ORDER FROM VIRTUAL STATES: A DIALOGUE ON THE RELEVANCE OF QUANTUM THEORY TO RELIGION

by Stanley A. Klein

Abstract. Lothar Schäfer has written a poetic tribute pointing out the relevance of quantum theory to religious beliefs. Two items in his article trouble me greatly. First are the excessive claims about the relevance of quantum mechanisms for the creation and evolution of life. Schäfer's claim that "everything that can happen must happen" can be dangerously misleading. The quantum rules predict that most outcomes have a near-zero chance of occurring. Although "anything can happen" can be a wonderful metaphor for living life, it can be dangerous if taken literally. It can also be misleading when applied to Darwinian mechanisms. My second trouble was with Schäfer's desire to extract moral values from quantum principles in a literalist manner. Extracting ethics from science has always been problematic. Luckily, Schäfer provides balance to these objections by including many wonderful passages that in my opinion correctly point out how quantum theory should change the way we conceive of our place in the universe. I list twelve points in which the quantum ontology differs from our normal Newtonian ontology. Awareness of these aspects is typically missing from our usual appreciation of nature, so Schäfer's poetry on a number of these points is well appreciated.

Keywords: evolution; paranormal; quantum theory; science-religion bridge; Sokal hoax.

Lothar Schäfer's article "Quantum Reality, the Emergence of Complex Order from Virtual States, and the Importance of Consciousness in the Universe" (2006; see pp. 505–31 in this issue) has much with which I can agree. He offers a wonderful poetic introduction to Copenhagen-style quantum mechanics. There are two parts, however, that greatly trouble me. On pp. 512–19 he applies quantum thinking to the origin of life and

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to Darwinian evolution in a way that seems to depart from mainstream understanding of quantum effects. Later he draws conclusions from the quantum formalism for morality. This section raises the problematic issue of whether morality can be derived from science. In the first half of my essay I discuss these two bothersome sections, and in the second half I expand on the sections that pleased me.

Problem Areas

In discussing the creation of life Schäfer says: "Since, in the quantum reality, everything that can happen must happen, given sufficient time, the actualization of states that express themselves in life forms was inevitable" (p. 512). This is a dangerous statement and can easily be misunderstood by those who are not familiar with probabilities. The same criticism can be levied against the misrepresentation of quantum mechanics that was present in the popular movie *What the Bleep*. It is the same type of problem found in the postmodernist, quantum theory–based Sokal hoax. For readers not familiar with the Sokal hoax, I recommend Googling "Sokal hoax" and reading a few commentaries, including *http://en.wikipedia.org/wiki/Sokal_affair*. Quantum mechanics, taken at first glance, can easily be misapplied.

Although quantum mechanics provides a powerful ontology that up-to-date theology could usefully incorporate, it also provides powerful constraints on what can actually happen in our universe, contrary to what one learns from *What the Bleep* and from Schäfer's article. Let us consider what quantum mechanics tells us about life's origin and about evolution, two of Schäfer's themes. My critique in both areas is that Schäfer's discussion is misleading, because, although quantum mechanics says that almost anything can happen, it places strict quantitative constraints on the likelihood of anything happening.

The calculation of getting life started on Earth involves a deep knowledge of biochemistry, and some of the critical calculations may indeed require quantum mechanics. Calculating the probability of life getting started is incredibly difficult, and no one is close to being able to calculate it with any accuracy today (a fact Schäfer does not mention). It probably will be 2200 before an adequate calculation is feasible. So now let us shift to 2200 and suppose that the calculation indicates that the probability of life starting on Earth (a quite hospitable planet) is about 10^{-30}. Because there are likely to be about 10^{10} hospitable planets in our galaxy and about 10^{10} galaxies in the universe, that means that the likelihood of life being found in the entire universe is about $10^{-30}\,10^{10}\,10^{10} = 10^{-10}$, or about one part in ten billion. Thus, even though the virtual states central to Schäfer's approach do exist, the probability of actualizing life somewhere, sometime in the entire history of the entire universe can be vanishingly small. That

is, just because something is possible, quantum calculations in the year 2200 could show that it is improbable.

Following the section on the creation of life, Schäfer applies his quantum perspective to evolution. Schäfer sees a conflict between Darwin's "Nature does not make jumps" and Gould and Eldredge's "punctuated equilibrium." The solution to this conflict is clear to Schäfer, who points out: "Such a process—the rapid and spontaneous change of a system from an enduring equilibrium to a new state—bears all the signatures of a quantum process" (p. 516). Well, that is possible, but it also bears the signature of a complex self-organizing system operating near the critical point.

Several points need to be made here: (1) Before jumping to a quantum explanation where one must be at pains to maintain isolation from environmental decoherence, it pays to check whether there is a simple and natural classical account. (2) Before making a claim that some emergent step is too difficult to come about by a classical account, one must be able to calculate probabilities in the classical and in the quantum account. It typically is much more difficult to calculate quantum than classical probabilities. For evolutionary steps we will probably need to wait two hundred years (similar to creation of life story) before the classical probability calculation can be done with any accuracy. That is largely because natural selection acts on the phenotype, but natural variation typically acts on the genotype. Sadly, the connection of genotype to phenotype is much too complicated for twenty-first and probably twenty-second–century science. So we must be patient before having any confidence in saying that classical (nonquantum) science can or cannot account for the apparent intelligent design all around us.

Schäfer does offer a wakeup caveat pointing out the limits of the quantum poetry: "We must be clear about the fact that quantum theory cannot be taken as a license for proposing paranormal effects, new age theories, and esoteric forms of magic. Nevertheless, we also must note that the materialism and naive realism of classical science are finished, and, at the level of elementary particles, aspects of consciousness appear" (p. 522). Unfortunately, the caveat about taking quantum theory as a license for magic is immediately followed by a magic statement that elementary particles have aspects of consciousness. It is as if Schäfer wants to bury the caveat. I would have liked to see a prominent place for that caveat about possible misuse of quantum theory by New Age paranormalism. Instead, that comment appears in the section that is focused on the metaphysics of Pierre Teilhard de Chardin with an emphasis on psychic forces that sound more literal than metaphoric.

Schäfer's discussion of cosmic morality and hope goes overboard for my taste, though the poetry is still wonderful. We find such statements as "The nature of quantum reality now seems to suggest that to live in accordance with the order of the universe is the cardinal value on which to

build a system of ethics" (p. 526). It is nice to "derive" cooperative values from quantum long range interconnectedness. But we also see disorder in the universe, so should our ethics follow the order or the disorder? As demonstrated by the Sokal hoax, quantum mechanics can lead to a postmodernist relativism of "anything goes." Rather than going directly from the quantum reality to morality and insight into one's oughts, it seems to me wiser to use the quantum reality as a bridge for modern humanity to listen to our inherited wisdom traditions. Schäfer provides several examples for how the quantum ontology can be helpful in that bridge building, as I discuss next.

How Quantum Theory Provides a Science-Religion Bridge

In this listing I review some of the quantum mechanics science-religion bridges (Klein 2002) that speak powerfully to me. I also comment on the topics that Schäfer treats in more detail.

1. QM gets subjectivity and the mental realm into science in an intrinsic way. It is nicely summarized by a quote from Werner Heisenberg early in Schäfer's essay: "quantum entities, of which we and everything around us are made, are not quite real but are 'standing in the middle between the idea of a thing and a real thing,' as Werner Heisenberg wrote ([1958] 1962, 41)" (p. 506). To me, Schäfer's article was worth reading just to see that quote and its interpretation by Schäfer.
2. QM is anti-Copernican in giving the observer a central role in creating reality. We are special, a notion central to many theologies and a focus of Schäfer's discussion of Teilhard and consciousness.
3. QM is the first self-consistent dualism ever developed. The dream of Plato, Descartes, Kant, and others may have been found. Previous dualities were plagued by inconsistencies and implausibilities. Many theologies have a hidden duality in their underpinning. The QM duality can legitimize these other dualities.
4. QM has a nonreductionist as well as a reductionist aspect. This differs from classical mechanics, which is fully reductionist. Reductionism is repugnant to many theologies. Throughout his article, Schäfer emphasizes how the quantum ontology has put an end to the notion that we are machines.
5. QM provides an ontological status for free will, which is important for theology, ethics, and jurisprudence. I provide more details in Klein and Naimark 2003. It underlies Schäfer's section on quantum selection (pp. 517–19).
6. QM clarifies the constraints on God's powers found in many post-Holocaust theologies such as Process theology. These limits on God's

power remove God's role in remote prayer, tsunamis, and miracles. Quantum mechanics is not as permissive as many followers of New Age religions believe.

7. QM is mysterious. Mystery is central to many theologies. It is neat to have a mysterious, commonsense violating ontology that reminds scientists to tone down their arrogance. Humility is good not only for oneself but also for one's dealings with others. Scientists often have a shortage of that commodity.
8. QM has uncertainty. This feature, like the preceding one, is good for humility.
9. QM has multiple interpretations (myths). The Copenhagen interpretation, Von Neumann interpretation, many-worlds interpretation, and Bohmian interpretation are incredibly different ontologies of what is going on at the fundamental level. Yet all four produce identical predictions for probabilities of events in the universe. These multiple myths are just like the religions of the world. In Klein 1991 and Klein 2002 I show how the moveable Von Neumann cut that distinguishes the observer from observed can be placed to provide ontological basis for different theologies. This demonstration of how conflicting myths can be compatible could be a wonderful lesson for world tolerance.
10. QM has nonlocality. We are tightly connected to and entangled with each other and nature. Schäfer appropriately emphasizes the individual wholeness of the quantum ontology.
11. QM has unlimited possibilities. Schäfer emphasizes the notion that the virtual states between collapses explore all possibilities. The Feynman sum over all paths method for calculating probability amplitudes is one of the most beautiful poetic expressions of the dynamic quantum laws. Although in the beginning of this article I strongly critiqued the belief that all outcomes have nonnegligible probability, having the idea in one's head of unlimited potential can be motivating. It is a wonderful basis for the power of positive thinking.
12. QM is metaphoric. The particles of Feynman or the complementary waves of Schrödinger are metaphors. As was expressed in Heisenberg's quote above, quantum mechanics can be thought of as the dreams that things are made of. For me this notion may be the most important of all for what quantum theory has to offer theology. Many theologians may be fearful of expressing their opinion that Bible stories should be taken as metaphor rather than as literal events. They may fear that the metaphor label takes the power out of the concept. Knowing that science has revealed that the fundamental building blocks of our universe have a metaphoric, idealike ontology makes metaphor more acceptable.

SUMMARY

I began with my admonition that articles presenting quantum mechanics for the lay person should be cautious about misleading the audience. It is true that quantum mechanics almost says all things are possible, as was emphasized in *What the Bleep*. What is not commonly stated is that quantum mechanics also says how to calculate the probabilities of the events. The calculations show that most possibilities have negligible probability. Thus I was bothered that Schäfer exaggerated the role that quantum mechanics plays in the origin of life and in evolution in general. Also, I am left with the queasy feeling that maybe Schäfer is taking his quantum story applied to morality and hope as literally as he took the predictions for life and evolution. Better would have been a clarification that one cannot really study the Schrödinger equation to learn about morality and hope. We learn about them from listening to our inner voice about what is right.

These negative comments on Schäfer's article are overwhelmed by the positivity that Schäfer evokes telling us of the beautiful poetry that quantum mechanics can give us. His effusively beautiful discussion of the poetic metaphors afforded by quantum theory has allowed me to end on a positive note. I listed twelve items with which quantum mechanics can provide a powerful bridge between science and religion. For one example, Schäfer and *What the Bleep* tell me that I can create my own reality by having the multitude of virtual possibilities available. I am told that I am the commander of my ship, that positive thinking can produce positive outcomes. Schäfer gives us many wonderful ideas. As he writes at the beginning with the Heisenberg quote, the new quantum world tells us that we are "standing in the middle between the idea of a thing and a real thing." That places us humans center stage not only as observers but also as actors able to make the world a better place. Schäfer's article reminds us of our sacred power.

REFERENCES

Heisenberg, W. 1962. *Physics and Philosophy*. New York: Harper Torchbook.

Klein, Stanley A. 1991. "The Duality of Psycho-physics." In *Tacit Assumptions in Vision Research*, ed. Andrei Gorea, 231–49. Cambridge: Cambridge Univ. Press.

———. 2002. "Quantum Mechanics as a Science-Religion Bridge." *Research News & Opportunities in Science and Theology* 2:13, 26.

Klein, Stanley A., and J. Naimark. 2003. "Free Will and God in the Quantum World." *Research News & Opportunities in Science and Theology* 3:16.