THE PHILOSOPHY OF SUPERDETERMINISM SUPPORTED BY ENTROPY

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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. The philosophy of superdeterminism is supported by entropy in the light of principles of reductionism. The second law of thermodynamics and the universe's drive towards higher entropy create a clear arrow of time at the macroscopic level, which aligns with our subjective experience of time moving forward. As time moves forward, we observe causes disappearing and transforming into effects. But, at the most fundamental level described by time-reversible laws like Newton's Third Law, the universe does not inherently recognize a directed cause and effect in the way we intuitively grasp it. Time-reversible laws are considered more fundamental than entropy, because they describe the behavior of matter and energy at their most basic, often microscopic, levels and work equally well whether time flows forward or backward. If causes truly disappeared, a reversed process would imply something appearing from nothing, which would violate conservation laws that are central to these fundamental laws. Because our experience of cause and effect is an emergent phenomena based on entropy and not a fundamental principle of physical reality, then we should believe that the fundamental principles of physical reality pointing toward a static block universe is the truth. Moreover, because the most fundamental principles of physical reality do not recognize cause and effect, then we should disbelieve in cause and effect in physics in accordance with the principle of reductionism. A superdeterministic interpretation positing a predetermined static block universe without cause and effect in physics aligns well with a reductionism, because it takes the time-symmetric nature of fundamental laws at face value. Because fundamental laws do not have a preferred direction of time, then a model where all moments in time exist equally is a more direct consequence of these fundamental principles than a model with a flowing time and inherent causality.

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 in physics. The philosophy of superdeterminism is supported the entropy of the universe. Entropy is a measure of the disorder within a system. The Second Law of Thermodynamics states the total entropy of an isolated system can only increase or remain constant in ideal, reversible processes. Because most real-world processes are irreversible, the overall trend is an increase in entropy. If we extrapolate this law to the entire universe over vast timescales, it suggests that the universe will continue to become more disordered. Energy will become more evenly distributed, temperature differences will diminish, and the ability to do useful work will decrease.

It is this tendency by the universe to increase entropy that allows us to experience a forward movement in time. The macroscopic world we experience has a clear direction of time. We see eggs breaking but never spontaneously unbreaking, heat flowing from hot to cold but

[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.

never the reverse, and memories of the past but not of the future. Our psychological experience of time moving forward is intimately linked to this thermodynamic arrow. We remember the past (lower entropy states) and anticipate the future (higher entropy states). It is difficult to imagine or experience a reversal of time, because it would violate the second law of thermodynamics in our macroscopic world. The second law of thermodynamics and the universe's drive towards higher entropy create a clear arrow of time at the macroscopic level, which aligns with our subjective experience of time moving forward.

As time moves forward, we observe causes leading to effects. During this transition, the observable form of the initial cause often transforms or is consumed in the creation of the effect, leading to its apparent disappearance. For instance, a moving baseball (the cause) strikes a window, and the observable cause of the intact baseball moving towards an unbroken window vanishes as its energy breaks the glass, resulting in a broken window and a baseball moving onward (the effect). Thus, the forward flow of time allows for the transformation of the cause into the effect, where the initial, readily identifiable form of the cause gives way to the resulting outcome, making the original cause, in its prior state, no longer observable. It is entropy that makes us believe that causes disappear as they transform into effects. In essence, the irreversible nature of processes, driven by the increase in entropy, leads to a transformation where the ordered energy or structure of the cause is dispersed or reorganized into a more disordered state (the effect). This transformation makes the initial, observable form of the cause appear to disappear as it becomes embedded within the higher entropy state of the effect.

Our strong belief in cause and effect is deeply rooted in our experience of entropy, the universe's tendency towards increasing disorder.[2] We observe this principle not only in the apparent disappearance of causes as they transform into effects, like a moving baseball shattering a window, but also in countless other everyday phenomena. The melting of ice into less ordered liquid water, the diffusion of scents spreading into a uniform distribution, and the irreversible decay of organized structures all demonstrate the natural progression from order to disorder. These consistent experiences of systems moving towards higher entropy, where initial ordered states give way to more probable, less organized outcomes, reinforce our understanding of a unidirectional flow of time and the causal relationships that drive these irreversible transformations. The fundamental law of increasing entropy, therefore, underpins our intuitive grasp of cause and effect as a truthful and inherent aspect of the universe we experience.

But, entropy is not a fundamental law for the existence of physical reality itself. Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction. This means that whenever one object exerts a force on a second object, the second object simultaneously exerts a force that is equal in strength and opposite in direction back on the first object. For example, if you consider billiard ball A moving toward and striking stationary billiard ball B, the cause A of the movement of B actually involves an equal and opposite force applied on A by B. According to Newton's Third Law, at the exact moment of contact and during

[2] The brain's fundamental processes of encoding memories and processing information inherently increases overall entropy through the dispersal of energy and information across neural networks. The brain can only effectively function in a direction towards increasing entropy. Consequently, our cognitive functions, including the unidirectional flow of memory and our perception of cause and effect in time, are fundamentally aligned with the universe's progression towards higher entropy. We no longer sense past events which we perceive as disappearing from the present moment in time, because the brain only works toward a direction of increasing entropy leaving past events behind as entropy increases toward the future - not because those past events must actually cease to exist.

the collision, billiard ball B exerts an equal in magnitude and opposite in direction force back on billiard ball A. So, while billiard ball A appears to be the cause and billiard B the effect, the fundamental equal exchange of forces by the balls upon collision do not give a preference to the force of A as cause over the equal and opposite force of B as the effect. At the more fundamental level of Newton's Third Law, physical reality does not recognize cause and effect, which is really just an aspect of entropy.

At the most fundamental level described by time-reversible laws like Newton's Third Law, the universe does not inherently recognize a directed cause and effect in the way we intuitively grasp it. Instead, what we perceive as cause and effect is deeply connected to the statistical increase of entropy, which provides the arrow of time and the unidirectional nature of macroscopic processes. Our experience of cause and effect is, in many ways, a manifestation of the second law of thermodynamics operating in our universe. Time-reversible laws are considered more fundamental than entropy, because they describe the behavior of matter and energy at their most basic, often microscopic, levels and work equally well whether time flows forward or backward. These laws, like those of classical mechanics (without friction), electromagnetism, and basic quantum mechanics[3], are seen as foundational to the fabric of

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[3] Quantum mechanics and quantum field theory ("QFT") are based on time-reversible fundamental laws with the notable exception of the weak force. The time reversal violation in the weak force manifests as a statistical preference for one temporal direction over the other in many decays of certain elementary particles, leading to subtle asymmetries in the rates of forward and reverse processes. The time reversal violation of the weak force is practically conclusive evidence against a general principle of retrocausality operating in our universe. If retrocausal laws of physics significantly differed from our forward-looking laws of physics, the predictive accuracy we currently observe would be lost due to disruption and interference. Because the fundamental laws of physics are generally symmetric in time, but retrocausality is not real, then the general time reversal symmetry of our fundamental laws of physics suggests that forward causality is symmetrically also not real consistent with a predetermined static block universe without cause and effect in physics.

reality. In contrast, entropy, particularly the second law dictating its increase, is understood as an emergent, statistical property arising from the behavior of large numbers of particles. The arrow of time and our experience of irreversible processes governed by entropy are thus viewed as consequences of these underlying, time-reversible laws acting on a universe with specific initial conditions, rather than entropy being a primary law governing the fundamental constituents of reality.

We assume that causes disappear as they transform into effects. But, the fundamental laws of physical reality do not require that causes disappear. Indeed, the time-reversible nature of our most fundamental laws of physical reality do not distinguish between cause and effect, which presumably means that causes do not actually disappear from existence. The time-reversible nature of fundamental laws implies that the underlying processes could, in principle, run backward. If causes truly disappeared, a reversed process would imply something appearing from nothing, which would violate conservation laws that are central to these fundamental laws. Accordingly, the time-reversible nature of our most fundamental laws of physical reality point to a block universe, where the past, present and future all exist and are equally real. Our perception of a flowing time and directed causality should be understood as an emergent phenomenon arising from the statistical behavior of matter governed by the second law of thermodynamics within this static spacetime block.

Because our experience of cause and effect is an emergent phenomena based on entropy and not a fundamental principle of physical reality, then we should believe that the fundamental principles of physical reality pointing toward a static block universe is the truth. Moreover, because the most fundamental principles of physical reality do not recognize cause and effect, then we should disbelieve in cause and effect in physics in accordance with the principle of reductionism.[4] A superdeterministic interpretation positing a predetermined static block universe without cause and effect in physics aligns well with a reductionism, because it takes the time-symmetric nature of fundamental laws at face value. Because fundamental laws do not have a preferred direction of time, then a model where all moments in time exist equally is a more direct consequence of these fundamental principles than a model with a flowing time and inherent causality. Accordingly, the philosophy of superdeterminism is supported by entropy in the light of principles of reductionism.

[4] Reductionism is a philosophical and scientific approach that seeks to understand complex systems by breaking them down into their simpler or more fundamental parts. The core idea is that the properties and behavior of the whole can be explained by understanding the properties and interactions of its individual components. Our everyday experience of cause and effect, which operates at a macroscopic level, should ultimately be explainable in terms of the fundamental laws governing the behavior of elementary particles. Ideas like entropy and even causality itself are emergent phenomena arising from the collective behavior of many individual components acting under simpler, more fundamental rules. By fully grasping the time-reversible and non-causal nature of fundamental laws, we can better understand why our macroscopic world appears to have a directed time and causal relationships. The properties of the whole (our experience of causality) are determined by the properties and interactions of its parts (fundamental particles and forces). Reductionism encourages us to look beyond our immediate macroscopic experience of cause and effect and seek an explanation in the more fundamental, microscopic laws of physics. It suggests that the truth about reality lies at this deeper level, and our macroscopic perceptions are derived from it.