Quasar Entanglement Experiment Fails

by Clark M. Thomas

Overview

A recent experiment involving two quasars in a test of quantum entanglement failed to achieve its results as advertised. It failed to extend spooky communication out to near the edge of our visible universe. It furthermore failed to close loopholes that are still better answered by Bohmian mechanics.

Universal theories must by definition apply everywhere within the universe. Therefore, if a "universal" physics theory applies only within limited areas of our visible universe, under limited conditions, then that theoretical paradigm is either not universal, or is false. Factor in a logical 4-D multiverse that embraces our visible universe, then the truth challenge for every hypothesized universal physics theory becomes that much greater.[1]

General Relativity (GR) has already staked its claim to being valid in every size dimension inside our 4-D visible universe that is greater than the Planck dimension, which is smaller than 10e-35 meters. GR has inspired imagined phenomena, such as lambda dark energy; and even supports ten-dimensional string theory (M-theory) with its 10e500 possible math universes. That number of potential full math universes is exponentially ("e")

[1] http://astronomy-links.net/Quanta.and.General.Relativity.pdf

much greater than all the very abundant Hydrogen atoms in our visible universe, some 10e80. M-theory represents self-verified math plunging deep into the rabbit hole of psychedelic theoretical physics, where absurds are verified by other absurds.

Quantum mechanical and field theories are not far behind in the race toward a universal Theory of Everything. Starting with Einstein in his Nobel proof of the dual wave/particle nature of light – quantum theorists have since designed experiments to seriously show how information units from all entangled photon sources, from any detectable direction and distance (even out to distant quasars), are immediate and precise.

Quantum mechanics (QM) and quantum field theory (QFT) experimental physicists ambitiously attempt to cover all known dimensions above and below the Planck level – with the basic assumption that all is at bottom random, even while velocities above the microscopic may appear classical to us.

Quantum communication is said to be not limited by the classical speed of light, such that entangled photonic information can travel at nearly infinite speed to and from distant quasars several billion light years away, even if individual photons are limited to "c". Einstein referred to superluminal communication as voodoo; but he offered nothing to disprove it.

Consider universal voodoo information speed, which a recent experiment with quasar photons has purportedly confirmed. No they have not.

This essay will below explain how experimental physicists misunderstood their own too clever experimental design, and thereby failed to support their ambitious universal claims. Their design failure does not by itself negate the local model of quantum physics, or even local quantum entanglement, but allows questions about its spatial/dimensional universality.

Seeing But Not Seeing

Several years ago I directly and visually saw with my own eye a quasar more ancient than our solar system, older by spectrum red shift than our Earth and Sun. Quasi-stellar sky objects are plentiful targets, if you have the proper imaging equipment, and can pick out a targeted speck of light far behind the cloud of dim stars in a field of view. Quasars that can directly and visually be seen (without CCDs) with home telescopes are few.

My 16" custom Dobsonian with dual tracking motors (but not go-to or point-to) was my magical tool. There are only a few other quasars slightly more accessible, the brightest of which is 12.8 visible magnitude. However, none of these "easier" quasars is older than our solar system.[2] Q0405-0012 in our constellation Eridanus is about 15th magnitude, and sufficiently distant to be a half-billion Earth years older than our solar system. It doesn't help much for amateur telescopes to have easy go-to capabilities, because just going to a quasar's visual area reveals several hundred very similar points of light in the eyepiece field of view.

I knew it was there, and precisely where, so I wan't looking to discover a sky Sasquatch. I was really going for the *existential thrill* of directly seeing something very special with my natural eye through an ordinary eyepiece. This visual capture would yield for me a direct quasar-brain connection.

After researching this object through DSS (Digital Sky Survey) images, and with my Equinox planetarium software, and a great Skyhound web site,[3] I knew where to look. I took two printed DSS images to the field. I had waited until an evening when the seeing and transparency would be superb under dry winter skies, and then drove to a dark site on the Blue Ridge Parkway. Using my red-laser finder, and then carefully comparing my field of view

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[2] http://spider.seds.org/spider/Misc/qso.html

[3] http://www.skyhound.com/observing/archives/dec/Q0405-123.html

with the DSS data, I was able to locate the right dot. Even then, I spent a half hour repeatedly checking to be 100% sure that I was looking at this precise object some five billion light years distant, not just admiring another dim Milky Way star.

Finally I had that moment of deep sublimity. Photons were hitting my retina from something much older than the Earth itself. In my frame of reference I was able to directly behold photons arriving from truly ancient antiquity. Of all the amazing things I have ever seen with my amateur scope (and I have seen many of them), this one tiny and seemingly boring light source was the most exciting. Amateur astronomy at its poetic best is more about envisioning than visioning.

However… I never directly saw any *original* photons from this quasar. Nor have I ever directly seen any other original photons through any reflector telescope. Thus we have revealed a bridge to the great quasar photonic entanglement experiment of 2018.

The Quest for a Theory of Everything

Just as the drinking chalice reportedly used by Christ in the last supper has been for many sleuthing faithful the religious holy grail – today's physicists are religiously looking for an elegant "holy grail" formula to explain everything.[4] There have been several eloquent precursor formulas, such as Newton's F=ma, and Einstein's e=mc^2. Now is the time for emerging physics to achieve a multiversal understanding, if not that elusive TOE.

The problem with all earlier formulas has been their inability to experimentally describe and measure both the very smallest and the very largest dimensions. A deeper problem is simply that technical science was not even aware of real dimensions beyond our powers of measurement, except as mathematical concepts.

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[4] http://astronomy-links.net/Religion.and.Math.pdf

The deepest science/philosophy problem zone is with finitude never being able to fully comprehend and embrace "near" infinitude – both large (approaching infinity), and infinitesimal (approaching zero). In other words, we don't know what we don't know of the multiversal universe, despite all experiments.

GR would love to invade the so-called random quantum realm below Planck's 10e-35 m. Penrose and Hawking modeled the pre-Big-Bang accumulation of mass and energy into a singularity of one point immediately preceding our great bang. That idea has lost favor, because of quantum push-back just before any BB. Our compressed local universe thus was never zero-dimensional, but three-dimensional, within a fourth time dimension.

QM and QFT have also staked their claims to universality. They can accurately measure random quantum movements up to the atomic or molecular level; but on larger scales the physics is best described by classical vectors. GR is a classical smooth vector theory with sheet-like branes, evoking the unity of space and time, or spacetime. Quantum theory has an alternate reality based on assumptions about the quantum nature of all phenomena which has little to do with spacetime branes.

I recently wrote a thesis on the crowning achievement of Stephen Hawking, a human whom I personally admired for his humor and bravery. His group's paradigm involves the absurd idea of "hairy black-hole event horizons" storing all incoming information. He and his associates reached this hypothesized solution to the Black Hole Information Paradox because they were intellectually trapped inside the deep rabbit hole of GR, while also trying to affirm core requirements of quantum theory.[5]

[5] http://astronomy-links.net/BH.Paradox.pdf

GR meets Quantum Theory

It has long been known that GR and QM/QFT are different ways of modeling Totality. The goal of experimental physics since Einstein has been to somehow blend fundamentally different paradigms into a higher order of knowledge, leading toward an elegant theory of everything (TOE). Physics is sadly no closer to unifying GR with QM/QFT than it was a half-century ago. Think of parallel math rabbit holes, or two residents inside Plato's cave.

The sharpest tool in the Relativity tool box has been string theory: This classical/GR-inspired set of math formulas tries to find an answer for everything. Instead of energy/matter particulate randomness, string theory proposes one-dimensional strings and loops in spacetime. String theory math says the foundation is stringy, not particulate. Going down that path ultimately requires a psychedelic 10 to the 500th power number of math universes needed to smooth out the model.

The sharpest tool in the quantum theory tool box has been precision measurements. Think of how calculus turned countless tangental lines into simple-to-express smooth curves. Quantum theory "proves" itself by precise correlative experiments. In this way randomness inside a large quantum universe becomes more easily explainable with correlative quantum formulas. Quantum theory works best at tiny levels, up to the atomic. Einstein's ordinary microscopic proof of the existence of atoms is also known as statistical Brownian motion among what he called quanta.

That's enough reality to start working on quantum computers, but not yet enough to establish the universality of quantum theory across very large dimensions, and to replace GR on the path to a viable TOE. This superseding goal is why clever photon quantum-entanglement experiments are trying to prove, with super-precision, instant (voodoo) entangled communication across large scales involving billions of photonic light years.

The 2018 Quasars Experiment

After "successfully proving" in 2017 quantum entanglement with stellar light from 600 light years away,[6] the next logical step would be to reach much deeper into physical space in quest of near-universal verification for quantum theory's universal claims.

Experimenters used two giant telescopes on the Canary Islands off the coast of Africa, just one kilometer apart. They captured data on two distant quasars from their mountain site midway between these telescopes. One object is almost eight billion light years away, and the other is about 12 b.l.y. away, according their Doppler red shifting and the Hubble constant.[7]

Their experimental array and design is described as follows:[8]

"Schematic of the 2018 'Cosmic Bell' experiment at the Roque de Los Muchachos Observatory in the Canary Islands, where two large telescopes observed the fluctuating color of light from distant quasars (red and blue galaxies). The green beams indicate polarization-entangled photons sent through the open air between stations separated by about one kilometer. Credit: Andrew S. Friedman and Dominik Rauch."

6 http://news.mit.edu/2017/loophole-bells-inequality-starlight-0207

7 https://www.cfa.harvard.edu/~dfabricant/huchra/hubble/

8 https://phys.org/news/2018-08-physicists-demystify-einstein-spooky-science.html

“When it comes to fundamental physics, things can get spooky. At least that's what Albert Einstein said when describing the phenomenon of quantum entanglement—the linkage of particles in such a way that measurements performed on one particle seem to affect the other, even when separated by great distances. ‘Spooky action at a distance’ is how Einstein described what he couldn't explain.

“While quantum mechanics includes many mysterious phenomena like entanglement, it remains the best fundamental physical theory describing how matter and light behave at the smallest scales. Quantum theory has survived numerous experimental tests in the past century while enabling many advanced technologies: modern computers, digital cameras and the displays of TVs, laptops and smartphones. Quantum entanglement itself is also the key to several next-generation technologies in computing, encryption and telecommunications. Yet, there is no clear consensus on how to interpret what quantum theory says about the true nature of reality at the subatomic level, or to definitively explain how entanglement actually works.

“According to Andrew Friedman, a research scientist at the University of California San Diego Center for Astrophysics and Space Sciences (CASS), ‘the race is on’ around the globe to identify and experimentally close potential loopholes that could still allow alternative theories, distinct from quantum theory, to explain perplexing phenomena like quantum entanglement. Such loopholes could potentially allow future quantum encryption schemes to be hacked. So, Friedman and his fellow researchers conducted a ‘Cosmic Bell’ test with polarization-entangled photons designed to further close the ‘freedom-of-choice’ or ‘free will’ loophole in tests of Bell's inequality, a famous theoretical result derived by physicist John S. Bell in the 1960s. Published in the Aug. 20 issue of *Physical Review Letters*, their findings are consistent with quantum theory and push back to at least 7.8 billion years ago the most recent time by which any causal influences from alternative, non-quantum mechanisms could have exploited the freedom-of-choice loophole.

“‘Our findings imply that any such mechanism is excluded from explaining the results from within a whopping 96% of the space-time volume in the causal past of our experiment, stretching all the way from the Big Bang until today,’ said Friedman. ‘While these alternatives to quantum theory have not been completely ruled out, we are pushing them into a progressively smaller corner of space and time.’

“In their experiment, the researchers outsourced the choice of entangled photon measurements to the universe. They did this by using the color of light that has been traveling to Earth for billions of years from distant galaxies—quasars—as a ‘cosmic random number generator.’”

As impressive as this experiment appears, there are problems with the design and interpretation. The next two sections of this essay will cover two critical areas of concern.

What Photons Are We Seeing?

The entire purpose of looking at quasar photons is to look at quasar photons, and not something else. The problem occurs not just within CCDs, but even with simple reflective mirrors such as those employed with my quasar-viewing Dobsonian telescope.

Early optical mirror theory considered photonic light as akin to balls bouncing off reflective surfaces. Today we know the process is more complex. Photons are both particles and waves, and they are absorbed and re-emitted from the reflective surface.

A photon that is "reflected" is NOT the same photon that encounters the reflective surface.[9] Quantum theory is very insistent on this photoelectric effect conversion process.[10] So-called quasar photons measured in the 2018 experiment (or in any similar recent experiment, such as the study of stellar light from 600 light years distant) are NOT what comes from afar. In the Canary Islands experiment only converted photons from each giant telescope are measured.[11]

The problem is easy to understand when "bouncing" photons off mirrors. The problem is more complex, but essentially the same, when talking about CCD collector boxes that amplify photonic energies, and then convert them into electrons.[12]

In other words, such experiments demonstrate voodoo-like information across very local distances, not cosmic distances. Therefore, so much for the fantasy of directly using the deep universe as a random number generator through entangled photons.

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9 https://www.scientificamerican.com/article/how-do-mirrors-reflect-ph/

10 http://www.physlink.com/education/askexperts/ae24.cfm

11 https://physics.stackexchange.com/questions/35177/what-happens-when-a-photon-hits-a-mirror

12 https://starizona.com/tutorial/how-ccd-cameras-work/

What Happens to Quantum Theory?

A frame house can tolerate only so many termites before it falls. Whereas I appreciate the idea of quanta as Einstein-like photonic wave/particles, and I incorporate foundational yin/yang particles, and even use the concept of multiversal quantum foam, there are critical differences.[13] Another mathematical expression of "quantum physics" allows for no weaknesses in the math, and avoids GR absurdities such as string theory and dark energy.[14] Factor in the interpenetrating multiverse within my paradigm, all of which makes my vision of astrophysics more amenable to emerging 21st-century astronomy and scientific inquiry.[15]

The Hawking group fell into the trap of trying to reconcile 20th-century GR and quantum theories. They followed the assumed requirements of quantum theory known as CPT symmetry.[16] Under these requirements, the universe can be a mirror of itself, and time flows both ways. CPT led the Hawking group to propose weirdness such as the holographic universe, and hairy black-hole event horizons. The Large Hadron Collider has also failed to support supersymmetry.[17]

When alternative real maths come along there can be a type of group-thinking rejection of the new within the physics community that has nothing to do with math. For example, NASA has just launched a unique solar telescope, the Parker Solar Probe, that will skim the outer corona.[18] Eugene Parker in the 1950s mathematically described the solar wind and other aspects of the cascade of solar energy. His excellent ideas were minimized. The

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13 http://astronomy-links.net/Quanta.and.General.Relativity.pdf

14 https://en.wikipedia.org/wiki/De_Broglie–Bohm_theory

15 http://astronomy-links.net/LIGO.and.GR.pdf

16 https://en.wikipedia.org/wiki/CPT_symmetry

17 http://astronomy-links.net/supersymmetry.htm

18 http://parkersolarprobe.jhuapl.edu

Parker Probe is notably the first NASA satellite named for a still living person. He was 92 at launching. (For another perspective on new physics and the solar corona, see this link:[19])

In the community of quantum mechanical physicists there is much group thinking. For decades another, elegant way to model their experimental findings has been known. De Broglie-Bohm pilot-wave math is proven to perfectly describe their experimental results, but within a nonlocal and classical particulate/wave framework. This math "heresy" has generally been ignored.

However, as footnoted herein: (1) the failure of the quasar voodoo idea; and (2) a Bohmian mechanics interpretation of the LIGO gravity wave results; along with (3) the unproven existence of supersymmetry; and (4) the failure of Hawking's CPT black hole information paradox solution – all point to the need for a causally refined quantum theory.

Consider this discussion toward the end of a standard quantum theory experiments essay:[20]

> "The de Broglie-Bohm theory, a deterministic and realistic alternative to standard quantum mechanics, is perfectly capable of explaining the delayed-choice experiment. In this theory, particles always have positions (which are the hidden variables), and hence have objective reality, but they are guided by a wave. So reality is both wave and particle. The wave goes through both paths, the particle through one or the other. The presence or absence of the second beam splitter affects the wave, which then guides the particle to the detectors — with exactly the same results as standard quantum mechanics."

I conclude this essay with a *highly recommended* link to Bohmian mechanics and the physics community:[21]

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19 http://astronomy-links.net/Solar.Corona.pdf

20 https://www.quantamagazine.org/closed-loophole-confirms-the-unreality-of-the-quantum-world-20180725/

21 https://www.quora.com/Why-dont-more-physicists-subscribe-to-pilot-wave-theory/answer/Thad-Roberts