THE PHILOSOPHY OF SUPERDETERMINISM AND A UNIVERSE FROM QUANTUM FLUCTUATION

BY: JOHN JOSEPH BANNAN

The philosophy of superdeterminism is based on a single scientific fact about the universe, namely that cause and effect in physics are not real. In 2020, accomplished Swedish theoretical physicist, Dr. Johan Hansson published a physics proof using Albert Einstein's Theory of Special Relativity that our universe is superdeterministic meaning a predetermined static block universe without cause and effect in physics. A prominent theory in cosmology is that our universe originated from a random quantum fluctuation. However, some object that such a large universe creating quantum fluctuation is much less likely to occur than Boltzmann Brains or even a small universe creating quantum fluctuation. But, any quantum event can be predetermined to occur at any time by the Creator of our universe. Consequently, a large universe creating quantum fluctuation occurring at the beginning of time can be predetermined to occur before any appearance of Boltzmann Brains or small universe creating quantum fluctuations. The philosophy of superdeterminism regards our universe from quantum fluctuation to be a predetermined miraculous quantum event by a Creator God.

The philosophy of superdeterminism is based on a single scientific fact about the universe, namely that we live in a predetermined static block[1] universe without cause and effect

[1] Imagine a cosmic four-dimensional block, where the three familiar dimensions of space (length, width, and height) are combined with a fourth dimension of time. Every single moment in

in physics.[2] In 2020, accomplished Swedish theoretical physicist, Dr. Johan Hansson proved by applying Albert Einstein's Theory of Special Relativity to what has already been scientifically verified about spin measurement correlations observed in entangled particle pairs[3] that cause and effect[4] in physics[5] are not real. Dr. Hansson demonstrated that the opposite spin measurements observed in entangled particle pairs cannot occur unless cause and effect in physics are not real. Experiments have shown that when the spin of the first entangled particle is measured, then the

---

history would occupy a specific location within this block. From this perspective, there is no special "now" moment that separates the past from the future. They all exist equally.

[2] Hansson, Johan. "Bell's theorem and its tests: Proof that nature is superdeterministic – Not random." *Physics Essays* Vol. 33, No. 2 (2020). Dr. Johan Hansson, a professor at Luleå University of Technology in Sweden, has been awarded the "Honorable Mention Award" by the Gravity Research Foundation, a prestigious foundation aimed at advancing the understanding of gravity in fundamental physics. This recognition places him among a group of previous winners that includes Nobel laureates and world-renowned physicists. www.ltu.se/en/latest-news/news/news/2023-05-23-awarded-prestigious-prize-in-gravitational-research#:~:text=Johan%20Hansson%2C%20a%20professor%20at,of%20gravity%20in%20fundamental%20physics.

[3] Dr. Hansson's version of superdeterminism proves the we live in a predetermined static block universe without cause and effect in physics. The other version of superdeterminism posits hidden causal variables responsible for the correlations observed in quantum entangled particles, and thus relies on cause and effect in physics. Indeed, Dr. Hansson's version of superdeterminism disproves any competing version of superdeterminism that relies on cause and effect in physics to posit hidden causal variables.

[4] Dr. Hansson wrote that "[e]verything is predetermined, including the experimenters (non) free will, the 'random' orientation of the spin-analyzers at either end, and anything else you can think of. Each measurement does not create but merely uncovers what already is embedded in space-time. All events leading up to, and including, the 'act of measurement' itself are already there. . . . Bell's theorem and its many experimental tests thus are proof that nature at its fundamental level is superdeterministic – not random. A 'cause' cannot alter the 'effect.' The events in global space-time are predetermined and fixed, much like pebbles cast into a concrete block. . . . What an experimenter seemingly 'chooses' to do at either end A or B is the only thing she can do, and cannot 'cause' either the event at her own position or the event at the other end. All events in the global space-time 'block' we call the universe (past, present and future), observed or not, are superdetermined and unalterable." Hansson, Johan. "Bell's theorem and its tests: Proof that nature is superdeterministic – Not random." *Physics Essays* Vol. 33, No. 2, at 217 (2020).

[5] Physics is the fundamental science that studies matter, energy, motion, and force. Physics explores everything from the incredibly small (subatomic particles) to the unimaginably vast (the cosmos).

spin of the second entangled particle will always be the exact opposite spin regardless of how far apart you place the particles when measured.[6] However, the spin of the first entangled particle measured for spin-1/2 particles, like electrons, will always be a purely random 50-50 result between Up or Down spin. This raises an inconsistency with Einstein's Special Relativity when observed from different inertial frames of reference.[7]

Observers in different frames of reference can observe a different entangled particle measured first due to the relativity of simultaneity.[8] As a result, two different observers each observing a different entangled particle measured first can observe conflicting spin measurement results for the pair. If Observer 1 sees particle A measured first with an Up spin, then particle B must show a Down spin for Observer 1. But, if Observer 2 sees particle B measured first with an Up spin, then particle A must show a Down spin for Observer 2. Observers 1 and 2 would see inconsistent spin measurement results for the pair of entangled particles. This potential conflict

---

[6] Aspect, A. et al. "Experimental Realization of Einstein-Podolsky-Rosen-Bohm *Gedankenexperiment*: A New Violation of Bell's Inequalities" *Physical Review Letters* Vol. 49, No. 2 (1982).

[7] An inertial frame of reference is a frame of reference in which an object at rest remains at rest and an object in motion moves in a straight line at a constant speed unless acted upon by an external force. Essentially, it is a reference point that is not accelerating. Think of it like a smoothly moving train: if you're inside and not near the windows, you can't tell if the train is moving at a constant speed or stationary. This is because the train is an inertial frame of reference.

[8] The relativity of simultaneity in Einstein's Theory of Special Relativity means that two events that occur at the same time for one observer may not occur at the same time for another observer who is moving relative to the first. This idea challenges our intuitive understanding of time. In our everyday lives, we tend to think of time as absolute, flowing uniformly for everyone, regardless of their motion. However, special relativity tells us this is not the case. This happens because the speed of light is constant being the same for all observers regardless of their motion. To visualize this, imagine two lightning strikes hitting opposite ends of a moving train simultaneously from the perspective of someone standing on the platform. To someone on the train, the lightning strikes might appear to happen at different times due to their motion relative to the platform. This concept might seem counterintuitive, but it is a cornerstone of modern physics and has been experimentally verified.

in spin measurement results occurs because of the random 50-50 chance of observing either an Up or Down spin on the first particle observed to be measured.

The only way to explain how the spin measurement results can be consistent for all observers regardless of inertial frames of reference is to say that the spin measurement results must be predetermined for all observers.[9] If Observer 1 is predetermined to see particle A measured with an Up spin, and Observer 2 is predetermined to see particle B measured with a Down spin, then the spin measurement results between the two Observers can always match even though the spin measurements still appear to the Observers to be completely random results. This is an example of predetermined randomness[10] and not caused randomness. If the random spin measurements were actually caused when the first entangled particle observed was measured, then there would be an inconsistency in spin measurement results which would violate the principle that there is no preferential frame of reference in Special Relativity or quantum mechanics. Consequently, Dr. Hansson proved that actual cause and effect in physics cannot be real using Einstein's Theory of Special Relativity, because eliminating cause and effect in physics is the only way to explain how the spin measurement results can be consistent when viewed from any inertial frame of reference.

A prominent theory in cosmology is that our universe originated from a random quantum fluctuation that initiated the Big Bang. At the smallest scales, quantum mechanics dictates that

---

[9] Dr. Hansson concludes that "[t]here is no other possibility than that the outcomes at A and B both are predetermined." Hansson, Johan. "Bell's theorem and its tests: Proof that nature is superdeterministic – Not random." *Physics Essays* Vol. 33, No. 2, at 217 (2020).

[10] The idea of "predetermined randomness" simply means an initial encounter with pre-existing pure randomness. So, in our static block universe where all purely random events exist equally whether in the past, present or future, one can encounter pre-existing purely random events for the first time as one enters future portions of the static dimension of time.

even in seemingly empty space, there are constant fluctuations in energy. These quantum fluctuations can briefly create particles and then annihilate them, appearing and disappearing in a fleeting instant.[11] Because the Big Bang started off at the quantum scale, then quantum fluctuation is the main candidate for the origination of our universe. This fluctuation could have produced a tiny bubble of spacetime with immense energy causing it to rapidly expand and evolve into our universe.

Some challenge the idea that our universe could have originated from a quantum fluctuation. If our universe lasts forever or at least $10 ^\wedge 10^{66}$ years and undergoes random fluctuations, then the typical observer is more likely to be a Boltzmann Brain[12] than a human observer that arises through traditional thermodynamic evolution in the wake of a low-entropy

---

[11] Quantum fluctuations have been indirectly evidenced through several phenomena. The Casimir Effect demonstrates that two closely spaced, uncharged, conducting plates experience an attractive force. This force arises from the difference in the allowed energy levels of quantum fluctuations between the plates and outside them. The Lamb Shift is a tiny shift in the energy levels of an electron in a hydrogen atom which cannot be explained by classical physics, and is attributed to the interaction of the electron with the fluctuating electromagnetic field of the vacuum. Hawking Radiation is the emission of radiation from black holes due to quantum fluctuations near the event horizon. Atoms in an excited state can spontaneously emit photons even in the absence of external stimuli explained by the interaction of the excited atom with the fluctuating electromagnetic field. The Higgs Mechanism in particle physics is responsible for giving mass to particles, acquires a non-zero vacuum expectation value due to quantum fluctuations. This is a crucial concept in the Standard Model of particle physics. The theory of cosmic inflation suggests that the universe underwent a period of rapid expansion driven by a powerful energy field. Quantum fluctuations within this field are believed to have seeded the initial density perturbations that eventually grew into galaxies and large-scale structures in the universe. The tiny temperature fluctuations observed in the Cosmic Microwave Background (CMB) radiation provide strong evidence for these primordial quantum fluctuations.

[12] Imagine an empty, near-perfect vacuum in the universe. According to the laws of thermodynamics, even in such a void, random fluctuations can occur. These fluctuations could, in theory, assemble a fully formed brain with complete memories and consciousness known as Boltzmann Brains. A problem arises because statistically, the formation of a single, isolated brain might be *more likely* than the formation of an entire universe with complex structures and the slow, gradual emergence of life.

Big Bang.[13] Additionally, because small quantum fluctuations are more likely than large universe creating quantum fluctuations, then we ought to find ourselves in a small universe. Because we do not find ourselves in a small universe, then large universe creating quantum fluctuations do not occur or recur.

However, any quantum effect that is not forbidden by the laws of physics can occur and is extremely likely to occur, but it might just take a very long time. But, it is also true that the waiting time for any quantum event is random and could be extremely short, even instantaneous. So, how does one explain a large universe creating quantum fluctuation occurring before either the appearance of Boltzmann Brains or even a smaller universe? Well, it is certainly possible for a large universe creating quantum fluctuations to occur before the appearance of any Boltzmann Brains or small universe creating quantum fluctuations. However, superdeterminism says that we live in a predetermined static block universe without cause and effect in physics. Consequently, the Creator of our superdeterministic universe could predetermine a large universe creating quantum fluctuation to occur at the beginning of time as opposed to much later after the appearance of Boltzmann Brains or small universe creating quantum fluctuations.[14]

Indeed, the extremely unlikely occurrence of a large universe creating quantum fluctuation at the beginning of time strongly implies that our universe was predetermined to exist by God without the naturally long waiting period. Such an extremely unlikely event occurring at the beginning of time also implies that nothing subject to the laws of physics pre-existed this quantum fluctuation otherwise this event would have occurred in the natural course of events

---

13 Carrol, Sean M. "Why Boltzmann Brains Are Bad." arXiv:1702.00850 (Feb. 6, 2017).

14 Boltzmann Brains and extremely unlikely quantum fluctuations are less likely to occur in our universe naturally over a finite dimension of time, because our universe would not exist forever making these extremely unlikely events bound to occur.

much later. In other words, the origination of our universe from a quantum fluctuation is evidence of a miracle by God under the philosophy of superdeterminism.