THE PHILOSOPHY OF SUPERDETERMINISM ON OBJECTIONS TO SUPERDETERMINISM

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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. There are various grounds for objecting to Dr. Hansson's version of superdeterminism, but none hold any water. The most common objections are easily dismissed on the basis of the objector's ignorance that Dr. Hansson's version of superdeterminism is unique and not subject to the same objections faced by the version of superdeterminism originally put forth by Dr. John Bell. Other objections based on the Copenhagen interpretation of quantum mechanics can be dismissed, because Dr. Hansson's version of superdeterminism disproves the Copenhagen interpretation and there is no direct evidence that the Copenhagen interpretation is true. Finally, a wide range of remaining objections can be dismissed for various specific reasons.

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

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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

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[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.

Dr. Hansson's version of superdeterminism can successfully counter every objection. The most common objections usually result from a misunderstanding that Dr. Hansson's version

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[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.

of superdeterminism is not the same version of superdeterminism first posited by Dr. John Bell. Dr. Bell's version involves causal hidden variables that orchestrate the spin measurement correlations observed in entangled particle pairs.[11] Dr. Hansson's version of superdeterminism relies on the absence of cause and effect in physics and says that the spin measurement correlations are simply non-local predetermined aspects of our static block universe uncovered during a measurement. Indeed, Dr. Hansson's version of superdeterminism is incompatible with Dr. Bell's version, because causal hidden variables cannot exist in the absence of cause and effect in physics. However, because almost everything presently written on superdeterminism is referring to Dr. Bell's version, then many objections focus on the wrong version of superdeterminism and are easily overcome by pointing out that the objection does not apply to Dr. Hansson's version of superdeterminism.

For example, some argue that superdeterminism requires hidden causal chains extending back to the beginning of time in order to orchestrate the correlations observed in entangled particles. They argue that such extenuated hidden causal chains are unlikely and may get disrupted by purely random quantum behavior. However, Dr. Hansson's version of

[11] Dr. John Bell coined "superdeterminism" as a loophole to Bell's Theorem, which assumed that the choices of measurements made by experimenters are truly free and independent. Dr. Bell's version of superdeterminism proposes that these choices are not truly free, but rather predetermined by causal hidden variables that are also correlated with the properties of the entangled particles. These variables are "hidden," because they are not directly observable or measurable. Their influence on the experimental setup and outcomes is assumed to exist, but we lack the means to identify or measure them. These hidden variables are postulated to have a causal influence on both the properties of the entangled particles and the choices made by experimenters regarding which measurements to perform. In essence, Dr. Bell's version of superdeterminism proposes a universe where a network of causal hidden variables exists, influencing both the quantum world and the actions of observers in a way that conspires to produce the observed correlations in entanglement experiments.

superdeterminism does not rely on hidden variables and causal chains to orchestrate the correlations observed in entangled particles.

Some might argue the Kochen-Specker Theorem, which says that the unmeasured quantum realm cannot have definite properties. More precisely, the theorem says that it is impossible to assign values to all quantum properties, like position or momentum, in a way that is consistent with how those properties are measured. This challenges the idea of a hidden variable theory, which tries to explain quantum mechanics using classical ideas. The theorem hinges on the concept of contextuality meaning that how you measure something at the quantum level can affect what you find. This suggests that the idea of a completely objective reality, independent of the observer, breaks down at the quantum level. However, Dr. Hansson's version of superdeterminism does not rely on causal hidden variables to orchestrate observed quantum correlations from objectively real classical reality. Rather, Dr. Hansson relies on a predetermined static block universe in which quantum correlations simply exist in situ regardless of the distance in time or space between the entangled particles. Because Dr. Hansson does not rely on causality, then the Kochen-Specker Theorem does not disprove his version of superdeterminism.

Some might object on the basis of experimental confirmation of violations of Hardy's Inequality,[12] which is a fundamental constraint imposed by local realism on the correlations between measurements performed on entangled quantum systems. Hardy's inequality states that certain combinations of joint probabilities (the probabilities of two events happening simultaneously) must be less than or equal to zero if the particles involved are governed by classical physics, which assumes that particles have definite properties independent of

[12] Zhao, Si-Ran et al. "Loophole-free test of local realism via Hardy's violation." Phys. Rev. Lett. 133, 060201 (Aug. 7, 2020).

measurement and that information cannot travel faster than the speed of light. In the experiment, polarization measurements of entangled photons are performed independently with each measurement choosing one of two possible measurement settings. The measurement settings refer to the different ways to measure the polarization of entangled photons by using different orientations or angles of the polarization filters. However, the Hardy's Inequality experiment only purports to close the causal hidden variable loophole. The experiment does not rule out Dr. Hansson's version of superdeterminism, which can explain the results as predetermined data exhibited by our static block universe.

Some might object based on the Leggett-Garg Inequality, which is a mathematical test used in quantum mechanics specifically challenging the ideas of macroscopic realism and noninvasive measurability. Macroscopic realism says that objects have definite properties at all times even when they are not being measured. The assumption of noninvasive measurability says that we can measure a property of a macroscopic object without disturbing its state or how it evolves in time. The Leggett-Garg Inequality sets a limit on how certain measurements on a single system can be correlated based on the assumptions of macrorealism and noninvasive measurability. Quantum mechanics predicts violations of this inequality, which means that the quantum world cannot be fully explained by classical ideas, such as that microscopic systems have definite values at all times or that the act of measuring a quantum state cannot intrinsically influence its state. However, the Leggett-Garg Inequality does not account for a predetermined static block universe without cause and effect in physics that is capable of predetermining the appearance of any data whether it agrees with the constraints of microrealism or not. And therein lies the beauty of Dr. Hansson's version of superdeterminism, which allows one to always say that whatever data is extracted from any scientific experiment has been predetermined to appear that way in our static block universe consistent with the laws of quantum mechanics.

Some might argue that the Greenberger-Horne-Zellinger (GHZ) quantum state cannot be explained by local hidden variable theories.[13] The GHZ state is a quantum state where three particles are entangled in such a way that their properties are correlated in a non-classical manner. However, the GHZ state does not apply to a predetermined static block universe without cause and effect in physics, because our block universe is predetermined to exhibit behavior consistent with quantum mechanics. Moreover, Dr. Hansson's version of superdeterminism does not rely on causal hidden variables.

Others might argue that the statistical boundaries of quantum correlations are stronger than any causal hidden variable theory can provide.[14] However, Dr. Hansson's version of superdeterminism not being a causal hidden variable theory is capable of exhibiting the same strength in quantum correlations as quantum mechanics.

Some might raise objections based on the Lorentz invariance, which states that the laws of physics under Special Relativity are the same for all observers in inertial frames of reference relative to one another. For example, some might argue a violation of the Lorentz invariance of the relation of temporal precedence, i.e. causes always preceding their effects temporally, because "'cause' and 'effect' have become scrambled and ill-defined"[15] under Dr. Hansson's proof. But, Dr. Hansson avoids this criticism, because there is no actual relation of temporal precedence

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13 Liu, Zheng-Hao. "Exploring the boundary of quantum correlations with a time-domain optical processor." Sci. Adv. 11, eabd8080 (2025).

14 Barizen, V. & Bancal, J. "Quantum statistics in the minimal scenario." arXiv:2406.09350v1 (Jun. 13, 2024).

15 Hansson, Johan. "Bell's theorem and its tests: Proof that nature is superdeterministic - Not Random." Physics Essays Vol. 33, No. 2 (2020), p. 217.

due to his disproof of actual cause and effect in physics. Another might object on the basis of a violation of the Lorentz invariance of the Born rule. Because the collapse of the wave function is not simultaneous in different regions of space in the thought experiment set forth in Dr. Hansson's proof, the integral of the modulus squared of the wave function defined at a given instant in the whole of space is impermissibly not one. But, without cause and effect in physics, the collapse of the wave function is not real, so whether this imaginary collapse is simultaneous or not is irrelevant.

Some argue that if all correlations were formed at the Big Bang under superdeterminism, then there would often be stronger-than-quantum correlations among systems. But, such stronger-than-quantum correlations have never been observed falsifying superdeterminism. A stronger-than-quantum correlation is a hypothetical concept that proposes a deeper connection between entangled particles than what standard quantum mechanics predicts. For example, imagine two entangled particles, A and B. When you measure the spin of A (say, finding it Up), you instantly know the spin of B (which will be Down) even if they are separated by vast distances. Stronger-than-quantum correlations takes things a step further by proposing that measuring A might not just determine the state of B, but also dictate the outcome of future measurements on B. Bell's Inequality sets a limit on how much correlations between entangled particles can be explained by hidden variables. Stronger-than-quantum correlations would violate this inequality by a larger margin than what is allowed by standard quantum mechanics, but not what is allowed by correlations formed at the Big Bang. However, this objection is asserted against the hidden causal variables version of superdeterminism and not Dr. Hansson's version of superdeterminism. There is simply no reason our universe without cause and effect in physics must exhibit stronger-than-quantum correlations.

The non-reversible nature of a quantum measurement, i.e. you cannot reconstruct the previous state of a quantum system once it has been measured and its state has collapsed into an eigenstate of the measurement operator, seems to rule out the possibility of our universe being a block universe. In a block universe, all events are predetermined and laid out across spacetime. This implies that the outcome of a quantum measurement must already be fixed on its worldline in the block. But, the purely random outcome of a quantum measurement would have to be reversible in order to be predetermined by deterministic physics appearing in the block universe prior to the quantum measurement. However, this criticism again falsely assumes that wave function collapse is a real thing. Plus, Dr. Hansson's version of superdeterminism does not rely on deterministic physics actually causing the purely random outcome of a quantum measurement.

The most challenging objections come from the Copenhagen interpretation of quantum mechanics.[16] However, a measurement or observation cannot actually cause the collapse of the wave function in the absence of cause and effect in physics. So, Dr. Hansson's version of superdeterminism disproves the Copenhagen interpretation of quantum mechanics. One example

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[16] The Copenhagen interpretation of quantum mechanics addresses the meaning of quantum mechanics, stemming from the work of Niels Bohr, Werner Heisenberg, Max Born, and others. Key features of the Copenhagen interpretation of quantum mechanics include the wave function, the Born rule, the complementarity principle, and the measurement problem. The wave function is a mathematical object that describes the state of a quantum system. It contains all of the information that is possible to know about the system. The Born rule is a rule that allows us to calculate the probability of measuring a particular outcome for a quantum system. The complementarity principle states that certain pairs of properties of a quantum system cannot be measured simultaneously. For example, it is not possible to measure both the position and momentum of a particle with perfect accuracy. The measurement problem is the problem of how to reconcile the wave function with the fact that we observe definite outcomes when we make measurements on quantum systems. Essentially, the Copenhagen interpretation of quantum mechanics says that a measurement or observation at the quantum level collapses an unreal mathematical construct called the wave function, which results in the definite state measured or observed from a superposition of possible quantum states.

of a Copenhagen-type objection is to claim that quantum computers could not work without quantum superposition being real. But, our block universe being statically organized consistent with the laws of quantum mechanics is capable of exhibited quantum computer solutions without the need for the entire solution space existing in a mathematical construct referred to as quantum superposition or even in a multiverse covering all possible quantum states. Indeed, there is no direct evidence of the actual existence of quantum superposition or a multiverse covering all possible quantum states, but quantum computers work nonetheless in their absence.

Moreover, the behavior of a qubit itself is fundamentally random due to the inherent probabilistic nature of quantum mechanics. Consequently, the acausal behavior of a qubit implies that there is no underlying deterministic cause that determines the specific outcome of a quantum computation. If there is no underlying deterministic cause of a quantum computation, then the solution space for the quantum computation does not need to be real in order for the computation result to be real. So, there is no reason to believe a static block universe without cause and effect in physics organized consistent with quantum mechanics would need the reality of the entire solution space under quantum superposition or in a multiverse for a quantum computer to work.

Some might argue that purely random behavior at the quantum level is an example of acausal physics, where the purely random behavior simply materializes into existence without any cause. However, Dr. Hansson proved that such behavior must be predetermined. Acausal physics cannot actually be an instance of reality materializing into existence, because such emerging into existence still would not resolve the inconsistency that would result in the measurements of the spins of entangled particle pairs as observed from different inertial frames of reference under quantum mechanics. Even if the spin measurement result of the first particle observed to be measured were not caused, such acausal physics does not do away with the 50-50 random chance that the particle's spin is observed to be either Up or Down. Consequently, the inconsistency remains that two observers in different inertial frames of reference would observe different spin measurement results fifty percent of the time under Special Relativity and orthodox quantum mechanics.

Indeed, other models based on retrocausality (transactional interpretation), Bohmian mechanics, or the entanglement of space and time also cannot explain away the inconsistency with Special Relativity raised by Dr. Hansson's thought experiment. Because the spin measurement result of the first entangled particle observed to be measured must be purely random, then an inconsistency in spin measurement results will always arise under these models. Other models would require a preferential frame of reference to decide which spin measurements are observed, but Special Relativity and quantum mechanics do not allow for preferential frames of reference. A retrocausal model would still require the frame of reference of one of the observers to retrocause the random spin measurement results, so that both observers see the same spin measurement results. Bohmian mechanics relies on wave function collapse, and so the frame of reference of one of the observers would have to be the preferred cause of that random collapse of the wave function. And a model based on the entanglement of space and time positing a wormhole[17] connecting entangled particles would still require a preferential frame of

[17] The ER=EPR theory is a conjecture in theoretical physics that proposes a connection between two seemingly unrelated concepts. ER: Einstein-Rosen bridges, also known as wormholes, are theoretical connections between two distant regions of spacetime. They were first proposed by Albert Einstein and Nathan Rosen in 1935. EPR: Einstein-Podolsky-Rosen paradox, a thought experiment proposed by Einstein, Boris Podolsky, and Nathan Rosen in 1935, highlights the phenomenon of quantum entanglement. Quantum entanglement is a non-local correlation between two or more particles, such that the state of one particle cannot be described independently of the state of the other, even when they are separated by large distances. The ER=EPR conjecture, proposed by Juan Maldacena and Leonard Susskind in 2013, suggests that

reference to decide which spin measurements are observed and so cannot pass Dr. Hansson's thought experiment. Indeed, one can just run Dr. Hansson's thought experiment against any competing physics model to figure out that the model cannot explain away the inconsistency in the observed spin measurement results from two observers in different inertial frames of reference under Special Relativity.

Some might argue that Dr. Hansson's proof only applies to the quantum level and does not disprove cause and effect in macro level physics. However, because the universe began at the quantum level as evidenced by the Big Bang near singularity, then the later existing macro level universe being derived from the earlier quantum state of the universe should not require an additional property like cause and effect in physics when cause and effect are not required at the quantum level. Additionally, one can reproduce Dr. Hansson's proof at the macro level by simply attaching a macro level signal indicator to the spin measurement devices, such as a light bulb that either turns on or off depending on the detected spin measurement. For example, each spin measuring device could have a green and red light bulb attached to it, where the green bulb lights up to indicate an Up spin measurement and the red bulb lights up to indicate a Down spin measurement. Observers in different frames of reference would have a 50-50 random chance of seeing either bulb light up for the first entangled particle observed to be measured in accordance with the underlying quantum spin measurement taken by the device. Consequently, you would still have a 50-50 chance of the inconsistency that one observer will see the red bulb light up, but

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there is a deep connection between these two concepts: wormholes are equivalent to entangled quantum states. In other words, a pair of entangled particles can be thought of as creating a wormhole between their respective locations. This conjecture has far-reaching implications for our understanding of quantum gravity, black holes, and the nature of spacetime itself. It suggests that the quantum entanglement that underlies the strange behavior of quantum particles may be a fundamental aspect of the fabric of spacetime.

the other observer will see the green bulb light up on the same measurement device. By using such a macro level signaling device, one can reproduce Dr. Hansson's proof observed at the macro level disproving cause and effect in physics at the macro level. In other words, whether the light bulbs turn on or off depending on the spin measurements detected must also be predetermined without cause and effect in physics, because the spin measurements are predetermined without cause and effect in physics.

Some argue that Fine's theorem demonstrates that under certain conditions, if a set of quantum correlations can be reproduced by a hidden variable theory, it must also be possible to construct a joint probability distribution for all the observables involved. It is argued that to be compatible with Fine's theorem, a superdeterministic theory would need to be incredibly complex and contrived suggesting that a more plausible explanation for quantum phenomena might lie in accepting the inherent randomness and non-locality of quantum mechanics. However, a predetermined static block universe without cause and effect in physics can exhibit the randomness and non-locality of quantum mechanics as a fundamental aspect of the structure of our block universe without increasing the complexity of the theory. Indeed, if every event is predetermined, it could, in theory, simplify the need for complex probabilistic calculations by eliminating the need for probabilistic interpretations of quantum mechanics.

There are many other objections to Dr. Hansson's version of superdeterminism that are easily dismissed. For example, one might argue that the complexity observed in the universe requires cause and effect in physics to propagate complexity as the universe unfolds in time. However, because cause and effect are not real, then the complexity of the universe must have a static explanation. Perhaps, the universe consists of timeless abutting and intersecting static hyperplanes of spacetime sharing common information held together through the logical coexistence of these similar but also different hyperplanes. A static block universe can be predetermined to exhibit complexity without cause and effect in physics, including the static appearance of increasing entropy through the dimension of time from the Big Bang. Indeed, imagine a universe with cause and effect in physics that unfolds in time, but instead of matter and energy transforming, it remains in a hidden dimension of time. At the end of time, you would have a static block universe without cause and effect in physics with all its complexity occupying a fourth dimension of time.

Some argue that superdeterminism will be the end of science. The argument goes that if the results of scientific experiments are not based on actual cause and effect, then the experiments cannot actually probe the true working of the universe but merely what has been predetermined to be revealed. However, the fact that our universe is superdeteministic has not stopped the progress of science. So, there is little chance that suddenly the scientific method will stop working once scientists understand Dr. Hansson's proof. Indeed, the universe still appears to obey our laws of physics despite the absence of actual cause and effect in physics, so the underlying organized appearance of the behavior of the universe still allows for predictive science and physics.

Some might object that superdeterminism is an unfalsifiable hypothesis, because any data collected in any scientific experiment can be explained away as a predetermined appearance of our static block universe. However, Dr. Hansson’s proof is falsifiable provided you can either demonstrate an error in Special Relativity or actually perform Dr. Hansson’s thought experiment and demonstrate that the correlations observed are frame dependent or inconsistent among observers in different inertial frames of reference.

One might criticize superdeterminism for not presently offering any new predictions about particle behavior beyond the standard model of physics. But, superdeterminism does offer a profound insight into the nature of the universe, which is surely of interest in the field of the philosophy of religion. Moreover, superdeterminism may very well make new predictions with future developments of the theory.

Some argue that because Einstein's Relativity has not been unified with quantum mechanics, then there must be something wrong with Special Relativity. However, a predetermined static block universe is capable of exhibiting organization based on both Relativity and quantum mechanics with no need of demonstrating how either theory of physics causes the other in light of the fact that cause and effect in physics are not real. There is no reason to assume that science must be capable of finding a deterministic predictive model of quantum behavior in light of the fact that cause and effect are not real and the logical impossibility of deterministically deriving a purely random outcome being contradictory states.

Some might take issue with the use of Special Relativity instead of General Relativity in Dr. Hansson's proof. However, Special Relativity applies to Earth bound experiments, so there is no question that the relativistic effects described in Dr. Hansson's thought experiment would occur on Earth. For example, GPS satellites orbiting Earth at high speeds relative to the ground have clocks that actually run slightly slower due to time dilation, which is an effect of Special Relativity. Engineers have to account for this by adjusting the clocks' readings. Moreover, special relativity assumes flat spacetime, which means gravity is negligible. Around massive objects like black holes or in situations with very strong gravity, spacetime becomes significantly curved. In such cases, it is more appropriate to use General Relativity, which incorporates gravity as a curvature of spacetime, to make accurate predictions. However, most of the universe has very weak gravity. This means spacetime in these regions is only slightly curved, and we can often use a simplified, "flattened" version of spacetime for calculations. This makes special relativity, which works well in flat spacetime, a good approximation for most of the universe and the best choice of the theory for Dr. Hansson to use in his proof.

One might argue that the continuous nature of time requires a continuous changing of reality, which implies the existence of cause and effect instead of discrete static hyperplanes of spacetime abutting or intersecting in the dimension of time. However, time does not exist as a continuous background ticking clock, but rather as a dimension of spacetime. The absence of cause and effect in physics precludes hyperplanes from causing each other to exist, which means that the universe cannot be a continuous changing of reality but rather a static block universe. Our experience of time is only an illusion of our static block universe.

Some argue that human beings have free will. Dr. Hansson's version of superdeterminism disproves free will in the universe, because the predetermined future must exist and be unchangeable due to the absence of cause and effect in physics. But, the existence of free will is also unsupported by biology and the standard model of particle physics. Indeed, there is no scientific evidence that brain neurons can act independently from their surroundings.[18] There is also no scientific evidence of any deviation in the laws of physics that would support a notion of freely willed action untethered to those laws of physics. Human beings are made of about 10^{30} particles. Those particles behave deterministically with the occasional purely random quantum jump in accordance with the wave function. Because free will is incompatible with

[18] Dr. Robert Sapolsky argues that the concept of free will is an illusion. He highlights how much of our brain wiring is predetermined before we are born. He examines how our upbringing, social conditioning, and life experiences profoundly shape our responses and choices constraining what we perceive as free will. Sapolsky, Robert. Determined: A Science of Life Without Free Will. (2023).

determinism and purely random indeterminate particle behavior, then a human being made of particles cannot exercise free will.

Some might argue that one of the implications of superdeterminism is that it implies a privileged or absolute frame of reference, because in order for everything to be predetermined in the universe, then must be some way of knowing what will happen in the future - a sort of "God's-eye view" from which the entire history of the universe is predetermined. In this view, there is no such thing as free will or randomness, and everything that happens is already set in stone. However, the idea of a privileged frame of reference contradicts the principle of relativity, which states that there is no absolute frame of reference. This principle is one of the fundamental pillars of modern physics, and it has been well supported by scientific experiments. However, relativity only applies to spacetime. Relativity does not apply to anything outside the laws of physics and outside the universe. Relativity would not apply to a non-temporal cause of the existence of the cosmos from unseparated nothingness being outside the laws of physics and outside the cosmos. Indeed, God's power to create the cosmos cannot be a power derived from the cosmos in the absence of cause and effect in physics. Because relativity only applies to spacetime which is powerless to create the universe in the absence of cause and effect in physics, then relativity cannot possibly restrain the creation of the cosmos by God acting outside of spacetime in order to create spacetime. In other words, the Creator of spacetime and hence relativity cannot be subject to spacetime and hence relativity. And because we know a Creator of the cosmos must be real under the philosophy of superdeterminism, then the creation of spacetime cannot be subject to relativity.

Some might argue that Dr. Hansson's proof is logically flawed as circular, because his use of Special Relativity implies a block universe without cause and effect in physics, which Dr.

Hansson then uses to prove that we live in a block universe without cause and effect in physics. The flaw of circular logic is presuming the existence of something in a proof of its existence. Of course, the underlying postulates of Special Relativity are not a block universe without cause and effect in physics, but rather the constancy of the speed of light namely that the speed of light in a vacuum is the same for all observers, regardless of the motion of the light source or the observer, and the principle of relativity namely that laws of physics are the same in all inertial frames of reference. Indeed, Special Relativity has been scientifically verified and Dr. Hansson simply applied it in his proof to the correlations in spin measurement results scientifically verified in entangled particle pairs. Consequently, the Theory of Special Relativity is not premised on the existence of a static block universe without cause and effect in physics and so there is no logical error of circular reasoning in Dr. Hansson's proof. The concept of a block universe is a philosophical interpretation of Special Relativity, but it is not a necessary consequence of the theory or a physical law.

Some claim that a static block universe in which past, present and future events are all equally real exists, but that there is a "spotlight" that moves along the timeline, illuminating a particular moment as the present. This moment is considered special, and it is only within this spotlight that things truly exist in the present sense. The Moving Spotlight theory does not provide a concrete answer as to what moves the spotlight. Some interpretations suggest that the movement of the spotlight is an intrinsic part of the structure of reality, perhaps a fundamental law of the universe. Others propose that it might be linked to the nature of consciousness itself, with the spotlight representing the focus of our attention as we experience the flow of time. However, superdeterminism disproves the Moving Spotlight theory. A Moving Spotlight would have to be an aspect of the universe in order to affect the universe. However, a Moving Spotlight could not actually cause a particular aspect of the universe to be illuminated as the present moment of time in the absence of cause and effect in physics. The concept of a "moving spotlight" that actively causes a particular moment to be special implies a causal relationship between the "moving" and the effect of a special present moment of time. In a universe without cause and effect, the spotlight might exist, but its movement and its ability to designate a specific moment as the present would be meaningless. It would be more like a static spotlight illuminating all moments simultaneously, without any inherent progression or special significance. Therefore, the Moving Spotlight Theory which relies on the concept of cause and effect to function is disproven by superdeterminism.

Some argue that even though all moments exist simultaneously in a block universe, that the causal relationships between events are still present. Events in the past still lead to events in the future, even if they are all predetermined. As an analogy, imagine a completed novel. Every page and sentence exists simultaneously within the book. However, the story progresses sequentially, with each event building upon the previous ones. While the entire story is already written, the causal relationships between events are still clear. This argument suggests that while our perception of time might be linear, the underlying structure of the universe could be atemporal, with all events existing simultaneously. Yet, the causal connections between these events remain intact, giving the illusion of a temporal flow. However, this understanding of the block universe cannot be correct, because it is premised on the actual existence of cause and effect in physics disproven by superdeterminism.

Some might argue that an immaterial God cannot create the universe, because power by definition requires mass or energy neither of which an immaterial God possesses. The laws of physics define power as force times velocity meaning mass times acceleration times velocity.

Einstein's famous energy mass equivalence says that energy equals mass times the speed of light squared. Therefore, God would either need mass or energy in order to have power under the laws of physics. But, in the absence of cause and effect in physics, there is no actual power under the laws of physics to create anything and power is merely an illusion of the ordering of appearances on static hyperplanes of spacetime in our static block universe. Power requires a force, and an actual force would require actual cause and effect in physics. In the absence of cause and effect in physics, actual power is not possible under the laws of physics. Consequently, our immaterial God need not possess mass or energy in order to create the universe, because the laws of physics do not have the actual power to create the universe and therefore the laws of physis cannot define the actual power necessary to create the universe.

Some argue that Special Relativity requires cause and effect in physics. The argument goes that Special Relativity is premised on the constancy of the speed of light. The speed of light is considered the speed of causality, because it represents the maximum speed at which information or a causal influence can travel through spacetime. This means that no physical object or signal can travel faster than the speed of light ensuring that cause always precedes effect. If something could travel faster than light, it would be possible to send signals into the past violating the principle of causality, which states that cause must always precede effect. This would lead to logical paradoxes, such as one traveling back in time to prevent their own birth. The idea that traveling faster than light could lead to time travel into the past stems from the principles of Special Relativity, specifically the concept of time dilation. As an object approaches the speed of light, time slows down for that object relative to a stationary observer. If an object could somehow exceed the speed of light, the time dilation would become extreme, potentially causing time to flow backward for that object relative to the rest of the universe.

However, the absence of cause and effect in physics prevents backwards time travel, because one could not travel backwards in time and actually cause a change to the past or its predetermined future. Therefore, one cannot travel faster than the speed of light due to the absence of cause and effect in physics, which renders backwards time travel an impossibility. Backwards time travel is not impossible due to causal paradoxes, but rather due to the fact that one could not travel into the past and actually cause a change to the past or its predetermined future in the absence of cause and effect in physics. Accordingly, Special Relativity does not require cause and effect in physics, because backwards time travel is rendered impossible by the lack of cause and effect in physics and not because of an aversion to causal paradoxes. Indeed, causal paradoxes cannot be even hypothetically real in the absence of cause and effect in physics. Moreover, Dr. Hansson's proof presents a thought experiment under Special Relativity in which cause and effect have become scrambled and ill-defined. The cause of the correlated spin measurements for Observer 1 is also the effect for Observer 2. This apparent role reversal of cause and effect does not lead to any causal paradox, because both Observers see the same correlated spin measurement results. Dr. Hansson's proof demonstrates that causal paradox is not an issue in Special Relativity and therefore, aversion to causal paradox is not the reason for the speed of light limitation. Consequently, Special Relativity and the constancy of the speed of light for all observers is not premised on the principle of causality, but rather are consistent with Dr. Hansson's proof that cause and effect in physics are not real.

Finally, some argue that Quantum Field Theory (QFT) avoids the inconsistency set forth in Dr. Hansson's proof. QFT ensures the consistency of physical measurements, including spin, across different inertial frames using representation theory. While representation theory ensures the consistency of the mathematical description of spin, it does not ensure the consistency of the order in which events occur. Indeed, representation theory does not predict that different observers will see a different sequence of causally connected events and hence does not resolve the inconsistency discussed in Dr. Hansson's proof.

Dr. Hansson's version of superdeterminism is resilient against all objections and challenges. This is to be expected, because his version of superdeterminism is proven true by Einstein's Special Relativity. Unfortunately, many objectors are biased due to the universal illusion of our experience that cause leads to effect. However, when one considers possible static reasons for the organization of our block universe without cause and effect in physics, one can appreciate the truth that cause and effect in physics are not actually real and that we live in a superdeterministic universe.