The Quanta You Won't Hear About:

Quantum Coattails, Quantum Peril and Quantum Pointlessness

Abstract: Theoretical physics is the science of fundamental questions. It follows then that in evaluating its claims we should find fundamental limitations, even of the scientific method. With tongue firmly in cheek at times, the author argues that, because of the indiscriminant commercial success of quantum theory, theoretical physics has not only to abide by the constraints of the scientific method but to be saintly in questioning its assumptions.

It was the 1960's. Special relativity was on the rise in the cultural psyche, fueled by its connection to practical (some argue dubious) power. Yet the modest equation, $e=mc^2$, would eventually see its ironic but apropos undertones of equality and tolerance embraced.

Quantum mechanics, a theory that was conjuring up even more contradictory nuances of existence than the once radical relativity theory, quietly percolated in academia. It was, in fact, poised for stardom. With characteristic innovative meticulousness and the obscure authority of royal magicians, theoretical physicists mastered the quantum art of tying up perpetual loose ends. The formative minds of up-and-coming scientists were emerging from their educations with quantum mechanical suppositions firmly embedded in their worldviews. Still, those outside of physics were yet to be indoctrinated.

Enter the American psychedelic revolution. The concomitant and indiscriminant bending of minds and altering of perceptions opens a hole (not necessarily a wormhole, a plain hole would suffice) in the collective physics consciousness. Through it the alternate realities, parallel universes, observer-dependence, and overall uncertainty of the dominant interpretation of quantum mechanics started pouring into the mainstream.

Witness (one iteration of) quantum's quantum leap. Moving beyond its bundle of energy origin, the quantum transmutes into quantum-ness. It does, after all, make a much spiffier modifier than "statistical" or "probabilistic."

As an adjective, the quantum ushers in a cultural phenomena. Today, of course, the quantum connection crops up in everything from decryption to teaching methodologies.

So what gives quantumness its appeal? One could argue that the appeal derives from a particular philosophical conundrum inherent to its source. The prominent dark side of a quantum mechanical reality – aka meaningless randomness – lacks a reassuring complement. A yin to its yang. So an intuitive conclusion has been cultivated as part of the quantum movement: that with uncertainty must also come unpredictable success. This is quantumness at its most sublime.

At its most mundane, the resulting quantum optimism is a coattail – the extra bit that hangs off something purely formal.

These days it doesn't take much to veil any topic, old or new, in mystery behind the quantum dream. One would think, given the fundamentally speculative and controversial nature of what greater reality lies somewhere in the vicinity of quantum mechanics, that scientists and other writers evoking quantumness would tend to approach their topics with generous doses of temperance and humility. While this is true on occasion, too often righteousness and over-zealousness are just as likely to shine through into what are often convoluted tales of harrowing intellectual and professional journeys. Quantum peril, if you will.

Let's be honest though. Quantum mechanics, while full of gee-whiz potential and collective appeal, boils down to statistical trends ruled by imperceptible fluctuations. As Albert Einstein, Erwin Schrodinger and other critical but now distant voices understood, the metaphysics of

quantum mechanics is nothing less than disturbing. It makes Zen koans look like the universe's joke book. But with retrospectives being issued on any number of the universe's unpredictable successes, we should feel comforted, right? Using my quantum mind to do some quantum organizing I can facilitate a massive quantum healing of the quantum spirit and take the final quantum leap – to quantum productivity. (There is no quantum God.)

The irony, of course, is that one eventually notices that predicting the next unpredictable success is just another example of quantum pointlessness, a matter which would seem to bring the whole effort to a grinding halt. Naturally, the world we live in is not pointless in this sense, and adding the word quantum to it doesn't make it any easier to accept such a conclusion.

There is a common belief articulated in the book Quantum Brain (Satinover, 2001), for example, that "once science arose the universe swiftly began to yield its secrets." That could be true, if one considers microprocessors, designer drugs, and the factors of 15 – the crowning achievement of quantum computing – to be secrets of the universe. Truth be told, 99% of technological, science-based progress maintains no persistent or direct relationship to mysterious aspects of the universe or, for that matter, to theoretical physics in any form. Our physical sophistication is attributable to the faithful execution of the firmly grounded processes of trial-and-error and human design.

Clearly even the most mystery-bound theoretical models are able to catalyze change and progress. They enliven the mind toward innovation. But the mysteries themselves are never contained by science and its technologies. Moreover, wherever a greater mystery is at the core of a theory – as is the case with the imperceptible smallness of physical existence – proof of its accuracy will remain elusive and even illusory.

Physicists have constructed an impressive self-predictive quantum universe out of mind-bending mathematics and elaborate instrumentation. Unfortunately, as of yet none has been able to

offer a tangible quantum link to the here and now. Whether you call it the search for physical unity or just plain metaphysical stubbornness, many, myself included, still hold to the ideal of an irreducible physical reality.

So the question I find myself asking these days is this: How would physicists know if they had actually superseded the irreducible physical reality? And how would they know if they had gone too far – actually passed by that reality? Like Dorothy's over the rainbow world, such a "place" would be both strange and familiar. All objects would appear to be in transition. Their existence would be observer-dependent. Uncertainty would be inherent in all results, though related patterns, symmetries, and numerical constants would persist and even continue to emerge. Sound strange – but perhaps familiar? These are the accepted realities of a quantum mechanical universe.

It is valid to speculate (as many physicists informally already do), Could the quantum movement spawned by theoretical physics culminate in a quantum fallacy? Or is quantum theory truly the most successful theory in all of science, as many proponents currently claim. It has certainly played a part in progress and has provided a productive professional platform for many. But given that by definition it arises from an entirely speculative branch of science (i.e. theoretical physics), I am forced to continue to view its generalization with skepticism.

If, in the end, the current quantum theory does provide a fundamentally accurate picture of a tangible (or at least reconcilable) reality, then it could be said that there is no harm in a little firm questioning such as this. On the other hand, if, as all excited bundles of energy do, it returns to the ground state, then the interpretation of all of the quantum hype as another unpredicted success must be rethought. After all, success is relative too.

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