative leap is truly an evolutionary upleveling─a real quantum jump in consciousness─that quantum physics is inviting each of us to partake in.

Quantum physics is the most subversive of all the sciences, having created a "reality crisis" in the field of physics such that the very idea of "reality" itself has been undermined, relegated to being a questionable, ambiguous and twilight concept. The very "reality" that pre-quantum physics had been studying has been demonstrated by quantum physics to not even exist! The greatest experts of quantum physics, if it's even possible to speak of "experts" in a field that, according to Nobel prize-winning physicist Richard Feynman, "no one understands," literally do not know "what" they are talking about.[2] Physicists who study their own theory have, in their attempts at grasping its implications, lost their grip on reality, finding nothing, absolutely nothing to hold onto. Quantum physics has pulled the rug out from under us only to reveal no floor below, no place on which to take a stand, as the notion of a seemingly solid, objectively existing world evaporates like dewdrops in the morning sunlight. Speaking about reality, quantum physics brings the question to the fore: Are we discovering reality, or creating it? And if we are, at least in part, creating what we call reality, what are we creating it out of?

Quantum theory is not just one of many theories in physics; it is the one theory that has profoundly affected nearly every other branch of physics. There is hardly an aspect of contemporary society or of our own individual lives that has not already been fundamentally transformed by the ideas and applications of quantum physics. One third of our economy involves products based on quantum mechanics – things such as computers and the Internet, lasers, MRI's, TV's, DVD's, CD's, microwaves, electron microscopes, mobile phones, transistors, silicon chips, semiconductors, quartz and digital watches, superconductors and nuclear energy. And yet, even with the huge impact quantum physics has had on all of our lives, this effect is infinitesimally small compared with what it will be when more of us recognize and

internalize the implications of what it is revealing to us about the nature of reality as well as of ourselves.

The discoveries of quantum physics, practically speaking, have given us the capacity to both increase the quality of our lives and/or to potentially ravage the environment on an unprecedented scale, even to obliterate our species altogether. To quote theoretical physicist Henry Stapp, "Yet along with this fatal power it [science] has provided a further offering which, though subtle in character and still hardly felt in the minds of men, may ultimately be its most valuable contribution to human civilization, and the key to human survival."[3] Do we use the discoveries of quantum physics for the betterment of our species, or to destroy ourselves? Quantum theory reflects back to us that the choice is truly ours.

Quantum physics works like a charm. It is like a higher-dimensional talisman, a physics of possibilities. The precise accuracy of its mathematical formalism and methodology is beyond debate, none of its predictions have ever been shown to be wrong; it is literally the most successful scientific theory of all time. It is like physics has discovered a wonderful magic wand that works every time, but the amazing thing is that no one knows why. I have never in all of my life come across a field where all of the supposed "experts" disagree with each other about the meaning of their own theory. This is the deep philosophical question that begs to be answered - what does quantum physics mean? When the alleged experts can't agree, we can feel free to choose our preferred expert – or explore and speculate on our own.

I am certainly not a physicist; rather, I am someone who, the more I contemplate the deeper philosophical underpinnings of quantum physics, can't help but wonder what nature itself is revealing to us through her new physics. As such, I am writing as an "outsider" regarding the field of physics. I have absolutely no authority to comment on the nuts and bolts physics of things, which I literally know nothing about. On the contrary, I am simply giving voice from my perspective as a curious person who is trying to make sense of what it means when physics tells us that the world we live in is quantum through and through. As a citizen in the recently recognized quantum world, I am writing as an "innocent bystander," except that quantum physics unavoidably implicates me as participating in what I'm writing about.

Most of us have no idea, have been ill-informed and left out in the dark regarding these over-the-top discoveries that have everything to do with the ultimate nature of the reality in which we live our everyday lives. Speaking about the public's ignorance regarding the earth-shaking discoveries in the new physics, Nobel Prize-winning physicist Isaac Rabi simply says, "It's a great pity." With reference to quantum physics, what we don't know *can* hurt us. In our modern age, scientific literacy has become a political and moral necessity. In our inquiry, we should prepare to be astonished.

2. PARTICIPATORY UNIVERSE

Renowned theoretical physicist John Archibald Wheeler, a colleague of both Albert Einstein and Niels Bohr, is considered to be one of the towering intellects and greatest physicists of the twentieth century. A professor emeritus at Princeton, Wheeler has been called a "sage of modern physics," as well as, after Einstein and Bohr, "the last of the greats." Drawn to explore the very limits of science, and unafraid to face the big issues of his field, his list of accomplishments in physics is staggering; the whole universe – both big and small – was the playground for his poetic imagination. Wheeler was a pied piper among physicists; due to his

fondness for speculating on what directions future science might take, he was considered to be the Delphic oracle of physics. A mentor to Richard Feynman, he was an inspiring teacher for many of the greatest and most innovative physicists of our current day. His goal was to plant ideas deep in the minds of his students, which like time-release capsules, might find some way to flower five, ten or fifty years later. To say he was an out-of-the-box, creative thinker would be an understatement; for Wheeler the box that he was "out of" was a higher-dimensional hyper-cube which existed in the realm of the imagination. Considered a "gentleman's gentleman," he was a hard-core scientist as well as a visionary whose musings went far beyond the orthodox, often astounding the narrow specialist. A speculative dreamer with the soul of a surrealist poet, he has been described as someone who "dreams with open eyes," and has been called "a twentieth century Leonardo da Vinci." Many of his fellow scientists are convinced that his insights into the foundation of modern-day physics will spur a revolution in our perception of the universe. Truly a legend in the physics community, Wheeler's impact on the field of modern day physics is hard to overstate.

As Wheeler has pointed out, the majority of developments in science have come out of asking the right questions. To quote Heisenberg, "What we observe is not nature itself, but nature exposed to our method of questioning."[4] The questions we ask are determined by our way of thinking. What we think about and how we perceive the world seems as if it subtly affects reality at a very deep and basic quantum level, thereby informing and modifying the underlying fabric out of which third-dimensional reality emerges. What we wonder about alters the way in which reality presents itself to us. We ourselves create the reality of human experience with the questions we ask and the procedures that we undertake to find the answers to them. It is easy to assume that when we ask questions of nature, of the world seemingly outside of ourselves, that there is an actual reality existing independently of what can be said about it. We can "divinize" the universe by learning to recognize its oracular nature. Parsifal-like, we have to ask the right question. To quote Wheeler, "The question is what is the question?" How to ask the question and when it is asked plays an important role in what answer we get. What is the universe revealing to us? Wheeler comments, "No question? No answer!"

Classical physics, the physics that existed before the discovery of quantum physics, was about uncovering what were thought to be the pre-existent laws of a separately existing universe that objectively existed independent of observation. Quantum physics obliterated the classical notion of an independently existing world forever. To quote Wheeler, "Nothing is more important about quantum physics than this: it has destroyed the concept of the world as 'sitting out there.' The universe will never afterwards be the same." Quantum physics forever shattered the idea of there being an objectively existing world – it has proven that there is no such thing! It is ironic that physics, long considered the most "objective" of all the sciences, in pursuing its dedicated quest to understand the deep nature of the material universe, has dispelled the very notion of an objective universe. According to quantum theory, the idea of a world independent of our observation is a meaningless statement; it makes no sense whatsoever to talk about an objective universe as if it exists separate from our observation of it. Our perception of the universe is a part of the universe happening through us that has an instantaneous effect on the universe we are observing. Similarly, it makes no sense to think of ourselves as a self-enclosed, encapsulated independent agent existing separate from the universe. Quantum theory has opened up the door to a profoundly new vision of the cosmos, where the observer, the observed and the act of observation are inseparably united.[5]

Quantum physics has shown that the idea of safely standing behind a slab of plate glass while passively observing the universe is impossible, as our observation of even something as miniscule as an electron necessitates the shattering of the glass and reaching into, so to speak, the electron's subatomic world, which changes both the electron and ourselves. It is impossible to gain information without changing the state of the system being measured, as we invariably bring about a different world by the very act of trying to determine the state of the world. In quantum physics, we are no longer passive witnesses of the universe, but rather, we unavoidably find ourselves in the new role of active participants who in-form, give shape to and in some mysterious sense "create" the very universe we are interacting with. Making this point, Wheeler says, "Useful as it is under everyday circumstances to say that the world exists 'out there' independent of us, that view can no longer be upheld. There is a strange sense in which this is a 'participatory universe.'"[6]

In essence, consciousness has entered into the physics laboratory, and physicists are not quite sure what to make of this turn of events. Who can blame them? The encountering of consciousness in their experiments—what has been called physics' "skeleton in the closet"—is, simply put, out of their league. Coming to terms and facing up to consciousness's intrusion into their hallowed halls is forcing physics to come to terms with questions of meta-physics, which for most physicists is not what they signed up for. Quantum physics is itself the greatest threat to the underlying metaphysical assumptions of "scientific materialism," a perspective which assumes that there is an independently existing, objective material world that is separate from the observer.

It can easily seem as if the whole consciousness problem (called the "measurement problem") has been forced upon physics against its will by some outside agency. But nothing could be further from the truth—the appearance of consciousness in the domain of physics is totally natural, which is to say it is nature revealing one of her most intimate mysteries. To quote Nobel prize winning physicist Eugene Wigner, "through the creation of quantum mechanics, the concept of consciousness came to the fore again. It was not possible to formulate the laws of quantum mechanics in a fully consistent way without reference to consciousness."[7] Most physicists think that something as ethereal as consciousness—what has been referred to as "the unwanted stepchild of physics"—has no place in "real" physics. The prevailing mainstream view is that consciousness, or "philosophy" is not supposed to be studied in a physics department. Anything that isn't testable and can't be measured is of no concern to most physicists. To the overwhelming majority of physicists, the role that consciousness plays in their experiments seems to be against the spirit of science – which in their view is always supposed to be impersonal and objective. And yet, like an uninvited, unwelcome guest at dinner, consciousness refuses to go away.

3. OBJECTIVE REALITY HANGOVER

Science, which, in Wheeler's words "is an intensely human activity," has a great effect on human beliefs. Oftentimes, the transition from one age to the next is triggered by a seemingly minute change in a single idea. Some of the most important science-generated beliefs that pervade our world are outdated and mistaken ideas that arose in science during the seventeenth, eighteenth and nineteenth centuries. One such antiquated belief is the unquestioned assumption of an external, independent, objective universe with its concurrent shallow, limited and

impoverished conception of how humankind fits into such an apparently objective world. Ironically, from the scientific point of view, it is irrational and against the very spirit of science itself to cling to such a false and antiquated idea of the world we live in. Relating to an after-image as if it still exists, many physicists are doing quantum physics—and successfully solving their equations—and yet, deep in their unconscious are still subtly entranced in a classical mindset that sees the world as independently existing. To quote physicist F. David Peat, "A revolution had occurred in physics, but at a deeper level the same order prevailed. The new wine of quantum theory had merely been put in the old bottles of Cartesian order."[8] Clinging to the idea of an objectively existing world is like holding on to the mistaken belief in a flat earth, all evidence to the contrary. Heisenberg writes, "The hope that new experiments will lead us back to objective events in space and time is about as well founded as the hope of discovering the end of the world in the unexplored regions of the Antarctic." Like the old "flat-earthers," "objective-worlders" are holding onto to an inculcated unconscious belief, reinforced by several centuries of habit, that has now ineluctably been shown to be a make-believe figment of the human imagination. Wheeler openly wonders whether, in an interesting choice of words, we are "sleep-walking" if we think that we aren't influencing the results of our experiments.

Not just the physics community, but the vast majority of our species is suffering from a similar "holding on" to what Stapp refers to as "a known-to-be-false" idea of the world if we think it inherently exists separate from ourselves. The objective world model which still has such a pervasive hold upon much of our species is a construct, literally a projection of a particular stage of human psycho-spiritual development. The quantum revolution has revealed that the classical worldview was something that existed entirely within the minds of a certain strain of European humanity that became reified into an orthodox creed and held the mind of modern humanity in a prison of their own making, as if humanity had become spellbound. Providing a way out of this self-imposed prison, quantum physics heralds the advent of an altogether new stage of human psycho-spiritual evolution. What seems to be an independent universe is in actuality a play of appearances, a persistent and persuasive false imagination, an unexamined and clearly mistaken metaphysical assumption. As Wheeler wonders, "is IT all just a Magic Show?"[9] It is as if, upon seeing a mirage of water in the desert, we think that the apparition of water really exists as actual water.

It is as if physicists themselves haven't fully comprehended and don't quite know what to make of the great truth that they have unwittingly stumbled upon. They have been forced to wrestle, not just intellectually but emotionally, existentially and spiritually with their own discoveries in the quantum realm. In the classic book *Quantum Theory and Measurement* that Wheeler co-wrote with Wojciech Zurek, the authors write regarding the quantum, "What else is it but an unfamiliar animal, confined to an animal house? And how else can one better capture its newness than by walking around, looking at it through one window after another, seeking to combine fragmentary views into a total picture?"[10] When all of the various perspectives of the multi-faceted quantum reality are combined and looked at together, it gives us a greater resolution and capacity to see what no single vantage point can reveal.

Physicists who are still entranced by the notion of an objective universe, with its concurrent exclusion of the observer, are simply unwittingly recreating the greatest failure of classical physics—its inability to find a place to accommodate us, its creators. Human beings are not likely to thrive or endure in a society ruled by a conception of ourselves that denies the very creative essence of our being. Our understanding of the world we live in determines the ethics we live by; living a life based on a worldview that is an illusion can easily lead to living the

wrong life. In re-visioning our idea of the world we live in, we change our perception of the possibilities available in our world, thus opening up previously unimagined pathways of creative and effective action.

"Objective reality" is an unexamined implicit assumption, merely an idea in our mind. What most of us call objective reality is simply an interpretation of data whose meaning is agreed upon by the majority, what can be called a "consensus reality." An inherently existing, objective world—something that has its "own nature" separate from something else—is a form existing only in the imagination. Upsetting the applecart of consensus reality, quantum physics points out that objective reality does not actually exist. Becoming a phenomenologist for a moment, instead of referring to the world "out there," Wheeler highlights the subjective nature of the experience that is taking place inside of us when he more accurately uses the phrase "the image of something 'out there.'" The apparent world "out there" has its roots in a field of sentience that is inextricably interwoven with the physical world while at the same time being shaped by the world of innumerable observers.

The notion of an independent, objective reality that exists separate from an observer is a very deep-seated assumption, a habit of mind, which like one of Kant's categories of perception, resides at a core level of the human psyche. This assumed viewpoint practically becomes hard-wired into the brain, causing us to filter our perceptions so as to reflect back our core assumptions. Regardless of the overwhelming evidence to the contrary, there still exists an underlying unconscious mode of language and type of thinking embedded in physics which conceives of the world as having a type of objective existence that it simply doesn't have. Albert Einstein was deeply disturbed by quantum physics' implication that there is no independently existing objective universe, and was not able to let go of his strong belief that there exists an external, objective world independent of the perceiving subject. To quote Einstein, "The belief in an external world independent of the perceiving subject is the basis of all natural science." Einstein was troubled by quantum theory's implication of the apparent role that the observer played in creating reality, feeling that it seemed incompatible with any reasonable idea of reality. In response, Bohr famously reflected back to Einstein that his "concept of reality is too limited."[11] We should question what it is in the way we think about the world that causes quantum behavior to be so troubling. Our being troubled is a result of the disparity between the way reality operates and actually manifests itself and our ideas of what reality should be. Wheeler confesses that he is not troubled "at all" by what quantum theory is revealing; on the contrary, he feels that it is "a perfectly marvelous feature of nature," and that "it is just the way the world works."

Thinking that there's an objective reality is a residue of the old materialistic perspective that lingers as an ingrained way of viewing reality, as if many physicists—and the majority of our species—are suffering from an "objective reality hangover." One of the things that distinguishes Wheeler from many others physicists is his refusal to try to save pre-quantum viewpoints, particularly, to quote physicist Anton Zeilinger, "the obviously wrong notion of a reality independent of us." For many people the idea that there is no independent reality is "unthinkable," an idea so off their map of reality that they can't even imagine it. The projection of an inherently existing world outside of ourselves is a deeply ingrained, seemingly innate and habitual mode of perception. Old intellectual habits die hard; it can be difficult to let go of familiar, comfortable—and "tranquilizing"—ideas about the way the world works. Heisenberg emphasizes, "The idea of an objective real world whose smallest parts exist objectively in the

same sense as stones or trees exist, independently of whether or not we observe them … is impossible."

According to our subjective experience the world certainly seems real enough, apparently contradicting what quantum physics is telling us about the world's lack of inherent, objective reality. In the overwhelming majority of cases, the world behaves "as if" it has an independent reality, which furthers our visceral belief in objective reality in what becomes a self-perpetuating and mind-created feedback loop. In other words, because of the quantum, dreamlike (i.e., consciousness based) nature of reality, once we view the universe "as if" it independently, objectively exists, it will manifest in a way which simply confirms our viewpoint (please see my article "As Viewed, So Appears"). Nature seems to respond in accordance with the theory and beliefs by which it is approached. The choices we make about what we observe make a difference in what we find. Wheeler wants to replace the idea of an objectively existing world, or as he puts it, a "hardware located out there," with a "meaning software" located who knows where.

4. REALITY

To quote Einstein, "Reality [which elsewhere he says 'is merely an illusion, albeit a very persistent one'] is the real business of physics." At the end of the day science is empirical, and its theories must be grounded somehow, "in reality," but where and, furthermore, what exactly is that reality? Another of the founders of quantum theory, Wolfgang Pauli comments, "I think the important and extremely difficult task of our time is to try to build up a fresh idea of reality."[12] But where is the ontological ground upon which our impression of a really-existing universe—our idea of reality—rests? Wheeler writes, "What we call reality consists of a few iron posts of observation between which we fill in by an elaborate papier-mache construction of imagination and theory."[13] We "connect the dots" between a "few iron posts of observation" so as to create a seemingly coherent picture of our world, which we then easily imagine is reality itself. "Reality" is just a word in our language. What we "call" reality is simply a theory and internalized mental model which is at bottom a way of looking at the world, rather than a form of absolutely true knowledge of how the world "really" is. It is important not to conflate reality with our theories, not to confuse the map with the territory. Our best models are no more than aids to our imagination, by no means are they complete reflections of the nature of reality. There is a fine line between imagination, reality, and illusion. Wheeler writes, "Recent decades have taught us that physics is a magic window. It shows us the illusion that lies behind reality—and the reality that lies behind illusion…. Today we demand of physics some understanding of existence itself."[14] It is as if there is a fissure in what we thought was reality, and quantum physics is the thread that is increasingly protruding through the crack that can potentially unravel our ideas about everything. Wheeler comments, "I continue to say that the quantum is the crack in the armor that covers the secret of existence."[15]

The Scientific Revolution was a deepening of our powers of reason, a flowering of human creativity and a breakthrough for humanity, helping us to explore our world in ever-more profound and ingenious ways. From another point of view which also contains an important truth, the Scientific Revolution that is now commonly associated with Isaac Newton's[16] ("Newtonian") physics, was also the onset of a particular form of madness. It started as a new worldview that was revolutionary in its power; yet it contained a subtle error that solidified into a

widespread delusion which has over time profoundly enabled the collective psychosis[17] that our species finds itself in. An essential feature of this madness is the severing between the subject and object, the observer and the observed, as if the scientific imagination thought that in its intellectual examination of the world it wasn't part of, participating in and thereby affecting that which it was investigating. This was done in pursuit of the ideal of objectivity, which was gradually elevated to the level of an absolute truth about the nature of reality. This approach worked remarkably well when it came to dealing with the macroscopic world, enabling unprecedented levels of control to be exerted over the physical world, but in this process of obtaining mastery over the physical plane an unseen cost was being incurred by the human spirit. This mechanistic, deterministic and reductionist attitude unfortunately became identified with science itself, thus introducing a number of tacit taboos and limiting assumptions into the otherwise open-ended process of exploration known as the scientific method. The modern scientific attitude which sees the world as objectively existing outside of itself—"scientific materialism"—is actually a deluded view expressing an epistemological blind spot in the very center of the predominating scientific vision of the world, a blindness of which modern society seems mostly unaware. Seeing the world as separate from ourselves has become the prevailing and institutionalized worldview of "the academy," a viewpoint that takes the heart, soul and "magic" out of the world, reducing it to a dead, inanimate, insensate domain. Scientific materialism disenchants the world while simultaneously bewitching and casting a materialistic spell over its inhabitants. Increasingly enthralled by science's ever-growing achievements and technological wizardry, few have questioned whether these very advances might at the same time be leading humanity astray from essential aspects of the true nature of our being; slowly dehumanizing our species in the process.

The conceptual tension that arises between conflicting ideas can potentially become the source of creative insight. Wheeler comments, "Progress in science owes more to the clash of ideas than the steady accumulation of facts."[18] In our current day we are at a transition point, as two contradictory worldviews—the classical and the quantum—are encountering each other, not just in physics, but also deep within the human psyche, as it is ultimately the psyche from which all our physics is derived. It is the leaving behind of commonly agreed-upon truths that have been "outgrown" and shown to be wrong that helps to propel science, and human civilization forward. In Wheeler's opinion, "the most revolutionary discovery in science is yet to come! And come, not by questioning the quantum, but by uncovering that utterly simple idea that demands the quantum."[19] According to Wheeler, the universe could not even have come into being without the quantum. It is Wheeler's opinion that until we arrive at this basic idea underlying the quantum, we have not understood the essence of the quantum principle. What is this "utterly simple idea" that Wheeler is positing that demands a quantum world? Could it have to do with the dreamlike nature of reality, a perspective which embraces the role of consciousness in creating our world? Wheeler says, "There are some ideas out there that are waiting to be discovered." It is as if some ideas are "in the air," pervading the underlying field of the collective unconscious, just waiting to be tuned into and "received." Etymologically, the word "idea" has to do with a way of seeing, a perspective through which we view the world. Wheeler writes, "Surely someday, we can believe, we will grasp the central idea of it all as so simple, so beautiful, so compelling that we will all say to each other, "Oh, how could it have been otherwise! How could we all have been so blind so long?"[20]

Is there a subtle form of teleology embedded in the observer's role in the quantum world; in other words, are we being shown something, are we being led to a new way of seeing our

world which will change the way our world manifests to us? Quantum theory implies that immaterial factors having more of the nature of images and ideas are the blue-print for our universe, actually in-forming and shaping the evolution of the universe as a whole. Wheeler goes so far as to liken the universe itself to an idea. Are the insights of quantum physics providing the clue that will lead us to a previously undreamed of treasure just waiting to be discovered? Wheeler comments, "Except it be that observership brings the universe into being what other way is there to understand that clue?"[21] It is as if the universe itself is conspiring with us to help us awaken to its, and our nature, and quantum physics is the theoretical and experimental "instrument" for this deeper insight to reveal itself. To quote Wheeler, "Somewhere something incredible is waiting to happen."

If we view the physics community as an individual and view quantum physics as their dream, it is as if physicists have "dreamed up" quantum theory in all its glory as a compensation for all of our intellectual one-sidedness, as a way of showing us our blind-spot, reflecting back to us our unfounded unconscious assumptions. As crazy as it might sound, quantum physics, with all of its seeming absurdity, is revealing a deeper order of nature that transcends the one-sidedness of the predominant scientific worldview and is thereby medicine for the overly materialistic madness we've succumbed to. Wheeler refers to the old mechanistic viewpoint of the universe as a machine that goes its own inexorable way as a "cracked paradigm." Commenting on the gifts that are embedded in the quantum realm, he says, "… not machinery but magic may be the better description of the treasure that is waiting." Because of its results being a function of the experimental set-up, quantum measurements resemble good stage magic more than a clumsy meter reading. Seen as a symbol crystallizing out of the dreamlike nature of reality, quantum physics is revealing to us that we don't live in the mechanistic, Cartesian world of classical physics, but rather, inhabit an enchanted world not separate from our mind's creative imagination.

5. THE LAWS OF PHYSICS

Physics has always thought of itself as being in search of the fundamental laws of the universe. Wheeler comments, "The beauty in the laws of physics is the fantastic simplicity that they have."[22] Quantum physics has raised the question, is the ever-evolving universe like a work of art in progress, making up its laws as it goes along? Wheeler writes, "The more one learns about the laws of physics, the more one learns how little one has learned."[23] Are the laws of physics an emergent property of the cosmos, which itself is emergent? Commenting on what quantum physics tells us about the laws of physics, Wheeler famously opined, "There is no law except the law that there is no law."[24] This is to say that the laws of physics are mutable, mutating in tune with the universe they support, in the same way that living organisms mutate. How can we believe that the laws of physics were chiseled on a rock for eternity if the universe itself is not going to be around forever? To quote Wheeler, "Law cannot stand engraved on a tablet of stone for all eternity… all is mutable."[25] This is a malleable, plastic universe. The laws and the physical universe they describe can only exist together, reciprocally co-arising and in-forming each other. It's meaningless to talk about the laws of physics before the existence of a material reality in which these laws are enacted. The idea that the laws which inform the functioning of reality spring into manifestation out of nothingness fully formed is a nonsensical, preposterous idea. Wheeler comments, "The laws of physics were not installed in advance by a

Swiss watchmaker, nor can they endure from everlasting to everlasting. They must have come into being. They could not always have been accurate. They are derivative and superficial, not primary and revelatory."[26] The "flexi-laws" advocated by Wheeler evolve and focus in on precisely the forms needed to give rise to the living organisms that eventually observe them. Is observership the ultimate underpinning of the laws of physics, and therefore of the laws of space and time themselves? Quantum theory implies that observer-participants create both the physical laws and the appearance of the material world in which the laws apply. In our questioning about the nature of the universe and its laws, to quote Wheeler, "Could it be that the quantum is trying to tell us the answer?"[27]

In trying to find some deeper structure that underlies the laws of physics, quantum physics is reflecting back to us that it is a mistake to think that as we penetrate to the universe's deeper levels it will terminate at some *nth* level, or that it goes on ad infinitum in an infinite regress. Rather, our inquiry leads back full-circle to the observer with which it began, as if the ethereal act of observership is the link that closes the circuit of interdependence between us and our world. The central and all-encompassing role of the observer[28] in quantum mechanics, what Wheeler refers to as the "magic ingredient," is the most important clue we have regarding the construction of the universe. Wheeler asks, "Is the architecture of existence such that only through 'observership' does the universe have a way to come into being?"[29] According to Wheeler, the universe is a self-referential "strange loop" in which physics gives rise to observers, who then give rise to information, which in turn gives rise to physics. The universe gives rise to meaning-establishing observer-participants, who, in developing the ideas of quantum mechanics, grant a meaningful existence to the universe. The construction of the universe is such that the observer is as essential to the creation of the universe as the universe is essential to the creation of the observer. It becomes extraordinarily difficult to state sharply and clearly where the community of observer-participants begins and where it ends; the boundary between the two is very shifty. The idea of observer-participancy implies that the universe has built into it from the very beginning the potentiality for giving birth to and housing observers. Without observers there is no existence; in Wheeler's words, "there would be nothing rather than something." The universe creates the conditions and paves the way for the emergence of the very observers that bestow upon it a certain reality, completing the transaction that allows the stars to shine, so to speak. In a world without a built-in purpose, quantum theory "promotes" the observer to the definer of reality and generator of meaning, which is essentially a creator of distinctions, a primordially creative role.

However we view it, we can't get around the fact that we are participating in creating our experience of the universe.[30] Wheeler says, "We are inescapably involved in bringing about that which appears to be happening."[31] Not only are we involved in bringing about what seems to be happening, we are intimately involved in creating our experience of ourselves as well. Being a form of insight, physics is a form of art; as such, quantum physics is reflecting back to us the part of ourselves that is a creator of experience. Are physics' insights into the participatory character of the universe, with all of its yet to be realized implications, just the tip of the iceberg? To quote from the wonderful book *Quantum Enigma: Physics Encounters Consciousness* by physicists Bruce Rosenblum and Fred Kuttner, "If our observation creates *everything*, including ourselves, we are dealing with a concept that is logically self-referential—and mind-boggling."[32]

Quantum physics simultaneously boggles, blows and melts our mind, which is to say that as we take in and digest what quantum physics is showing us about the universe and our place in it, it psycho-energetically "changes," expands and refreshes our mind. Becoming "quantum-

physicized," we learn to think directly and naturally in terms of quantum mechanical language and logic. Quantum physics is riddled with paradox to its core. Thinking "quantum-logically," we are able to hold paradox in a new way; instead of needing one or the other viewpoint to be true, in a higher form of logic[33] we can hold seemingly contradictory statements together as both being true simultaneously. This gives new insight into how what may appear to be contradictions at one level can be part of a deeper consistency and completeness from a higher, more inclusive level. Wheeler stressed that as we develop more of a capacity to consciously hold paradox new insights will often emerge. Each new generation will take into itself, learn and integrate quantum physics' worldview more easily, as each person's initiation into this new way of thinking and seeing the world nonlocally affects the whole, transforming the collective unconscious of humanity itself. Once we catch up with and integrate what science has discovered about our place in the universe, quantum physics will become the lens through which we view our experience, as its simplicity and obviousness will seem utterly natural. We will wonder how we could have been so blind for so long. Or so I imagine….

6. SELF-EXCITED CIRCUIT

Wheeler's vision of the universe is like a "self-excited circuit," to use a metaphor from electronics. To say the universe is "self"-excited is to say it is not "other"-excited, which is to say that rather than depending upon an external agent, god or deity, the universe is self-creating and self-referential—i.e., able to refer to, reflect and act upon itself, and hence, endlessly re-create itself anew.[34] Seen as a self-excited and self-actualizing circuit, the physical universe bootstraps itself into existence, laws and all. As a self-excited circuit, the universe gives rise to observers who, in completing the circuit, potentially give meaningful reality to the universe. Wheeler says, "The universe is to be compared to a circuit self-excited in this sense, that the universe gives birth to consciousness, and consciousness gives meaning to the universe." The emergence of consciousness in the universe is as epic and epochal an event in cosmic history as the first big blast of its materialization in the supposed big bang. The self-excitation is caused by the innate fundamental tendency for self-perception built into the very ground of being. In this process of self-cognition, the universe is able to turn back upon itself so as to explore its nature via its various life forms as it endlessly creates and recreates itself through innumerable acts of observer-participation. The universe generates an interactive feedback loop of cosmic intelligence within itself that becomes the internal guidance system and source of its own continually unfolding genesis. Contrary to the mechanistic worldview of classical physics, the universe as a self-excited circuit implies a participatory universe that endlessly creates itself through innumerable acts of participatory self-perception. To quote 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."[35]

In such a self-referential cosmology whose nature is a self-generating feedback loop of pure creativity, we are dreaming up the universe, while at the same time the universe is reciprocally dreaming us up, as the seemingly subjective and objective realities interblend and co-create each other. Un-countable small acts of observer-participancy have over eons built up the tangible appearance of the material world. Self-excitatory, to quote Wheeler, "the universe is

a grand synthesis, putting itself together all the time as a whole. Its history is not a history as we usually conceive history. It is not one thing happening after another after another. It is a totality in which what happens 'now' gives reality to what happens 'then,' perhaps even determines what happened then."[36]

Talking about one of the most startling features of a thought experiment that he dreamed up called the "delayed choice experiment" (which has since been empirically verified), the act of observation, to quote Wheeler, "reaches back into the past in apparent opposition to the normal order of time." In his thought experiment, which is a creative use of the imagination to tease out a little more information from nature, Wheeler discovered that "a choice made in the here-and-now has irretrievable consequences for what one has the right to say about what has *already* happened in the very earliest days of the universe, long before there was any life on Earth."[37] This is to say that acts of observer-participancy in this moment give tangible "reality" to the universe not only now but back to its beginning. This is not far-out science fiction, but hard-core science that is actually stranger than fiction. Wheeler elaborates, "It is wrong to think of that past as 'already existing' in all detail. The 'past' is theory. The past has no existence except as it is recorded in the present. By deciding what questions our quantum registering equipment shall put in the present we have an undeniable choice in what we have the right to say about the past."[38] Classical physics describes the present as having a particular past; quantum physics, on the other hand, because of its probabilistic nature enlarges the arena of human history such that the past is an amalgam of all possible pasts compatible with the version of the present moment we are currently experiencing. The quantum universe is polyhistoric; the past involves a wide range of possible pasts all co-existing in a state of unmanifested potential. The act of observation collapses what is called the wavefunction (a mathematical construct that describes all of the system's possible states) in such a way so as to evoke a particular universe in the present moment while simultaneously reaching backwards in time to create a history appropriate with our present moment experience. There is no way to say unambiguously what the past really was really like until we know its future; as in a work of art, each part of the universe acquires its full meaning only in its relation to the whole. To quote physicists Stephen Hawking and Leonard Mlodinow, co-authors of *The Grand Design*, "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."[39] In any case, in quantum physics it certainly seems "as if" an observation made in the present moment reaches back and influences the past. Through our observations in this moment, Wheeler writes, "we decide what the photon *shall have done* after it has *already* done it."[40] The connection between the observer and the observed not only cannot be separated in space, but has no distinction in time as well. This perspective turns our conception of linear time and causality on its head. To quote author Graham Smetham, "The entire universe appears to be a kind of collective delayed choice experiment in which inhabiting sentient beings somehow determine the manifested nature of the universe even backwards in time!"[41] This introduces a self-referential circularity in which the laws of quantum physics can allow for their own self-modification backwards in time. The implication is that as observers we are participants in the genesis of the universe, a process that Wheeler calls "genesis by observership." The moment of the world's creation lies in the present, in the eternal now, with us somehow playing a "starring" role.

7. COSMOGENESIS

Without an observer it is as if this is a dead universe, one that wouldn't evolve over time, for without observers, there is no existence. Quantum theory reflects back to us, to again quote Wheeler, "that the universe would be nothing without observership as surely as a motor would be dead without electricity."[42] In the act of observation, the physical reality of the world becomes actualized, and in a self-generating circular feedback loop that is self-referential in nature, it is the same physical world that generates observers who are responsible for bestowing seemingly tangible reality to its existence. The observer-participant is both a result of an evolutionary process and, in some sense, the cause of its own emergence. Wheeler wonders, "Is observership the 'electricity' that powers genesis?"[43] In other words, mind-boggling as it is to contemplate, are we, as "observer-participants" playing a role in the genesis of the cosmos in this very moment? According to Wheeler, "It is incontrovertible that the observer is participator in genesis… it is difficult to see any other line that lends itself to exploration. What other way of genesis is there?"[44] Wheeler is reflecting that we play a role in the creation of the universe that has been normally reserved for the "gods."

I can only imagine what it must have been like for the founders of quantum physics to stumble upon the quantum realm; they must have felt like explorers from a faraway land coming across something completely unknown and mysterious. Wheeler uses the example of someone seeing an automobile for the first time. Conjecturing on what it is like to encounter this mysterious phenomenon, Wheeler, writes that thoughts arise such as, "It is obviously meant for use, and an important use, but what use?"[45] In his example, the automobile is the quantum: One opens the door, cranks the window up and down, flashes the lights on and off, perhaps even turns over the starter, all the while without knowing what it's really for. Similarly, we use the quantum in a transistor to control machinery, in a molecule to design an anesthetic, in a superconductor to make a magnet. All are great advances that we are using to our advantage, but are we missing the main idea? Wheeler asks, "Could it be that all the time we have been missing the central point, the use of the quantum phenomenon in the construction of the universe itself? We have turned over the starter. We haven't got the engine going."[46]

Is, in Wheeler's words, the "eruption after eruption" into physics of "the quantum"─the "fiery creative force of modern physics"─the doorway into deepening our understanding of the very architecture and engineering of the creation of the universe itself? Wheeler refers to quantum phenomena as untouchable, indivisible "elementary acts of creation"[47] which reach into the present from billions of years in the past, and he views them as the building material of all that is. Wheeler openly wonders, "Are billions upon billions of acts of observer-participancy the foundation of everything?"[48] In other words, are "billions upon billions of acts of observer-participancy" by innumerable beings over countless eons the very quantum process which has created our world, literally dreaming our world into materialization? Wheeler ponders whether the very term "big bang" is merely a shorthand way to describe the cumulative effects of these billions upon billions of acts of observer-participancy.[49]

Regarding how the universe came into being, Wheeler asks, "is the mechanism that came into play one which all the time shows itself?"[50] Is enfolded within our present moment experience the primordial creative act which reflects the genesis of the entire cosmos? Does the mystery of the world's on-going creation lie in the present moment, in the eternal now? Wheeler continues, "For a process of creation that can and does operate anywhere, that reveals itself and

yet hides itself, what could one have dreamed up out of pure imagination more magic─and fitting─than this?"[51] What more "fitting" physics could we have, in Wheeler's words, "dreamed up" out of pure imagination to reflect back to us the "magic" of our dreamlike world? A process which itself is an expression of the dreamlike nature, we have "dreamed up" quantum physics to reflect the dreamlike nature of the universe back to us. In trying to understand nature, as if by magic, physics is helping us discover our nature.

We live in a universe that is capable not only of harboring life, but of cultivating life which is intelligent enough to wonder and ask about its origins. In our observing and reflecting upon our universe we are actually changing the universe's idea of itself. Through us, the universe questions itself and tries out various answers on itself in an effort – parallel to our own – to decipher its own being. Wheeler comments, "and then at last an inspiration: a feeling that we who felt ourselves so small amidst it all are, in the end, the carriers of the central jewel, the flashing purpose that lights up the whole dark universe."[52]

8. STRANGER THAN FICTION

It has been said that the universe is not only stranger than we imagine, it is stranger than we can imagine. Wheeler writes in his autobiography, "The strangeness of the quantum world, from which Einstein incessantly sought escape and from which Bohr saw no escape, is real."[53] The quantum realm─the world of the really small[54]─is composed of objects that are unlike any other objects we have ever imagined. Subatomic objects don't exist as things, but rather, as events, as happenings, as dynamic ever-changing interactive psycho-physical processes. The aspects of nature represented by quantum theory are converted from elements of "being" to elements of "doing," which basically replaces the world of material substances by a world populated by actions, events and processes. Not located in time or space but in an abstract realm, the elementary quantum phenomenon, to quote Wheeler, "is the strangest thing in this strange world." The strangeness of these subatomic entities is highlighted by our inability to even conceive of them separate from our participating in their genesis. As compared to Einstein's theory of relativity, which the more deeply we think about, the less strange it seems, the more deeply we think about quantum physics, the more strange it seems. The universe's mind-bending strangeness is part of its charm, however. To quote Wheeler, "We will first understand how simple the universe is when we recognize how strange it is."[55] In science, oftentimes the greatest insights are won from nature's strangest features. And yet, at a certain point the universe's, and quantum physics' strangeness will seem utterly natural, or so I imagine. Wheeler is fond of quoting Gertrude Stein's view of modern art, "It looks strange and it looks strange and it looks very strange, and then suddenly it doesn't look strange at all and you can't understand what made it look strange in the first place."[56]

The quantum realm lacks phenomenality; quantum physics has discovered that there are no elementary particles, no fundamental "building blocks" of reality─referred to as "solid, massy, hard, impenetrable moveable particles" by Newton, at least ones that can be said to exist and are real. In a quote often attributed to Bohr, "There is no quantum world. There is only an abstract quantum description. It is wrong to think that the task of physics is to find out how nature is. Physics concerns what we can say about nature."[57] Quantum entities aren't real in the way we usually think of as being real – having no independent, intrinsic existence, they don't exist "on their own," and cannot be said to exist separate from their being observed. Heisenberg

famously said, "The concept of the objective reality of the elementary particles has thus evaporated."[58] Having no well-defined boundaries, elementary particles exist in a state of open-ended potentiality, "inhabiting" (if we can even talk about location for a nonexistent object) at the same time every possible universe they could potentially manifest in. To quote Heisenberg, "But the atoms or elementary particles themselves are not real, they form a world of potentialities or possibilities rather than one of things or facts." Elementary particles don't "exist" in the common sense meaning of the word—not as a thing "out there," existing in its own right—but if physicists treat them "as if"' they exist, then they manifest "as if" they really exist and the physicists then get the right results in their equations. Everyone is happy, as long as no one asks what it all means.

Elementary, subatomic particles are simply a construct, a convenient way of talking about what is nothing but a set of mathematical relations concerning different observations. Because an atom does not have an independent, pre-existing reality, it is meaningless to ask, for example, what an atom really is. Atoms are only concepts physicists use to describe the behavior of their measuring instruments and the outcomes of their experiments. An idea such as an atom emerges from the interaction between the observer and the observed, mediated through the particular measuring devices used to make any specific observation. The properties of microscopic objects are inferred from the behavior of the physicist's measuring apparatus, and are then treated "as if" they are real physical things. It is easy to mistake their model for reality, and think of the subatomic particles as actually being real things.

In quantum physics the wavefunction is not a wave of material things, but rather a probability wave; the wave that it is describing is, in a sense, not of this world. According to Heisenberg, "It introduced something standing in the middle between the idea of an event and the actual event, a strange kind of physical reality just in the middle between possibility and reality."[59] The wavefunction is just an abstract idea, which is to say that both the wavefuncton and the atom are essentially ideas, and outside of the idea, both the wavefunction and the atom are not there. Only idea-like stuff could be fashioned out of ideas. To quote Stapp, "We live in an *idea-like* world, not a matter-like world."[60] The primal stuff of the quantum realm is dreamlike in character, idea-like rather than matter-like. Stapp continues, "the actual events in quantum theory are likewise idea-like."[61] In the quantum world, there is no "place" for matter, in the same way that in the classical world there is no "place" for mind. Classical physics' theory of a world of matter is converted by quantum physics into a theory of the relationship between matter and mind. Unveiling a great mystery, quantum physics is pointing out that the ultimate nature of the universe is more mind-like than matter-like. The "matter" of this world seems more akin to the phenomena of dreams rather than that of a solid, independent reality. As quantum physics has lifted the veil to our understanding the connection between mind and matter, and hence of consciousness, it can't help but to at the same time deepen our insight into the nature and operations of our own being.

9. VOODOO FORCES

Quantum entities exist relationally with other interdependent quantum objects that themselves don't exist as separate things, but rather in relation to other inter-related quantum objects ad infinitum; which is to say that there is no independent objectively existing quantum object that has a reality in and of itself; there is solely the quantum field. "The field," as Einstein

famously said, "is the only reality." Thing-ness has dissolved into a state of "no-thingness," a web of mutual interactivity with no fixed reference point to be found anywhere.[62] That quantum entities exist not in isolation from each other, but only in relation to each other is a reflection of our own nature—in a sense, we are quantum entities who don't exist as separate objects, but rather, are interdependently interconnected with each other as well as the whole universe. The quantum field exists in relation to and not separate from the whole universe, including consciousness itself.

When two quantum entities interact, they become intermingled in such a way as to remain forever linked together.[63] Exhibiting a form of contagious magic, each seemingly telepathically "knows" what the other is doing. Once connected, their wavefunctions become phase entangled with each other, such that there are no longer two independent wavefunctions but one which encompasses both quantum entities forevermore. It is as if after their interaction each one leaves part of themselves with the other. At that point they are no longer separate in the way that they once seemed to be, but rather, even when separated by vast amounts of space and time, behave in concert, as if they are one entity. Quantum entities do not exist in isolation, but are always coupled with an environment (the measuring apparatus, the mind of the physicist, as well as the rest of the world). The act of measurement is not a private affair, but a public event in which the whole universe participates.

What if the quantum system under investigation is the whole universe, in which case there is nothing outside of itself to interact with? If, as quantum physics tells us, the whole universe is quantum to its core, this suggests that the universe is inseparably phase entangled with itself, as ultimately speaking, there is no part of itself that the universe is not nonlocally connected with. In a quantum universe such as ours, the universe is a unity, one big entangled state composed of and not separate from any of its interdependent constituent parts. Thinking of these parts as separate has nothing to do with the actual reality of things, but is purely a mind-game that does not correspond to the facticity of the world. These seemingly separate parts are connected in such a way as to nonlocally, over inconceivably vast distances of space and time, influence and provide instantaneous feedback for each other, "as if" communicating with each other faster than the speed of light. Imagine, in baseball terminology, a throw from deep centerfield to home plate, only the outfielder is on the other side of the universe, and the ball takes zero seconds to arrive. This is another aspect of quantum reality that greatly troubled Einstein—what he referred to as "spooky action at a distance." The superluminal (greater than the speed of light) interaction involved in a nonlocal universe is not any form of interaction we are familiar with, as it doesn't involve any expenditure of energy or exchange of information in the conventional manner. And yet, experiments in physics have shown that what Einstein derided as "voodoo forces" do indeed exist, at least as much as we do.

There is truly nothing like our universe; having no frame of reference outside of itself, there is nothing to compare it to. Our nonlocal universe's spooky action-at-a-distance is an expression of the fundamental, indivisible wholeness of the universe, which is radically different from classical physics' previous conception of the universe as composed of separate parts. At the quantum level, there is the radically new notion of intrinsic unbroken wholeness, a seamless interconnectedness between all of the universe's seemingly separate parts; at the quantum level, the universe is "one" with itself. In a quantum universe, everything is related to everything else. At the moment of observation, the observer and the observed compose a single, unified whole. The quantum universe, as Bohr could not emphasize enough, can be properly conceived of only as an intricately interconnected dynamic whole. An expression of this undivided wholeness,

which is the fundamental reality, is that consciousness is no longer separated from matter but somehow is essential to it.

Our universe is an emergent universe in which the whole is greater than the sum of any of its parts can even imagine. Playing off the famous saying "Less is more," Wheeler has as a fondness for the term "More is different." A substance made up of a great number of molecules, for example, has properties that no one molecule possesses; its difference is qualitative rather than quantitative. Wheeler comments, "The rich complexity of the universe as a whole does not in any way preclude an extremely simple element such as a bit of information from being what the universe is made of. When enough simple elements are stirred together, there is no limit to what can result."[64] The behavior of the whole ecosystem cannot be described in terms of the language[65] or qualities that apply to any of its parts. Moreover, an emergent global property can feed back to influence the individuals who produced it in an interlocking, creativity-generating, self-sustaining and life-supporting feedback loop. Thus individuals and groups can begin to consciously tap into the energy that makes up the quantum realm─the zero point energy of creation itself─in a way which changes everything.

An observing consciousness does not "cause" the collapse of the wavefunction in the way we normally think of one thing linearly, mechanistically causing something else. At the quantum level the "material" world has melted away into an apparently immaterial field of quantum potentiality which is somehow synchronously and synergistically entangled with the minds of observers.[66] What we call matter is, at the quantum level, not separable from some aspect of the observer's mind, as if the quantum entities are embedded in the observing consciousness itself. Once these atomic events are registered in consciousness they are transformed into meaningful "information" (which itself is a meaningless idea without some sentient being who relates to and thereby "knows" the information), which somehow nonlocally loops back into and in-forms the atomic realm in what Wheeler refers to as a "meaning circuit." In essence, the physical state of the universe acts to alter the mental state, which then instantaneously feeds back into and changes the physical universe. Once a bit of information is added to what we know about the world, at the same moment in time, that bit of information determines the structure of one small part of the world. Wheeler speculates, "Information may not be just what we *learn* about the world. It may be what *makes* the world."[67]

10. A PHYSICS OF POSSIBILITIES

Quantum entities exist in a realm of potentiality, in what is called a state of "superposition," which is to say they hover in a ghostly state between existence and nonexistence, existing in all possible states up until the moment they are observed. Wheeler expresses the central point of quantum theory in a single, simple sentence when he says, "*No elementary phenomenon is a (real) phenomenon until it is an observed phenomenon.*"[68] The necessity for this demarcation is the most mysterious feature of the quantum, for it holds the clue to the central principle of the construction of everything out of nothing. This tenet changes our traditional view that something has happened before we observe it; as Heisenberg writes, "The term 'happens' is restricted to the observation."[69] At the moment of being observed, the wavefunction collapses in no time at all into a particular manifestation, while all of the other potentialities vaporize as if they had never existed.[70] From the quantum point of view, everything that might have happened influences what actually does happen. In a quantum universe such as

ours, everything ultimately exists in a state of open-ended potential, what Heisenberg calls "transcendent potentia." Quantum theory implies that the whole universe─including ourselves─is recreated and recreating itself anew every nano-second based on how we are dreaming it up. Wheeler comments in his own inimitable style, "We may someday have to enlarge the scope of what we mean by a 'who.'"[71]

Observation is the very act through which the quantum realm "discloses" itself. In quantum theory the moment of observation is where the rubber meets the road, which is to say, where abstract theory and empirical data meet and a specific actuality is realized and manifested out of a vast array of possibilities. It is important to note that /we are always "at" the moment of observation, which is to say that we're there right now! There is no other moment but the one eternal moment of observation. The tendency to think that the moment of observation is just one single discrete moment in a linear sequence of other moments is due to the long ingrained habit of thinking in terms of linear sequential time, i.e., a "linear time hangover." In our role as observer-participants, it is as if we are on the cutting edge of the big bang itself, on the forefront of the moment of creation that is always taking place in this very moment, in the here and now.

Quantum theory is revealing to us the creative nature of our moment to moment experience. It should get our highest attention that observing these quantum objects is the very act that brings them into existence. When we observe an atom to be someplace, quantum physics tells us that it is our looking that caused it to be there. Just like a rainbow can't be said to exist until the moment that it is observed (as it is made up of light, moisture, and an eye), quantum entities can't be said to exist until the moment of observation. Quantum theory reveals that there is nothing inherently real about the properties of an object that we measure; it is as if we ourselves are intimately involved in producing the results of our own measurements. Our discovery of a quantum entity in a very real sense "causes" it to be there, which implies that there is no physically real world independent of our observation of it. Before these entities are observed they don't really exist, there is nothing we can say about them; they are "unspeakable."

Wheeler sometimes used a baseball analogy to illustrate this situation. Talking about how they call balls and strikes,[72] some umpires say "I call them the way I see 'em," which is an expression of the subjective, projective nature of our perception. A second umpire might say "I call them the way they are," which is an expression of there being an objectively existing reality not dependent on observation, which was Einstein's point of view. Wheeler then quotes a quantum umpire who would say "They ain't nothing till I call 'em," which is an expression of a quantum baseball game in which nothing exists until it is observed. The properties of quantum objects aren't inherent to the object, but instead emerge from and are created by interactions with their environment as well as their relationship to observers and their inescapably creative acts of observation.

We can use light as an example: it is well known that light displays either wave-like or particle-like qualities depending upon the experimental set-up and how it is observed. To be more accurate, the wave-like or particle-like behavior that we observe in light is not a property of light per se, it is a property of our *interaction* with light. If, as quantum physics attests, there is no independent, external objective reality, then light, be it in its wave-like or particle-like aspect, cannot be said to exist separate from our interaction with it. In other words, light has no properties independent of us. What we are saying about light is true of everything; what we experience is not external reality, but our interaction with what our minds construe to be an external reality.

Wheeler likens how we create "reality" out of nothing but our interactions to a slightly skewed, surprise version of the party game "twenty questions." In the regular version of the game, someone leaves the room, and everyone decides on a word. The person is allowed to ask a series of yes or no questions until they feel that they have enough information to guess the word. Wheeler tells the story that he was the one sent out of the room, and when he came back and began asking his yes or no questions, his friends were taking longer and longer to answer. The tension was building in the room, until he finally guessed the word to be "cloud," at which point the whole room bursts out into hysterical laughter. His friends explained to him that they had decided to not decide on a predetermined word, and were play-acting "as if" they had decided on a particular word based on nothing but the answers they were giving, the only rule being that every answer had to be consistent with all previous answers. There was no word that existed until the very moment of Wheeler's guess. Wheeler's questions and interactions with his friends helped create, or to say it differently—"magically conjured"—the word in the same way that physicists' and their measuring apparatuses' interactions with the subatomic realm actually create the elementary particles they are measuring. To talk about the word "cloud" existing "in the room"—i.e., in the "minds" of Wheeler's friends—before Wheeler's guess is not accurate, in the same way that the elementary particle wasn't "in the universe" before the experiment, having no existence prior to being measured. Similarly, in our inquiries into the nature of the universe it is easy to imagine that the final answer already exists, which we will one day uncover, without realizing that the very questions we ask and the actions we take conditions and creates the answers we get back. If Wheeler had asked different questions or the same questions in a different order, he would have ended up with a different word. The idea that the word "cloud" was sitting there, waiting to be discovered, is in Wheeler's words "pure delusion and fantasy."

In discussing the surprise version of the game of twenty questions as illustrative of how physicists participate in producing the results of their experiments, Wheeler painstakingly makes the point that the power he had to bring about the word "cloud" was only partial. Similarly, the experimenter has some substantial influence on what will happen to the electron by the choice of experiments he will perform, i.e., "the questions he will put to nature;" but there is always a certain unpredictability about what any given one of his measurements will disclose, i.e., "what answers nature will give." This unpredictability is because the rest of the universe is always inescapably involved in any observation that we make. Quantum reality is not subjective—a mere figment of the imagination—just as it is not objective. The quantum dimension is the bridge, the intermediate realm between the subjective mental realm "in here" and the seemingly objective world "out there," somehow coupling the two.

Quantum entities don't "have" or "possess" intrinsic properties. The fact that the properties of these quantum objects is a function of our observation and that there is no substance, no separately existing intrinsic quantum object separate from its properties, is an expression that these quantum objects have no independently existing objective reality. They are not real in the way we commonly think of something being real. And yet, we ourselves, as well as the experimental instruments physicists are using to measure these not-real quantum objects, are made of the same quantum stuff that itself isn't real in the ordinary sense. This brings up a related question—how does the mass-less, intangible photon, which has zero weight, give rise to even a single particle that has mass, not to mention the massive weight of the whole universe?[73] The mystery either way is still equally great. Simply put, there aren't any nuts and bolts at the quantum level. We can't visualize the quantum world, not because we know too little, but because we know too much. Though beyond our imagination, nature has no trouble, however,

producing such quantum entities; indeed, such entities are what this whole wide world is made of.

The universe appears in one way, but exists in another. Behind the apparent solidity of everyday objects lies a world of open-ended potentiality. Physics has penetrated to the very core of material, seemingly objective reality and has found nothing that can be said to ultimately exist beyond or outside of our observation of it. It is as if objective reality has slipped beyond our grasp, beyond concepts, beyond even the concept of existence and nonexistence. To quote one of the most important astrophysicists of the first part of the twentieth century Sir Arthur Stanley Eddington, "We have found a strange footprint on the shores of the unknown. We have devised profound theories, one after another, to account for its origins. At last, we have succeeded in reconstructing the creature that made the footprint. And lo! It is our own."[74] Exploring the farthest reaches of the outside micro-world brings us right back to our inner selves. We can never speak about nature without, at the same time, speaking about ourselves. Poetically expressing the same realization, Wheeler asks, "What is Out There? 'Tis Ourselves?"[75]

11. MERLIN

Quantum theory points out that the "real world" is not classical, but quantum mechanical. Rather than the quantum realm being illusory, quantum physics points out that the appearance of the macroscopic, conventional world can be likened to a holographic optical illusion produced by the interaction of our sense faculties with quantum reality. Quantum theory insists that our everyday world is embedded in quantum reality, that our day to day world is quantum through and through, which is to say that the quantum realm is not separate from the world of ordinary objects. The world of the very small is co-extensive with the world at large. Quantum theory applies to big things as well as small; we can't get to first base without quantum theory in dealing with such large scale objects as stars, for example. And yet, our everyday world, with its chairs, trees and people, seems, at least to all appearances, not to be quantum at all, but quite real, and solid, very much in alignment with classical physics' version of reality, with its one-at-a-time sequence of definite actualities. When we throw a baseball, for example, it has a continuous trajectory that can be measured. This is very different from probabilistic quantum entities, which are discontinuous, can take multiple routes to get somewhere at the same time and get to where they're going in no time at all. And yet, quantum theory tells us that baseballs are quantum objects, too—they have a cloud of probability which collapses from uncertainty to certainty, but their quantum fluctuations are so microscopically small that they are entirely below the threshold of observation. The elementary particle and the baseball differ only in scale, not in principle. To quote physicist Hideo Mabuchi, it is as if "the universe were ruled by atoms' aversion to the public embarrassment of quantum behavior writ large."[76]

In the transition from the random uncertainty of the quantum realm, where particles ceaselessly spring into and out of existence, to the seeming solidity and orderly certainty of our everyday world, the question naturally arises, where is this boundary between the quantum world, where things don't actually exist in a real way but in a state of potentiality, and our everyday world, where things at least appear to exist in a solid-seeming way? Wheeler asks the question, "If the world 'out there' is writhing like a barrel of eels, why do we detect a barrel of concrete when we look?"[77] How do the classical and quantum worlds join together? The quantum reality of the microworld is inextricably entangled with the classical reality of the

macroworld, as the part has no meaning except in relation to the whole. And if the ordinary-seeming classical realm manifests out of the underlying quantum domain, where did the "weirdness" of the quantum realm go?[78] The moment of observation appears to be the link between the uncertainty of the quantum world and the apparent certainty of the classical world, for observation is the point at which what might happen (or, in a quantum physics sense, all the things that the quantum realm is doing simultaneously while "nothing is happening") crystallizes into what does happen. As Heisenberg writes, "…the transition from the 'possible' to the 'actual' takes place during the act of observation."[79] This brings up the question ─ *How* does the act of observation, of gaining mere information (i.e., knowledge or "software") modify the state of macroscopic things ("hardware")?

According to quantum theory, the whole universe is in a quantum state, which is to say that, at least in principle, there ultimately is no boundary between the microscopic/quantum realm and the macroscopic/classical realm. Though some physicists still cling to the idea that these two realms are separate, others consider it delusional to conceive of there being a distinction between the two. In any case, it certainly seems as if the boundary between the quantum world and the everyday, classical world is an extremely interesting place, the exploring of which could bring about great insights. Paradoxically, in quantum physics the macroworld determines, through the act of macroscopic observer-participancy, the microscopic reality that it itself is made of.

Wheeler calls the quantum principle the "Merlin principle" because of the way the ever-elusive quantum shapeshifts and Mercury-like, changes form to continually escape our too-limited and limiting conceptions of it. Wheeler recounts, "You remember Merlin the magician; you chased him and he changed into a fox; you chased the fox and it changed to a rabbit; you chased the rabbit and it became a bird fluttering on your shoulder."[80] Just like trying to grasp a rainbow or chase after a projection, the quantum always eludes our grasp. If someone says that quantum theory is "completely clear" to them, it is Bohr's opinion that "he has not really understood the subject." There is always an element of uncertainty[81] in describing quantum entities; they can never be known in their totality. We can never know both their position and momentum at the same time, which makes it impossible to pin these quantum objects down. It is not a question of building better technology to one day know both of these properties; it is "as if" these quantum entities don't possess both of these qualities at the same moment in time. If we know where these quantum entities are, it is as if we pay a price, for then we don't know where they're going. Similarly, if we know where they're going, we don't know where they are. We reach a certain point at which one part or another of our picture of nature becomes blurred, and there is no way to refocus that part without blurring another part of the picture. Nature is so constructed that we can study one aspect of nature, or the other aspect, without any possibility of studying both aspects simultaneously.

Not only do quantum objects not have a "path" in the normal sense of the word, but the very notion of having a path itself comes into question. These quantum objects can be at point A in one moment and─in what is called a "quantum jump"─instantaneously be at point B without having traversed a path between these different locations. Quantum physics has shown that not only is the full description of these quantum particles unknown, but, because they do not exist prior to being measured, they are ultimately unknowable.

It is not that the deeper reality is veiled and we can't know it; rather, there is no deeper, independent reality based on our ordinary conceptions of what this means. Whereas in the mythical land of "Oz," reality stems from the conjuration of the wizard, in the quantum realm,

Bohr argued, there is no wizard. There is "nothing" behind the curtain; all we see is the formless archetypal play of phenomena itself, a display which is empty of inherent existence and inextricably linked to our consciousness and its various operations. This is both a display "to" our consciousness and an expression "of" our consciousness at the same time, as the distinction between subjective and objective reality dissolves.

As physicists have chased the quantum/Merlin principle, to quote Wheeler, "…in each ten years of its history, it's somehow taken on a different color, each time growing more magnificent in plumage, more penetrating in meaning, and more comprehensive in power."[82] The further we descend down the quantum physics rabbit hole, the more magnificent the plumage of this very strange quantum bird. The more we appreciate the quantum realm, the more it appreciates, and the more there is to appreciate, as if it's the gift that never stops giving, a wish-fulfilling jewel beyond belief. As Wheeler reminds us, the quantum, the smallest stuff in the universe, is the crack in the armor that covers the secret of existence. Big stuff indeed!

It is Wheeler's opinion that in exploring this opening, "we are at the beginning, not the end." The discovery of the quantum observership-based nature of reality represents the first rupture in the armor of the classical chrysalis that had long encased the human mind and fettered the human spirit, holding it securely in a state of slumber dreaming of a deterministic cosmos that operated like clockwork. Irreversibly awakening out of its somnambulistic trance, humanity is going through an evolutionary metamorphosis in which it is unfurling its incandescent wings of creative imagination as it flies into the open-ended space of previously undreamed of possibilities, releasing itself into the luminous imaginal sky of freedom.

12. DREAM STUFF

Etymologically, the word "science" comes from the Latin word "scire," which means "to know." What the founders of quantum physics realized is that the proper subject matter of science is not what is "out there," but rather, what we can "know" about our world, which clearly includes us. At the quantum level science becomes inseparable from epistemology. Quantum physics has realized that it is no longer representing the state of, for example, an objectively existing elementary particle per se, but rather, only our "knowledge" of its apparent behavior, a subtle, but important difference. This knowledge is a state of mind, experienced in our subjective sphere of consciousness rather than being a state of some actual, external, material thing. This "failure of thing-ness" is one of the fundamental features of the quantum world. In the quantum realm we never end up with things, but always with interactive relationships. Our "thing-king" mind can't grasp or relate to the simplicity, elegance─and ungraspability─of the quantum realm.

Physicist Nick Herbert, author of the fine book *Quantum Reality*, calls the fundamental elements that the quantum realm are composed of "quantumstuff," a (non)substance which, in Herbert's words, "combines particle and wave at once in a peculiar quantum style all its own."[83] Wheeler's colleague, physicist Wojciech Zurek, refers to this quantumstuff as "dream stuff." This quantum dream stuff, the underlying fabric out of which what we call reality─which is to say, "everything"─is made of, is what is called "epiontic." The word epiontic is the synthesis of the two terms "epistemic" (the root of the word "epistemology," which has to do with the act of "knowing") and "ontic" (the root of the word "ontology," which has to do with "existence" and "being"). To say something is epiontic is to suggest something whose existence is intrinsically intertwined with the knowledge we have of it. To be epiontic is to imply that the act of knowing

creates its being, which is to say that, just as within a dream, the act of perception creates the existence of whatever is perceived. At the quantum level, being and knowing, perception and reality, epistemology and ontology are inextricably entangled.[84] The world that appears to be an independent material world is constructed from "quantum epiontic dream stuff" which is of the nature of mind, or consciousness.

This quantum epiontic "dream stuff" is capable of producing the seeming solidity of the material world from out of the process of perception. To quote Graham Smetham, author of the excellent book *Quantum Buddhism: Dancing in Emptiness*, "The appearance of the material world is a matter of deeply etched quantum 'epiontic' memes!"[85] The more often a particular perception takes place, the more likely it is to occur in the future.[86] Perceptions which subscribe to the inherent existence of the physical world feed back and strengthen the tendency to perceive the world in this same way in the future, as well as making it more likely that the world will continue to appear "as if" it is inherently existing. If we buy into the perspective that the world objectively exists in and by itself, we have then fallen under a self-created and self-perpetuating spell, evoking evidence that simply confirms our original unexamined assumption. This is a process in which our mind's own genius for co-creating reality is unwittingly turned against us in a way that can severely limit us, stifling the awareness of our options and thus crippling our greater potentials. We can become imprisoned by our belief in the objective truth of our perceptions in such a way that we hypnotize ourselves and literally become blind to our imprisonment, remaining convinced that we are simply "in touch with reality."[87]

The persistent appearance of the classical world is generated by innumerable sentient beings through a continuous web of rapidly repeated, habitual perceptions over vast stretches of time, which amounts to a collective inter-subjective feedback loop. Once the appearance of an apparently stable material world gains enough momentum it develops a self-sustaining pattern which confers a seeming immutability upon our world, a perception which literally becomes reinforced, inscribed and embedded into the very quantum ground of being. Solidifying the fluid dreamlike nature of our world, we then create a collective dream that seems by all appearances to be solid and fully classical. Referring to the outside world, Zurek writes that in whatever way it manifests it acts "… 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."[88] The more often a perception of an independent, objective world is made, the more potent becomes the classical world's advertising billboard campaign, increasing its broadcasting power as it further proliferates its meme into ever-more brains.

The viewpoint that is emerging from the cutting edge of quantum physics is that, instead of being an epiphenomenon of matter, consciousness is the ontological ground and driving force of the process of reality itself. Max Planck, the first person to ever propose the quantum nature of light and one of the first architects of quantum theory, commenting on what the new physics was revealing to humanity, famously said, "Mind is the matrix of all matter."[89] Consciousness is in some mysterious fashion creating the "stuff" of the material world. Wheeler goes so far as to say, "In what medium does spacetime itself live and move and have its being? Is there any other answer than to say that consciousness brings all of creation into being, as surely as spacetime and matter brought conscious life into being? Is all this great world that we see around us a work of imagination?"[90] Quantum physics is nature's way of telling us something. Does our imaginative, dreaming and visionary capacity link into the quantum realm, interfacing with and becoming a portal for the "divine creative imagination" to potentially transform our world through us?

We couldn't imagine or "dream up" a more dreamlike physics than quantum physics if we tried. Quantum physics is the physics of the universal dream, in the sense that quantum physics is simultaneously pointing to the dreamlike nature of reality while being an expression of the very dreamlike nature at which it is pointing. Wheeler "confesses" that, in apparent moments of lucidity, "sometimes I do take 100 percent seriously the idea that the world is a figment of the imagination."[91]

13. KEY POINTS

1. There is no objective reality independent of an observer.
2. We live in a participatory universe. The observer affects what is observed by the mere act of observing.
3. Quantum entities exist in a multiplicity of simultaneous potential states (called a superposition), hovering in an abstract realm between existence and nonexistence prior to being observed.
4. There is no independent quantum entity separate from its properties. Its properties are a function of our observation. This is to say that these quantum entities aren't real in the way we ordinarily think of something as being real.
5. The act of observation is the very act which turns the potentiality of the quantum world into the actuality of the seemingly ordinary world.
6. Our act of observation not only changes the present state of the universe, it reaches backwards in time and changes what we can say about the past. This turns our conception of linear time and causality on its head.
7. The questions we ask make a difference.
8. The universe is a seamless, undivided and instantaneously interconnected whole. This is to say that each part of the universe is interrelated with every other part in an immediate and unmediated way.
9. An expression of this wholeness is the universe's nonlocality, in which every part of the universe is related to and in communication with every other part. Our universe doesn't play by the typical rules of third-dimensional space and time.
10. Quantum entities can jump from one place to another without traversing the path in-between.
11. The laws of physics are not written in stone, but are mutable.
12. The quantum universe is not separate from consciousness; rather, it is an expression of consciousness. Mind and matter are no longer seen as separate.
13. Our ordinary, day-to-day universe is quantum through and through.
14. Quantum physics literally changes and transforms our mind, as it introduces a new way of thinking. It also helps us see the world differently, which helps the world to manifest differently.
15. Quantum physics is showing us how we ourselves are moment by moment playing a key role in the creation of our experience, as well as in the genesis of the cosmos, in this very moment.
16. Significantly altering Descartes' famous principle, "I think therefore I am," quantum physics would instead say, "I choose therefore I am."

17. Quantum physics is a revelation in living form: it is showing us the dreamlike nature of our universe.

A pioneer in the field of spiritual emergence, Paul Levy is a wounded healer in private practice, assisting others who are also awakening to the dreamlike nature of reality. He is the author of *Dispelling Wetiko: Breaking the Curse of Evil* (North Atlantic Books, 2013) and *The Madness of George W. Bush: A Reflection of Our Collective Psychosis*. An artist, he is deeply steeped in the work of C. G. Jung, and has been a Tibetan Buddhist practitioner for over thirty years. Please visit Paul's website www.awakeninthedream.com. You can contact Paul at paul@awakeninthedream.com; he looks forward to your reflections. Though he reads every email, he regrets that he is not able to personally respond to all of them.

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[1] For the purpose of this article, the terms quantum physics, quantum theory and quantum mechanics are interchangeable.

[2] This is reminiscent of the alchemists, who in writing about Mercurius, the lapis, the philosopher's stone (all different ways of describing their "God-image"), in Jung's words "did not know what they were writing about."

[3] Stapp, *Mindful Universe: Quantum Mechanics and the Participating Observer*, p. 4.

[4] Heisenberg, *Physics and Philosophy*, p. 58

[5] To quote Walter Heitler, author of a standard textbook on the light/matter interaction, "The separation of the world into an 'objective outside reality' and 'us,' the self-conscious onlookers, can no longer be maintained. Object and subject have become inseparable from each other."

[6] Wheeler, *At Home in the Universe*, p. 126.

[7] Wheeler and Zurek, *Quantum Theory and Measurement*, p. 169.

[8] Peat, *Infinite Potential: The Life and Times of David Bohm*.

[9] Sarfatti, 'Wheeler's World: It from Bit?' – Internet Science Education Project, San Francisco, CA.

[10] Wheeler and Zurek, *Quantum Theory and Measurement*, p. xvi.

[11] Bohr, "Can quantum mechanical description of physical reality be considered complete?" *Physical Review* 48, pp. 696-702 (1935).

[12] Pauli, letter from Pauli to Fierz 12 August 1948, quoted by K. V. Laurikainen, *Wolfgang Pauli and Philosophy*, Theoretical Physics Preprint HU-TFT 83-6, University of Helsinki.

[13] Wheeler, *At Home in the Universe*, p. 126.

[14] Wheeler and Zurek, *Quantum Theory and Measurement*, p. 210.

[15] Bernstein, *Quantum Profiles*, p. 138.

[16] Although Newton himself had a worldview that was far more spiritually oriented than the "Newtonian" worldview that is now attributed to him.

[17] We are currently in the midst of a massive collective psychosis which the Native American people refer as "wetiko." My book *Dispelling Wetiko: Breaking the Curse of Evil* is an in-depth inquiry into this psychic epidemic, a psycho-spiritual disease of the soul.

[18] Barrow, Davies and Harper, ed. *Science and Ultimate Reality*, p. 3.

[19] Zurek, van der Merwe and Miller, ed. *Between Quantum and Cosmos*, p. 12.

[20] Wheeler, *At Home in the Universe*, p. 310.

[21] Ibid., p. 45.

[22] Buckley and Peat, *A Question of Physics*, p. 60.

[23] Wheeler, *Frontiers of Time*, p. 31.
[24] Barrow, Davies and Harper, ed., *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity*, p. 6.
[25] Woolf, ed., *Some Strangeness in the Proportion*, p. 350.
[26] Wheeler, *Frontiers of Time*, p. 20.
[27] Wheeler, *At Home in the Universe*, p. 35.
[28] The question naturally arises – what constitutes an observer? This is one of the central and most burning philosophical questions in quantum physics. In addition to humans, what about a cat, or a mouse, a cockroach, an amoeba, a piece of mica? Where does consciousness first enter in the elaborate hierarchy of terrestrial life? Where does the capacity to collapse a wavefunction derive from?...from the presence of consciousness or from some other condition? It's as if observership and its ability to translate unmanifest possibilities into definite actualities is a pervasive feature which is widely distributed throughout the web of life. From this perspective all life forms are dreaming together, collectively collapsing the universal wavefunction of this universe to manifest the way it is moment by moment.
[29] Wheeler, *At Home in the Universe*, p. 26.
[30] In my recent book *Dispelling Wetiko: Breaking the Curse of Evil*, I point out that our unawareness of our participation in creating our experience is actually at the root of a psycho-spiritual dis-ease (which I call "malignant egophrenia" or "wetiko"), a malady which is causing great destruction, both within ourselves and out in the world at large. What I call "Aparticipatory Delusional Syndrome" (ADS for short) is based on the deluded assumption that we are separate from and not participating in calling forth the very situation in the outside world to which we are reacting. ADS is the primary, underlying psychological "dynamic" or "engine" that fuels the "malignant" aspect of malignant egophrenia/wetiko. To the extent that we feel ourselves the victim of circumstances and don't realize our complicity in what is playing out in our lives is the extent to which we have fallen prey to ADS. ADS effectively immobilizes and renders inoperative our ability to self-reflect, as it relates to the world through the fixed and non-negotiable lens of assumptions that the world "object"-ively exists, independent of ourselves. When we are stricken with ADS, we react to our perceptions and interpretations as if they exist inherently and independently in the objects of the world, rather than realizing that they are automatic reflexions of the way we are looking and are thus always revealing the subject (ourselves). When we have fallen under the spell of ADS, we always see the cause of our problems as being outside of ourselves. In an unconscious "reflex," we then try to "attack" the problem from the wrong point of view, externally, instead of approaching its source, which is within ourselves. ADS is a "semantic syndrome" in which we are misinterpreting the nature of our experience, subtly but significantly altering the way our mind gives meaning to and contextualizes our experience of the universe as well as ourselves. A simple example: I am withdrawing from my girlfriend due to my own wound. She senses this, which triggers her insecurities around being rejected. In her reaction, she acts out her wound, which gives me all the seemingly "objective" evidence that I need to further justify my withdrawal. I don't realize, however, my complicity in invoking the very wound in her to which I am reacting.
[31] Wheeler, *At Home in the Universe*, p. 120.
[32] Rosenblum and Kutner, *Quantum Enigma: Physics Encounters Consciousness*, p. 201.
[33] Please see the section "Four-valued logic" in my book "*Dispelling Wetiko*," pp. 40-44.

[34] Note how Wheeler's description of the universe as a self-excited circuit is similar to what in alchemy is called the "prima materia," which is the "famous secret" and the basis of the entire alchemical opus. It is the raw material out of which the lapis, the philosophers' stone (the highest value) is made. The prima materia is called *radix ipsius* (root of itself). It is an *increatum,* an uncreated, autonomous, self-generating, spirit-like entity which is rooted in itself, is dependent on nothing, and has everything that it needs. Without beginning or end, and in need of "no second," it can by definition only be something of a divine nature. The prima materia is related to the God-image of the alchemists, Mercurius, who interestingly enough, begets himself.
[35] Wheeler (1999) Information, Physics, Quantum: the Search for Links. In *Feynman and Computation: Exploring the Limits of Computers*, ed. A. J. G. Hey, p. 309 (314). Cambridge, MA: Perseus Books.
[36] Wheeler, Geons, *Black Holes and Quantum Foam*, 338.
[37] Wheeler, *At Home in the Universe*, p. 114.
[38] Ibid., p. 126.
[39] Hawking and Mlodinow, *The Grand Design*, p. 82.
[40] Wheeler, *At Home in the Universe*, p. 124.
[41] Smetham, *Quantum Buddhist Wonders of the Universe*, p. 155.
[42] Wheeler, *At Home in the Universe*, p. 39
[43] Wheeler, *At Home in the Universe*, p. 39.
[44] Ibid., pp. 42-4
[45] Wheeler and Zurek, ed. *Quantum Theory and Measurement*, p. 200.
[46] Ibid.
[47] Note the similarity to Jung's description of a synchronistic phenomenon as "an act of creation in time."
[48] Wheeler, *At Home in the Universe*, p. 130.
[49] Wheeler and Zurek, *Quantum Theory and Measurement*, pp. 196-7.
[50] Ibid., p. 123.
[51] Ibid.
[52] Ibid., p. 227.
[53] Wheeler, *Geons, Black Holes and Quantum Foam*, p. 337.
[54] Quantum theory was developed early in the twentieth century to explain the "mechanics" – the mechanism – governing the behavior of atoms.
[55] Zurek, van der Merwe and Miller, ed., *Between Quantum and Cosmos*, p. 11.
[56] Quoted in Wheeler and Zurek, *Quantum Theory and Measurement*, p. 185.
[57] Quoted in Barrow, Davies and Harper, ed., *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity*. p. 218.
[58] Heisenberg, *Physics and Philosophy*.
[59] Ibid., p. 41.
[60] Stapp, *Mind, Matter and Quantum Mechanics*, p. 221.
[61] Ibid.
[62] Note the similarity to the Buddhist idea of "dependent co-arising" (also called interdependent co-origination), which is considered to be the very condition of and process by which empirical reality is constituted. This view is not a final affirmation about reality, as it doesn't seek to define a reality external to the observer, but rather, is a way of seeing that focuses on how our experience of the world and ourselves arises. Similar to quantum physics, dependent co-arising is

considered to be a milestone in human thought; its ever-deepening realization is one of the greatest and furthest reaching cognitive revolutions of our time.

[63] Forty years ago, during my freshman year in college, I was visiting my best friend, who was a first year physics student at Princeton. I accompanied him to his introductory physics class, and right before the class started, he leaned over, and in a very impressed voice whispered in my ear "John Wheeler is sitting right behind you." He was close enough that I could have reached out and touched him. Unfortunately, the fact that John Wheeler was sitting behind me meant absolutely nothing to me at the time, for I literally had no idea who John Wheeler was. I now joke with my friends that Wheeler and my wavefunctions become phase-entangled at that moment.

[64] Wheeler, *Geons, Black Holes and Quantum Foam*, p. 341.

[65] In light of the new worldview emerging from quantum physics, we have to develop a new form of language to describe heretofore un-navigated realms. We cannot speak about atoms, for example, in ordinary language. To quote Wheeler, "The kind of physics that goes on does not adjust itself to the available terminology: the terminology has to adjust in accordance with the kind of physics that goes on." *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity*, p. 177. Based on the process-oriented nature of the quantum realm, our new language should be based more on verbs than nouns, and more on action, events and movements than on static things. To again quote Wheeler, "How can we hope to move forward with no solid ground at all under our feet? Then we remember that Einstein had to perform the same miracle. He had to re-express all of physics in a new language." Wheeler, *At Home in the Universe*, p. 294. Human language is a remarkable form of information processing, capable of expressing, well, anything that can be put into words.

[66] Note how this is similar, and obviously related to Jung's inquiries into synchronistic phenomena, in which the boundary between mind and matter dissolves.

[67] Wheeler, Geons, *Black Holes and Quantum Foam*, p. 341.

[68] Wheeler, *Frontiers of Time*, p. 4. Wheeler has been quoted saying this numerous times, sometimes with the word "real," at other times without.

[69] Heisenberg, *Physics and Philosophy*, p. 52.

[70] There is another interpretation, however, known as the "Many-Worlds Interpretation," that says that all of the other potentialities actually do occur but each in its own parallel universe.

[71] Wheeler, *At Home in the Universe*, p. 307.

[72] Over the course of this article, I have used numerous baseball analogies to elucidate quantum reality. Stealing a footnote from Wheeler's autobiography, "My apologies to readers not familiar with baseball. You may need to consult a baseball fan."

[73] The question naturally arises - How does the universe precipitate out of a field of pure light?

[74] *Space, Time and Gravitation* (1920)

[75] Sarfatti, 'Wheeler's World: It from Bit?' – Internet Science Education Project, San Francisco, CA.

[76] Barrow, Davies and Harper, ed., *Science and Ultimate Reality: Quantum Theory, Cosmology and Complexity*, p. 329.

[77] Wheeler, Geons, *Black Holes and Quantum Foam*, p. 330.

[78] It should be noted that as we stop solidifying the fluid, dreamlike nature of our universe and recognize its dreamlike quality, the more dreamlike and synchronistic (and hence, "weirdly") it will manifest. Once we stop superimposing our own fixed and limited ideas upon its dreamlike

fabric, we allow it to reveal its dreamlike magic. Once we let go our grasp, the universe will exhibit more synchronistic phenomena, which literally reveal the underlying quantum. We can use our imagination to deepen our understanding of this – when we are in a night dream, if we recognize that we are dreaming (instead of thinking the universe we are inhabiting is objectively real and separate from us), we allow the dream to even more reveal its dreamlike nature. For being like a dream, the universe is not separate from the consciousness that's observing it, a realization which it continually reflects back to itself through us.

[79] Heisenberg, *Physics and Philosophy*, p. 54.

[80] Buckley and Peat, *A Question of Physics*, p. 61.

[81] This is the Heisenberg Uncertainty Principle

[82] Buckley and Peat, *A Question of Physics*, p. 61.

[83] Herbert, *Quantum Reality*, p. 40.

[84] To make this point, Wheeler, in his classic text *Quantum Theory and Measurement*, quotes Art Historian E. H. Gombrich, "we can never neatly separate what we see from what we know…. what we call seeing is invariably colored and shaped by our knowledge (or belief) of what we see." p. 203.

[85] Smetham, *Quantum Buddhism: Dancing in Emptiness*, p. 244.

[86] Note the similarity to Rupert Sheldrake's idea of "morphogenetic fields." Sheldrake is of the opinion that memory is inherent in nature, and that most of the laws of nature are more like habit patterns.

[87] This is a characteristic of the psychic malady called "wetiko" that I write about in my recent book. Wetiko is a form of psychic blindness that believes itself to be sighted. When people are afflicted with wetiko, they react to their projections upon the world as if they are objectively existing, separate from themselves.

[88] 'The Evolution of Reality' – www.fqxi.org/community/articles/display/122 (The Foundational Questions Institute) November 10, 2009.

[89] "Das Wesen der Materie" (The Nature of Matter), speech at Florence, Italy, 1944 (from Archiv zur Geschichte der Max-Planck-Gesellschaft, Abt. Va. Rep. 11 Planck, Nr. 1797)

[90] http://adsabs.harvard.edu/abs/2003APS.APR.b6003W.

[91] Bernstein, *Quantum Profiles*, p. 132.