

Quantum Dreams

A careful consideration of all the evidence produced by man's physical examination of quantum phenomena reveals an arrow pointing from the physical to the informational. Matter and the space it requires are increasingly seen as emergent from the quantum of action itself, the energy-time relation. Consider here what can be abstracted from relational quantum mechanics and quantum monism. On the one hand, two physical observables are necessary for the primary component of reality—the relation—to exist in RQM. Further consideration leads to the realization that the concept of existence itself has more to do with transient observables than with fundamental relations, including the quantum of action itself.

In quantum monism, a single quantum—divisible into both observed state and dynamic system—comprises reality. Researchers working in this vein look to the Schrodinger equation to describe the universal quantum, and to provide a basis from which to extract its necessary components: space, matter, and their gravitational interaction.

Two things stand out: the arc of physical research—both theoretical and experimental—describing quantum phenomena is including larger and larger systems, while classical physics is stuck in the macro world, revealing Einstein's physics to be as approximate and metaphorical as Newton's and as that of the ancients.

And from a top-down, purely philosophical perspective—one that science has been trying to live without since the third edition of the Principia, but that has repeatedly proven essential to the comprehension of anything, much less quantum mechanics—an aggressive insistence on the parsimony of applying what we've learned about the most basic physical components of reality to our intuitive, classical, macro world is the only way forward.

Those who have pursued this way and made tantalizing progress—including Rovelli, Wheeler, and his student Everett—must lead us. Rovelli, apparently more than he himself even knows, threw down the gauntlet for everyone in the abstract of his seminal paper that gave us RQM in 1996 by prompting us to: “consider a reformulation of quantum mechanics in terms of information theory.”

There are additional threads emerging from physics, of course, pointing toward information—which is by definition comprehensible—as at least a coequal component of reality along with Einstein's world of confounding and paradoxical physical objects.

Let's elaborate that important distinction here. Quantum states and the systems that govern them are only counterintuitive when we apply them to the physical objects that reside on the other side of “measurement.” As information, our quantum conception of reality of course makes sense, otherwise it would be useless as a description of reality. It only adheres to Feynmann's insistence that it is incomprehensible when applied to a world we traditionally separate from our own. Why would we defer to an outside reality that in the end is merely conjectural when we have internal evidence that our internal reality is not in fact separate? And could Einstein's Spinozan God have handed us a better clue as to the pragmatic nature of the reality we are constructing as humans?

Einstein's is the world of remote objects and impossible dreams, like understanding the mind of the God of Spinoza. It's a beautiful and impressive world, and solving Einstein's gravity in quantum terms may

itself be an effectively impossible dream. But pragmatically, Planck alone handed us all the math we will ever need to construct the universe or our actual dreams. In fact, Einstein's is the world of the dream of a dream—not of our meaningful pursuit of building the world we wish to actually live in. Von Neumann expressed this pursuit thus:

All stable processes we shall predict. All unstable processes we shall control.

This pursuit is borne by the consequences of Planck's math, compared to those of Einstein's. The quantum of action gave us all the marvels of our current world, both ominous and wondrous. All of our electronics and catastrophic weaponry derive from the Quantum. While our understanding of the greater physical cosmos is almost all Einstein's, it's still the world of the dreamer, not the pragmatist.

For the pragmatic observer of modern physics, all the excitement is quantum. In particular, one subfield of quantum physics is joining the physical to the informational in a way that offers the greatest promise for mankind's actual dreams: quantum computation.

Here, quantum algorithms are teaching us something new about the nature of physical reality, namely that it is both informational and physical. In fact, it is becoming increasingly difficult to separate computation from reality generally. This is a trend that will continue. In another paper, *The new paradigm: quantum interbeing*, I propose that human consciousness—and that means all of human reality—is itself a quantum computational phenomenon, a superposition of awareness and self-awareness instantiated by theory of mind. Describing the quantum firewall that allows humans to possess both simultaneously is outside the scope of this paper. Suffice to say, in a world that is 100-percent quantum—our world—all algorithms are quantum algorithms.

Keen observers will note that in order to process quantum algorithms natively, we must manipulate quantum physical objects—and this has consequences that are both physical and informational. Those who have read the magnificent speculation contained in the 1997 masterpiece by the father of quantum computation, David Deutsch—appropriately titled *The Fabric of Reality*—know that pursuing quantum computation will probably award us the ability to affect physical reality generally.

In this time of rapid change brought on by classical computation, it is perhaps more difficult to anticipate the changes to be wrought by its emerging descendant. But just as we are now building a world of cyberspace with classical computers where we can live virtually in a way of our choosing, we can also envision a world built by quantum computation in which we will live in such a world, but physically.

And as we move toward this world, Einstein's dream of understanding the most basic secrets of the physical world—how matter and space come into being and how gravity provides necessary structure—will fade in the light of a new world of today-unimaginable peace, fulfillment, and adventure, all directly built by human hands from the unwavering pursuit of the promise of Planck's energy-time relation.