

THE NEW PHILOSOPHY OF SUPERDETERMINISM ON THE NATURE OF TIME

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. In the absence of cause and effect in physics, past, present and future events must all exist equally in logical relationship. Our experience of time must be an illusion, because our experience of change in our world is not actually caused in time. Rather, the change we experience in our world is caused by the changing appearances in our static block universe in the static fourth dimension of time. We should think of time as a distance in the fourth dimension of time from our present position in the dimension of time to another position either towards or away from the beginning of the universe. Because physical reality is not actually caused to change in our static block universe, then static physical reality is actually timeless. But, because very good evidence supports the creation of timeless physical reality, then non-temporal causation of timeless physical reality outside of time is real.

The new philosophy of superdeterminism is based on a single scientific fact about the universe, namely that we live in a predetermined static block¹ universe without cause and effect 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

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 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.

verified about spin measurement correlations observed in entangled particle pairs³ that cause and effect⁴ in physics⁵ 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 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

³ Dr. Hansson's version of superdeterminism proves 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).

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).

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 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

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.

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 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.

In the absence of cause and effect in physics, past and present events cannot actually cause future events. But, future events are generally not purely random implying that future events are determined by past or present events. If a past or present event determines a future event without actually causing that future event, then the future event must logically already exist. As an analogy, if $x = 2$, then $x + 1 = 3$. The value of x determines the value of $x + 1$ without one causing the other. This implies a timeless logical or mathematical relationship.¹⁰ Past, present and future events in logical relationship imply that all these events equally exist just

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 static organization of our block universe must be organized on the basis of logical relationships. Perhaps the static organization of our universe is based on the logical co-existence of timeless hyperplanes of spacetime that share information in common forming a unified block universe of abutting and intersecting hyperplanes.

like for any given value of x , the value of $x+1$ must also exist. Because events in the past or present are not imaginary, then the future events in logical relationship with those past or present events must equally exist, because future events cannot be caused to exist later in the absence of cause and effect in physics.

There is a logical generally deterministic relationship between events in our universe that cannot be caused in time in the absence of cause and effect in physics. Events and physical reality in our universe are timeless. As an analogy, consider the photon which does not experience time as an example of timeless physical reality. The logical deterministic relationship between events necessitates that all events already exist. Consequently, we must live in a static block universe consisting of all past, present and future events without causation in time.¹¹ Our experience of time must therefore be an aspect of our static block universe without cause and effect in physics.

While we experience future events that seem to materialize into existence in time, our experience of that materialization is really only an illusion of our static block universe. You exist in the present and cannot observe the equal reality of past and future events. Your memories of the past or imaginings of the future cannot actually be a result of your present existence in the

¹¹ One can imagine only the present sliver of our block universe actually existing in an occasionalist process entailing the non-temporal creation of that sliver followed by the annihilation of that sliver and replacement with the creation of the next future sliver of our block universe. However, our whole block universe almost certainly exists as opposed to just the sliver we are living in at the present moment of time. Time would be an out of place extremely short dimension compared to the other three, if only the sliver we are living in at the present moment of time actually exists. Moreover, the cutoffs at the front-end and back-end of that sliver in the dimension of time would give preference to certain relative inertial frames of reference over other frames of reference by allowing some to more fully exist in the sliver and not other frames in violation of the laws of physics, which do not allow preferential frames of reference under the Theory of Special Relativity or quantum mechanics.

past or future, which means your memories or imaginings of the flow of time must not be a real experience in the past or future, but an illusion in the present. Moreover, because cause and effect in physics are not real, then you cannot be experiencing an actual flow of time from changing caused events.

Time is not a caused changing of events, because cause and effect in physics are not real. Rather, time is a fourth dimension of spacetime in which the universe changes in static three dimensional appearance. The measure of change in our static block universe is distance in the static dimension of time. When one thinks about time, one should think in terms of the separation of events in terms of temporal displacement in the static dimension of time. One should not think of the distant past as something that happened eons ago, but rather as something that still exists in our block universe at a very great temporal displacement away from us in a direction toward the beginning of the universe in the static fourth dimension of spacetime. Moreover, a future event should be thought of as something that already exists at some distant temporal displacement point away from us in the static dimension of time in a direction away from the beginning of the universe. However, we need to stop thinking that events in the past and future do not equally exist with events of the present.

Our universe is comprised of timeless physical reality existing in the four dimensions of spacetime. The dimension of time is real, but our experience of time is an illusion of our static block universe albeit a real illusion. One can imagine any particular timeless physical reality either existing or not existing. The creation of timeless physical reality would therefore be an act

of non-temporal¹² causation meaning outside of time. Evidence that our universe was created despite the universe consisting of timeless physical reality is evidence of the reality of the non-temporal causation of timeless physical reality.¹³

There is very good evidence that our universe was created through the non-temporal causation of timeless physical reality, including the fact that our universe is contingent on nothingness as evidenced by the flatness of spacetime under the zero energy universe theory.¹⁴ Because nothingness cannot have the power to separate itself into our universe in the absence of cause and effect in physics, then our universe must have been created outside of the laws of physics. Second, the universe exhibits purely random behavior at the quantum level from which one can infer a cause of such purely random behavior.¹⁵ Third, the universe is only one out of $10^{10^{23}}$ possible permutations¹⁶ which are not known to exist inferring the creation of our particular universe. Fourth, regression in time to the Big Bang allows an inference that our universe popped into existence from nothingness. Finally, our universe being made of parts must be caused by those parts implying that our universe must be caused.

¹² Non-temporal or atemporal means something is independent of or unaffected by time. It is a concept often used in philosophy, theology, and physics to describe things that exist outside the constraints of time.

¹³ Because the timeless physical reality comprising our static block universe must be non-temporally caused to exist, then every event that stands in logical relationship with our universe must be non-temporally caused to exist in order to be a real event in our universe. The creation of one event does not require the creation of any other event that stands in logical relationship, because it is not the logical relationship that creates events but rather a non-temporal cause of the events.

¹⁴ Berman, Samuel Marcelo. "On the Zero-Energy Universe." *International Journal of Theoretical Physics* 48, 3278-3286 (Aug. 25, 2009).

¹⁵ By definition, randomness implies unpredictability. If a result could have been different, given the same initial conditions, then it is considered random. This is a fundamental concept in probability and statistics.

¹⁶ Penrose, Roger, 1989, *The Emperor's New Mind: Concerning Computers, Minds, and the Laws of Physics*. Oxford: Oxford Press, pp. 339-345.

Because causation requires a cause and effect, we assume that causation can only happen in time to allow for the appearances of the cause and effect. But, timeless physical reality is not subject to time. There is no time before or after the existence of timeless physical reality. There is only whether the timeless physical reality exists or not. There is no time before the timeless physical reality existed, and no time after the timeless physical reality ceased to exist. One must acquire a perspective on timelessness in order to understand the nature of time under the philosophy of superdeterminism.