Quantum + Theology = Rocks Ain't What They Used To Be

A service by Rev. Jaco B. ten Hove — Cedars Unitarian Universalist Church — January 9, 2011

CALL TO WORSHIP — *Namasté!*

Derived from the Sanskrit, ***Namasté*** is a South Asian greeting, originating in India, and used when either hello or goodbye would be offered in English.

But the meaning is quite different than just a welcome or farewell. ***Namasté*** is a reverential acknowledgement of the fundamental unity of things and people. One translation would be: "I recognize and honor the Holy in both of us (or all of us)."

Another translation that I was taught at a weeklong continental UU youth conference with the theme of ***Namasté*** —in *1984*, no less—is this: "That within me, which is also within you, greets and honors you." ***Namasté.***

SONGS:

Oh, help me see the part of me that lives inside of you.
And I will help you see the part of you that lives in me. —Joyce Poley ("Help Me See")

Ours Be the Poems of all tongues, all things of loveliness and worth.
All arts, all ages and all songs, one life, one beauty on the earth.
—Kenneth L. Patton (#379, SLT)

SERMON:

We Americans and Unitarian Universalists provide plenty of lip service to this concept of oneness, and have been for some time now. *Out of Many, One — E Pluribus Unum* was adopted on the Seal of our country by Congress in 1782. The first coins with this motto were made just four years later by my home state of New Jersey. Now, 225 years later, our US coins are still imprinted thusly.

Meanwhile, I came of age with Kenneth Patton, the author of that sung quartet, as my minister in my home congregation there in northern New Jersey. And I imagine I'll die still trying to comprehend and live out the implications of this challenging notion: that we are all intricately interconnected, even though our eyes and experience might convince us otherwise. Despite the illusion of separation, it is "one life, one beauty on the earth."

I expect you've heard of Quantum Physics, the science that ambitiously endeavors to explain this interconnectedness and lots more at the forefront of contemporary awareness. Quantum Physics, bless its pointed little head, has thrown all kinds of monkey wrenches in the mix, thrusting us ever so slowly, yet inexorably into a postmodern world that has few of the conceptual handles that used to provide us stability, at least in our worldview.

Now we have to come to grips with not just oneness—which has, actually, been an insight of sages through the ages, if never quite a mainstream recognition. We now also have to grapple with the basic quantum proposition that there is no such thing as objective truth—and there never has been. Everything is always subjective, meaning everything is dependent on any individual's perception of it, and its very existence changes with differing viewpoints.

We might best know this concept from the observation that "History is written by the victors," a truism often, if arguably attributed to Winston Churchill. Many of us have indeed learned that when we appraise a so-called historical account of a moment in time, it is wise to critically consider the perspective of the author or presenter before basing assumptions on a particular portrayal of the past.

In a similar but more scientific vein, Quantum Physics has documented that, in the physical world, merely looking at something—anything—affects and changes it, especially at the microscopic level, which is where all the building blocks of matter exist in essence and are in constant motion.

So now, when we observe an event or an object in this or any moment, we can't really be sure that what we're seeing is the full truth of the matter, so to speak. Uncertainty reigns. "Maybe we are different, maybe not. Who knows what's true?" [Quote from prior song.]

Rocks, for instance, ain't what they used to be, which was solid, we thought. Now, through quantum physics, we understand all matter, including stone hard boulders, to be "events" in motion, featuring lots of empty space in which the tiny, tiny particles that make up any and all matter can be steadily bouncing around, often coming in and out of existence for no apparent reason. (This is articulated by a demonstration rock, carved in to which are the words, "Nothing is written in stone.")

Speaking of coming into existence for no apparent reason, I have featured a picture of our own local landmark, Frog Rock, because it does such a good job of blending realities: in this one spot you have the rocky earth, an endangered species, and human creativity. It all came together about 30 years ago as a teenage lark, but has stood the test of time, as it were. What a great, colorful reminder of the oneness of life, viewable just a mile from here [at the intersection of Phelps & Hidden Cove Roads], in case any of you have yet to experience this notable spot.

We look at Frog Rock, or anything that appears impenetrable, such as my hard head, and we might have trouble believing that there's actually more empty space in there than anything packed solid. All matter is in motion, we find out, made up of tiny particles bouncing around in a lot of empty microspace.

Furthermore, everything is in transition; and your view of those perpetual transitions will be unequivocally different than your neighbor's. This reality helps create the uncertainty that now so often characterizes our lives. Thanks a lot, Quantum Physics.

We can behave as if we know something for certain, but the fact remains: we don't. Absolutism—the belief that we have the absolute truth about something—is dead. Kaput. As some would say back in New Joisey: *Fahgedaboudit.* And the chance that someone would use that lumpy phrase in connection with a denial of Absolutism is about as great as anyone putting the two theme words of my title together: Quantum and Theology.

Theology has been called the body of wisdom that explores our spiritual search for meaning [Diarmuid O'Murchu], which I think puts it right in the middle of the progressive, open-ended, open-hearted push forward of science. The two do belong together, I think, as mutual guides into a very uncertain future.

There is great hope in Theology, but not necessarily as it has been cast in the past. We have some good work to do, I think, we religious liberals, to postmodernize Theology, and bring it up to date, a worthy adventure I will not attempt to join today, at least more fully. I will go much further in that direction soon (in the next sermon in this short series, when I'll delve into the ways Theology might offer a Quantum collaboration).

Here I want to concentrate on offering a grounding glimpse of this Quantum stuff—what it suggests and where it came from—and at least put it in the *context* of Theology.

Thinking back over my years of interest in Quantum Physics, I remember initially being rather stunned to realize that this is not even a relatively new field, dreamt up by, say, Stephen Hawking in the late 20th century, even. Certainly there are recent physicists doing forefront work in the field, such as Hawking, but the quantum ground was broken most notably 85 years ago!

And actually, even a few *19th century* scientists [notably Sir William Hamilton] dabbled in early foundational work that led to the arrival of so-called "quantum mechanics" in 1925, when the 24-year-old German physicist Werner Heisenberg developed what he first called "matrix mechanics," based on an innovative way of understanding the behavior of sub-atomic particles, using mathematical matrices. *1925, this is; 85 years ago!*

"Sub-atomic particles," you may know, are the tiniest of elements that constitute electrons, protons and neutrons, which then combine to form atoms, which are pretty darn small themselves. At the sub-atomic level, "particles" are so tiny that physicists can only measure what they have at the beginning of an experiment and what's there at the end, resisting any speculation about what actually happens in between, which they can't reliably examine. Thus they use probabilities to suggest "tendencies" of behavior.

Back to Heisenberg, whose revolutionary calculations showed the presence of sub-atomic *dis*continuities and quantum leaps in and out of previously unheard of states. His experiments (and those of some colleagues) produced *repeatable* results that could not be accounted for or predicted using previous understandings of physical science. So a new system was born, although not without controversy and resistance, of course.

About that same time the Austrian physicist Erwin Schrödinger proposed the related but more aesthetic notion of "wave mechanics," which used experimental evidence to show that sub-atomic *particles* were also *wave*-like in nature, again a result that could not be accounted for in the predominant classical physics.

Visualize, if you will, sub-atomic "particles" as relatively solid (say, like a fist), and waves as undulations in motion (like a flat hand surfing the air). Schrödinger's contribution was the notion that light, when it is not being measured, is in the undulating waveform (surfing the air), existing anywhere and everywhere as a potential event, called a probability field. Only when it is measured does light "collapse" into particle-form as a solid (fist), suddenly located and observable.

This advance was a leap in awareness comparable to Heisenberg's matrix mechanics, although the two physicists were not exactly aligned. Evidently, Heisenberg found the physical ideas of Schrödinger's theory "disgusting," and Schrödinger was "discouraged and repelled" by the lack of visualization in Heisenberg's method. Oh, well.

Albert Einstein was paying attention, too, certainly, but he had trouble accepting some of the more revolutionary ideas, especially what emerged as the first consistent formulation of quantum mechanics: that there is no absolute truth to be found anywhere anyway, so give up trying and just concentrate on what we're actually experiencing, which was a lot of repeatable contradictions.

Einstein was never able to settle for explanations that contained inherent contradictions and said, rather famously, "God does not play dice." (He may have been echoing Ralph Waldo Emerson, who much earlier had declared that "The dice of God are always loaded.") Fellow physicist Niels Bohr supposedly shot back, "Einstein, stop telling God what to do." Their debates around this time are legendary. When reminded in 1927 that he had revolutionized science 20 years earlier, Einstein replied, "A good joke should not be repeated too often."

(And decades later, Stephen Hawking, continued the notable conversation by adding: "Not only does God play dice, but sometimes throws them where they cannot be seen.")

Back in that same significant year 1927, Heisenberg announced his immensely formative Uncertainty Principle, which is also complex enough to defy a full explanation, but the gist is that any sub-atomic particle immediately changes when it is measured, so that, for instance, we cannot accurately know a particle's position *and* momentum simultaneously. If we measure its *position*, we cannot also know its motion, which is automatically changed by our attention to it. Likewise, we can measure for *motion*, but that inherently prevents us from truly knowing its location.

Another way to imagine this, with reference in the larger world, is to realize that every observation any of us makes requires an energy exchange to create the information gained, meaning that some number of photons move from the item observed to our receptive eye. On a macro level, think of the starlight we see when we look upward at the night sky. We might realize that the light arriving at our eyeball to give us the image of that pinpoint in the sky has been traveling some number of light-years to get to us from its source.

This kind of exchange happens on a micro-level, too, just a whole lot faster and with incredibly tinier distances. At that level of measurement, physicists can evidently predict the characteristics of a single subatomic particle with accuracy equivalent to estimating the distance between New York and Los Angeles to within the width of a human hair [Richard Feynman]. And they can measure infinitesimal changes, too.

Now, our notice of a bright star in the sky isn't likely to alter its make-up any time soon, but at the other end of the size spectrum, in the realm of incredibly sensitive microscopes, simply observing makes such a difference that investigators can no longer be sure what it is exactly they are examining, because it has already changed, or already moved.

At the sub-atomic level, this is a really big deal, because any attempt to measure the property of a particle instantly alters it, which severely limits the ability to precisely determine its full characteristics, such as both the position *and* momentum of the particle. So even the most astute of scientists cannot measure or know *both* the speed of a particle *and* its location. And thus uncertainty attains its unheralded reign.

This can be sound rather distressing, but here's an example of the kind of joke quantum physicists tell, to lighten up a bit, by applying the Uncertainty Principle to larger life: Heisenberg, who was evidently known to have a lead foot, was out for a drive one day when a traffic cop stopped him and asked a typical question in that situation: "Do you know how fast you were going?" Heisenberg confidently replied, "No, but I know *where* I am." Ha ha ha.

And so, as of 1927, uncertainty became a given, unavoidable—at least in the sub-atomic realm. (But we're talking about the building blocks of all matter and energy, so there are huge implications for our wider understanding of how things work.)

It's been a quiet revolution since then, generally, occurring behind a technical curtain, affecting mostly scientific understandings of atomic-level interactions of matter and energy, without impacting much of the everyday world that the rest of us are caught up in.

One indication that this is beginning to shift significantly, however, is an increasing propensity to not call it quantum "mechanics" anymore, since the extensions of this realm have become anything but mechanical.

Quantum mechanics superseded classical Newtonian *mechanics*, which really did promote a mechanistic worldview, as if the universe were a big machine that could be figured out by knowing how all its component parts worked separately. So that was the first way of thinking about this new realm, too, because "mechanics" generally refers to the study of motion.

But it may be more accurate to call it *quantum theory* or the *quantum reality map.* Or some even say it's the "Quantum Undoing"! This quiet revolution is now beginning to influence wider fields, and the shape it's taking is more organic than mechanistic. As the curtain rises and more of us non-scientists grapple with quantum findings, we are seeing pathways to awareness that point toward a future of hope and holism, even if it be full of ambiguity and uncertainty.

The Quantum "undoing" is actually not so much a wholesale *replacement* of theories as an extension *beyond* what we knew before. We haven't torn down Classical Physics like a barn and put up a new Quantum skyscraper in its place. It's more like we've gone farther up a metaphorical mountain and can now see more, including *but beyond* the previous resting spot. We can now see how limited the view was from there, even though that view still works, for what it is.

And here's the Really Big Rub: of course any of us at any one time can not observe everything all at once, so whatever has not yet been observed evidently exists in a state that quantum physicists call "superposition," meaning it exists in all *possible* states at once. We cannot reliably predict what it will look like once observed, because that act—observing it—will change it anyway. (See why it's called the "Uncertainty" Principle?)

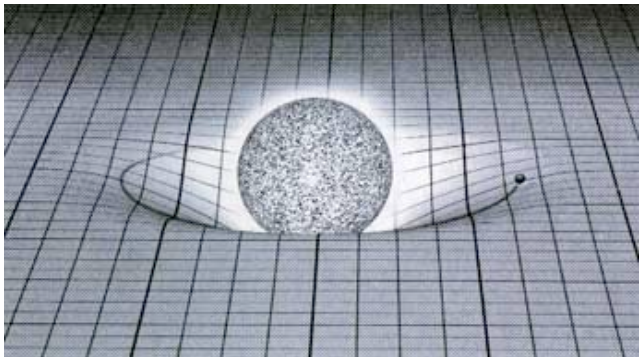
The most famous example of superposition is the regrettably gruesome thought experiment called "Schrödinger's Cat," in which a resting feline in a closed box is understood to be neither alive nor dead *until it is observed.* Until that time, the cat is *both* alive and dead (technically, in probability terms, it is half-alive and half-dead).

In quantum understanding, anything could be a wave (flat hand surfing the air) *or* a particle (fist). We don't know until it is measured, at which time it "collapses" into an observable event. Until then, like the unseen cat, it could be either. Now, at the level on which we live, things are generally smoothed out and the rules of classical physics still apply reasonably well, so we don't have to consider every step until something immediately before it "collapses" into form. But under the surface—or up higher on the metaphorical mountain, superposition and Uncertainty dominate.

There are too many other intriguing Quantum aspects to go into here, such as non-locality, by which the speed of light is somehow no longer a limit, and all "information" everywhere is interconnected in such ways that anything can appear anywhere instantaneously.

Or how time is actually no more fixed than any other aspect of reality; it's a much more fluid concept than we ever thought. And whereas classical physics described space and time as smooth, with the natural world as a defining container, in quantum reality *dis*continuities exist in the space/time fabric, which is not contiguous at all.

Einstein's General Theory of Relativity (fully published in 1915) unleashed all manner of possibility and undid the rules of Euclidian geometry by showing how in curved space parallel lines can meet, and the sum of the angles in a triangle can be more, or less than 180 degrees, etc. This set the stage for the quantum leaps that followed, portrayed by diagrams such as this:



The point is that quantum understandings like these have undone a lot of our previous system of thought, but not much has emerged yet to positively replace the old paradigm. At least we haven't yet been able to clarify how the new paradigm will guide us, beyond the need to unlearn some of our basic assumptions about the universe.

We still generally order our world (and our worldview) with a reliance on classical physics, even as we sense things are in flux. Indeed they are, and getting used to that reality may well be the essence of our next paradigm. We're still just exploring the view from higher up the metaphorical mountain, with jaws dropping and brows furrowed at what is now visible. On the horizon we might now see the beacon of Oneness, still off in the distance, perhaps, but coming into clearer view.

My poking around in this odd, abstract and humbling field of quantum science has affirmed for me the principle of Oneness, which can also be articulated as in our Seventh UU Principle: "respect for the interdependent web of all existence of which we are a part." This is theology anew, unlike most previous explanations, although not a new experience to the mystics among us.

Most of us are just beginning to grasp what this kind of a shift will mean to us, and we understandably resist stepping on this new path, as complex, yet unformed and fuzzy as it is. But, from another angle, we are already on the path; we do not have to wait for Oneness to arrive from some distance, even though our perception of it is murky. I figure we are called to intentionally explore these new realms, challenging as they may be.

I expect to spend the rest of my life figuring out what it all looks and feels like. I also expect that much of what I think I know now will be proven wrong soon enough, and I will have to adjust and readjust my thinking, perhaps even my metaphors.

Nevertheless, Oneness calls and another quantum leap awaits. "Help me see the part of me that lives inside of you, and I will help you see the part of you that lives in me."

We do celebrate the web of life, which shimmers in radiant, if inscrutable Oneness. We do know that as peculiar as people might appear, "ours be the poems of all tongues." We do recognize and honor the Holy in all of us. *Namasté.*

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