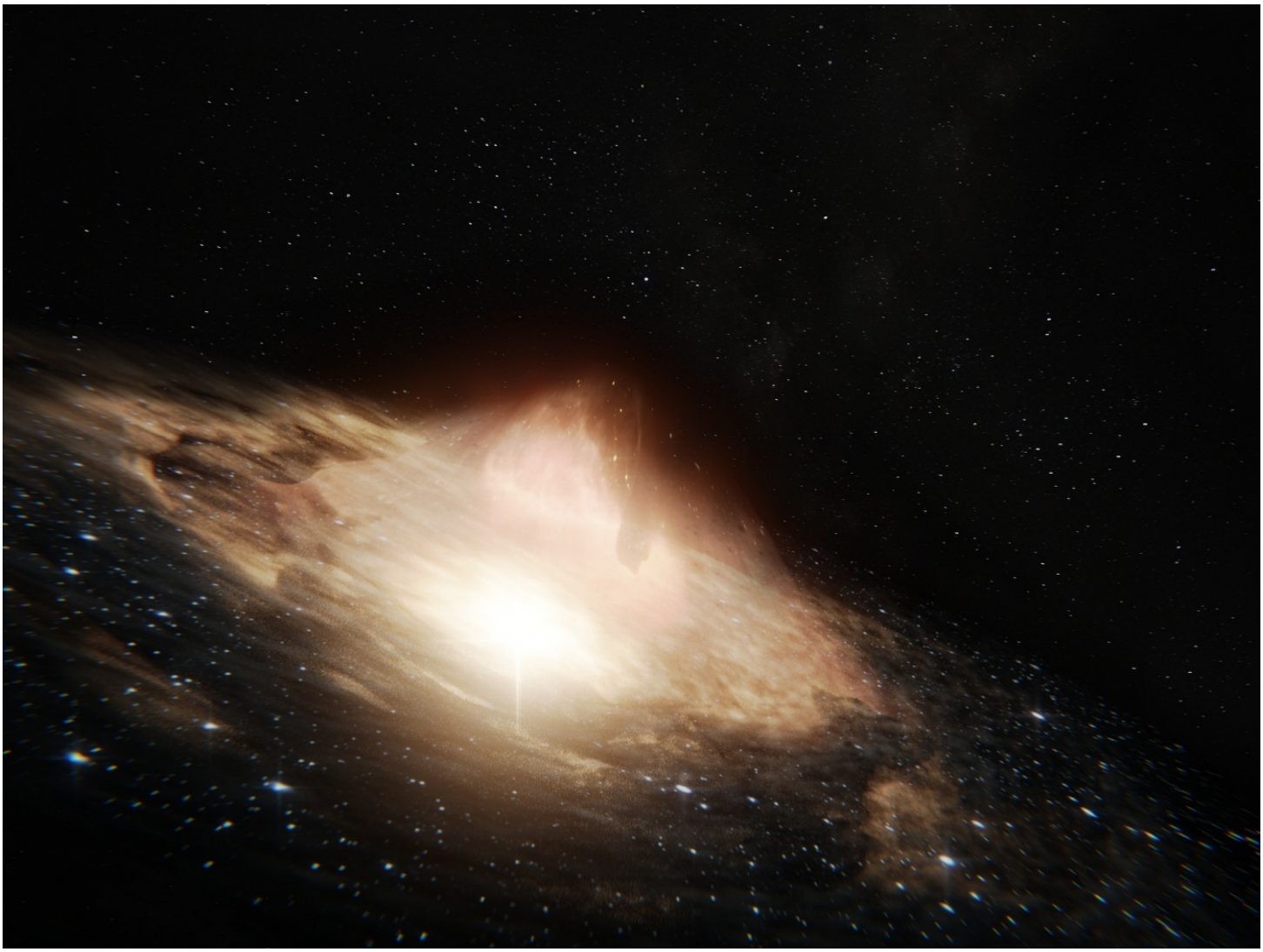
NATURE WORLD NEWS

Light From Quasars Older Than Earth Confirm Quantum Entanglement

By **Naia Carlos** Aug 20, 2018 09:34 PM EDT



Light from quasars may provide the key to quantum entanglement. A new study uses light from these ancient cosmic objects to reduce the "freedom-of-choice loophole" in the experiments. (Photo : Alex Myers | Pixabay)

For years, scientists have been trying to prove — or disprove — quantum entanglement. In new research, physicists take a significant step forward.

What Is Quantum Entanglement?

Quantum entanglement is the state when two particles are inextricably linked despite being far apart in space and time. This means that any action performed on one particle will instantly affect the other. In entangled particles, the state of one is always relative to the state of the other.

It sounds far-fetched, and even famed physicist Albert Einstein thought so, calling it "spooky action at a distance." Countless of physicists have demonstrated entangled particles measured over distances, but quantum entanglement has never been truly proven.

The Freedom-Of-Choice Loophole

One of the biggest challenges in determining the existence of quantum entanglement is the "freedom-of-choice loophole." It argues that invisible, unknown factors may influence a researcher's selection of the properties to measure on the entangled particles.

The possibility of these hidden variables can take away the randomness in the experiments, making it extremely difficult to prove true quantum entanglement.

MIT Takes On The Theory

In a new study published in the journal Physical Review Letters, researchers from the Massachusetts Institute of Technology tackle quantum entanglement by significantly reducing the freedom-of-choice loophole.

According to a report from the university, the MIT team first took on the theory of quantum entanglement in February, using 600-year-old starlight to pick the properties to measure in two entangled photons. In this setup, a classical mechanism that would affect the correlations between the two photons would have to be set in motion over 600 years ago.

In their latest research, the team took it a step further and used light from a pair of distant quasars that emitted their light 7.8 billion and 12.2 billion years ago. This puts an even greater stretch of time between a potential classical mechanism and the experiments.

With the ancient quasar light determining the measurements on the entangled photons, the researchers discovered correlations in over 30,000 pairs of entangled photons.

"If some conspiracy is happening to simulate quantum mechanics by a mechanism that is actually classical, that mechanism would have had to begin its operations — somehow knowing exactly when, where, and how this experiment was going to be done — at least 7.8 billion years ago," Alan Guth, study co-author and the Victor F. Weisskopf professor of physics at MIT, says in a statement, adding that this implausibility makes their evidence

extremely strong in supporting quantum mechanics.

David Kaiser, study co-author as well as the Germeshausen Professor of the History of Science and professor of physics at MIT, points out that the Earth is only 4.5 billion years old, so other mechanisms affecting their results would have to be older than the planet itself.

"So we've pushed any alternative explanations back to very early in cosmic history," Kaiser concludes.

Tags physics , quantum physics , quantum entanglement