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QUANTUM ENTANGLEMENT

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This month [March 2009] *Scientific American* ran an article called "Was Einstein Wrong?" by David Z. Albert and Rivka Galchen. Albert is in the philosophy department and Galchen is in the English department, both at Columbia. Not too long ago, Feynman was ridiculing "physics by philosophers," and being cheered for it across the country; but now, less than two decades later, we have not only philosophers being published as physicists, we have teachers of creative writing being published as physicists. Now, I have nothing against philosophers or English teachers: I am simply pointing out the hypocrisy of it. Philosophers are not allowed to have opinions about physics unless they teach at some place like Columbia, have been fully indoctrinated (at Rockefeller University, no less), and sign on completely to the current disinformation campaign. In other words, *your* philosophers cannot have opinions on science; but *ours* can. We will not publish philosophers who disagree with us, but if a philosopher is willing to parrot our views entirely, we will.

I have run across Albert before. I have already critiqued his book http://milesmathis.com/super.html *Quantum Mechanics and Experience*, which is centered on the controversy of superposition and the problem of detectors in sequence. I solved those problems for him in a simple mechanical way, with diagrams, and sent them to him directly. But he prefers to stay with the "in" party rather than be correct. He did not reply to my paper, and has now switched mysteries. He is now concentrating on entanglement, the subject of this paper at *SA*. In a nutshell, Albert has accepted the interpretation of John Bell that entanglement must imply non-locality. In one short paragraph, Albert poorly glosses Bell's argument, and then states, "And so the actual physical world is non-local. Period."

Here is Albert's entire argument for that final decision: "if no algorithm could avoid non-localities, then they must be genuine physical phenomena. Bell then analyzed a specific entanglement scenario and concluded that no such local algorithm was mathematically possible."

Yes, well. Albert claims that Bell said that no algorithm could avoid non-localities. In direct language, that means that Albert thinks that Bell said no mechanical explanation of entanglement was possible, or, conversely, that a mechanical explanation was *impossible*. I would say that interpretation of Bell is pretty strong, but let us say it is true that Bell meant that. Can Bell be correct? No. Albert must be a very poorly trained philosopher if he believes you can prove a negative in this form. Every good philosopher since Thales has known that you can't prove a general existential negative. Yes, you can prove that a theorem is false, but you can't mathematically or logically prove that something cannot be done, universally.

This should be doubly obvious in Quantum Mechanics, the realm of probabilities. Any first-year statistician knows you cannot prove anything with probability math. But Albert expects us to believe you can prove a negative with probability math and probability assumptions.

The reason you cannot prove a universal negative is that it requires total knowledge of the field. To make the claim Bell and Albert are making would require them to know, for a certainty, that they knew everything about the mechanics, operations, and interactions of the quantum field. Norman Finkelstein has entitled one of his books *Beyond Chutzpah*, and this argument of Albert's is beyond chutzpah. It is hubris, period.

To give you an example, 180 years after Faraday and 230 years after Franklin http://milesmathis.com/charge.html, we still don't know how the charge field works mechanically. Today, top physicists will tell you the charge field is mediated by messenger or virtual photons, photons that are able to "tell" the quanta "move closer" or "move away." Yes, the same photon can cause negative or positive charge. As a matter of science, that is clearly infantile. I have proposed http://milesmathis.com/charge2.html a mechanical charge field that is always repulsive, and this begins to answer some of the mysteries of QED. But, regardless of any of my theories, which are admittedly in the first stages, the standard model is nowhere near omniscience about the charge field. And **it is this charge field that must mediate entanglement**.

My assumption is that entanglement will be explained by some simple mechanics. In fact, I am quite near to that solution myself (very close: only a few minutes away: see below). This was also the assumption of Einstein. In the famous EPR paper, Einstein argued that entanglement was proof that quantum mechanics was incomplete. Bohr disagreed, but he was simply saving face. He never argued for actual non-locality, as Albert admits. He only argued that quantum mechanics was as good as it was going to get.

Amazingly, contemporary physics is finally moving past the Copenhagen interpretation. Albert says in his paper that this is happening and that it is of historical importance, and I agree with him. The publication of his paper is proof of that by itself. Albert is dismissing both Einstein and Bohr here, which would have been *verboten* in the mainstream until very recently. But the standard model is moving past the Copenhagen interpretation to become less mechanical, not more. The Copenhagen interpretation, which was already a flight into the non-physical, was still too restrictive for contemporary physics. Bohr's philosophy was already pseudo-philosophy, an enshrinement of irrationality, but it was not irrational enough to suit the contemporary physicists. The contemporary physicist wants no limits on his ability to perform mathematical magic, so the idea of locality must be given up.

This is revolutionary, in the worst way, in that it removes the last rule of logic and theorizing. Bohr had already destroyed mechanics, which was bad enough. Planck, Schrodinger, and Einstein never forgave him for it. But even Bohr had been forced to admit that there was probably something physical going on beneath the wave function. Bohr believed it was forever hidden from us, but it was there. It had to be.

But with Albert's interpretation of Bell, all that is gone. The dam has broken completely free, the last rock is dislodged, and theorists in the future will not have to obey any rules except the ones they make up freely.

In fact, physics will no longer be physics, since it will no longer be physical. It will be entirely mathematical. *Scientific American* will have to change its name to *Unscientific American*, or *Heuristic American*, or *Magician's Monthly.*

I have called this argument of Albert's disinformation, and some might say that is unnecessarily incendiary. But if you read this paper at *SA*, you will see that it reads like propaganda. Albert is not only selling a viewpoint, he is trying to sell that viewpoint by dressing it up as its opposite. That is disinformation and agitprop, by definition. He says that after the Copenhagen interpretation,

to spend any more time on these matters became, thereafter, apostasy. The physics community thus turned away from its old aspirations to uncover what the world is really like and for a long time thereafter it relegated metaphysical questions to the literature of fantasy.... From the early 1980s onward, the grip of Bohr's conviction—that there could be no old-fashioned, philosophically realistic account of the subatomic world—was everywhere palpably beginning to weaken.... The old aspirations of physics to be a guide to metaphysics, to tell us literally and straightforwardly how the world actually is—aspirations that had lain dormant and neglected for more than 50 years—began, slowly, to reawaken.

That, my friends, is purposeful misdirection. Albert tells us outright that the Copenhagen interpretation is being bypassed in order to "tell us literally and straightforwardly how the world actually is," to give us an "old-fashioned, philosophically realistic account of the subatomic world." When the exact opposite is true: the Copenhagen interpretation is being bypassed to give physicists room to propose even more unrealistic,

non-literal, non-straightforward, and non-old-fashioned theories. Non-locality is not realistic, is not literal, is not straightforward, and is not old-fashioned. Albert is only using those words to fool you into accepting something you would not think of accepting dressed in its own garb.

Now let me show you some of the ways that entanglement is misinterpreted. If we go to Wikipedia for the modern gloss, we find this:

Quantum mechanics holds that states such as spin are indeterminate until such time as some physical intervention is made to measure the spin of the object in question. It is equally likely that any given particle will be observed to be spin-up as that it will be spin-down. Measuring any number of particles will result in an unpredictable series of measures that will tend more and more closely to half up and half down. However, if this experiment is done with entangled particles the results are quite different. When two members of an entangled pair are measured, one will always be spin-up and the other will be spin-down. The distance between the two particles is irrelevant.

A close reading of those few sentences already shows how the mystery of entanglement is a manufactured mystery, created by false probability assumptions. The problem in this Wiki quote is closely related to Schrodinger's cat mystery. In a thought problem, Schrodinger put a cat in a box and then assigned a probability number to the cat: say, .5 the cat was alive, .5 the cat was dead. We can't see the cat, so we don't know. Quantum mechanics says the numbers are all we know. Schrodinger says no, there is some fact underneath the numbers: either the cat is dead or it is alive. When we open the box, it must be one or the other, not both. Amazingly, the princes of QM did not say, "Yes, well of course. But we don't know until we open the box." That would have been sensible. No, QM said to Schrodinger that the cat was NOT really alive or dead. It was neither alive nor dead until we opened the box and saw it!

Yes, that is the level of philosophical understanding of modern physicists. Schrodinger *lost* that argument, which is why I still have silly things like that that I can quote from Wiki.

Contemporary physicists actually believe that the "physical intervention" of measurement determines part of the math. It does this via the HUP, the Heisenberg Uncertainty Principle. A certain interpretation of the HUP makes the physicist an actual part of every equation, and this interpretation is now the accepted one. That is spooky enough, in itself, but entanglement is even spookier. Using the anti-Schrodinger interpretation of cats, QM had decided that nothing could be known about particles except their probabilities. In other words, there was no certain knowledge beneath the numbers. But with entanglement, we get certain knowledge from probabilistic situations. With entangled particles, "one will always be spin up and the other will be spin down." Note the word *always*. That is certain knowledge.

To explain this, quantum physicists have come up with the idea that the particles are in contact with eachother over huge distances, without any mediating field or particle. Yes, they can talk to eachother instantly, so that when the physicist measures one as spin up, the other can flip immediately to spin down to conserve parity.

All this is patently absurd, but neither the physicists nor the philosophers can seem to cut through to the fairly obvious answer. They can't do that because they have made the question much more complex than it is. First of all, the physicists have buried the problem under decades of math and terms. Then the philosophers have followed, adding their mountain of semantics and lingo and sloppy thinking. One must come to the conclusion that neither the physicists nor the philosophers *want* a simple answer. They only want to look smart, bandying a vast vocabulary and an infinite disrespect for their readers.

The fairly obvious answer is that their first postulate was wrong. They assumed that there was no reality under the probability numbers, but entanglement showed that there was. Just look at the Wiki quote again: the whole problem is between their postulate and the outcome of the experiment. Faced with a contrary experimental

outcome, a sensible person would admit his postulate was wrong, but that is not the way of modern physics. Physicists cannot admit they were wrong. So, in order to keep their postulate, they stoop to this force-at-a-distance magic.

Albert even admits that non-locality is force at a distance, which puts physicists right back with Newton. In order to keep their "modern" edgy pseudo-philosophical postulate, they are willing to turn the clock back on the entire field 300 years. This is the only way that superseding the Copenhagen interpretation can be seen as "old-fashioned": it takes us back to the time of the Inquisition, before anyone was capable of doing mechanics. If we accept non-locality, we can wipe out all of physics since Galileo, and we can wipe it out in the name of "progress," as Albert does in this paper. As art is now post-modern, physics is now post-mechanical. Physics is post-physical.

Ironically, Feynman did not believe in this force-at-a-distance dodge. I have been hard on Feynman in other papers http://milesmathis.com/feyn2.html, and he continued a lot of the propaganda of Bohr and Pauli; but not all of it. If you study my explanation of his shrink-and-turn method in a recent paper, you will see why. I will gloss it here to explain entanglement mechanically. In his book *QED*, Feynman explains partial reflection by glass by assigning an arrow and a clock to each individual photon. I have shown that the arrow is a vector and the clock is a spin. The clock and arrow, taken together, are able to tell us where in its spin cycle each photon is. In other words, we can calculate where the particle is in *its own* wave.

Now, Feynman was never able to give this mechanical interpretation; or if he was, he never admitted it. But his method would have allowed him to explain entanglement without force at a distance. In this way: since each photon has both a turning clock and a vector, each photon has both a wave motion and a linear motion. This means that the wave belongs to each photon, not to the set of photons. This is revolutionary because, in this way, light is no longer analogous to sound: it is not a field wave, but a particle with spin. The wave belongs to *each* particle, and may be assigned to a mechanical motion: spin. If each photon has a real spin with a real wavelength and a real period of rotation, then we can use that period of rotation to track it. Using Feynman's little turning clock, we can follow the photon, no matter how far it travels, and predict with some certainty what state it will be in. We cannot say that the clock will be at 6 or 12, but, given an initial state, we can predict a final state. *If* the clock was initially at 12, after some time we can predict that the clock will be at 12 again. To do this, we only need to know the period of rotation and the time of travel. If we know the wavelength, we can calculate the period of rotation quite easily, so this is not a difficult problem mathematically. Once we sort through the mechanics, the math becomes simple.

This explains entanglement because we do know an initial state. We don't know if the quanta are at 12 or 6 on the clock face, but we might know one is opposite the other, for example. *If* one is at 6, the other is at 12. If they have the same periods of rotation, then after any time, they will still be opposite, without any communication between them. Other relationships will also be trackable and stable, as long as the periods of rotation are known relative to eachother. In other words, as long as we know sizes and wavelengths, we can predict comparative wave positions at any distance or time away from collision.

This is the mechanical explanation of entanglement, without spooky forces. Albert and Bell have both been proven wrong, by direct demonstration.
