

Chance in animate nature, day 1

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[Ulrich Herkenrath](#), a mathematician working on stochasticity, convened a tiny [symposium](#) of only about a dozen participants discussing the role of chance in living beings. Participants included mathematicians, philosophers and neurobiologists.

Herkenrath: “Man as a source of randomness”

Herkenrath kicked off the symposium with his own presentation on “Man as a source of randomness”. He explained some principal insights on stochasticity and determinism as well as some boundary conditions for empirical studies on stochastic events, emphasizing that deterministic chaos and stochasticity can be extremely difficult to empirically distinguish.

In a short excursion, he referred to [Nikolaus Cusanus](#), who found that no two subsequent situations can ever be exactly identical, our knowledge being thus essentially conjecture. Apparently, Cusanus was already proposing to falsify hypotheses as a means to approaching ‘truth’. Not surprisingly, he immediately referred to [Popper](#) with regards to the modern scientific method. Equally expectedly, when he started talking about kinds and sources of chance, he talked about quantum mechanics.

Moving from inanimate to living nature, he proposed amplifications of quantum chance to the macroscopic level as sources of objective randomness in the mesocosm, always emphasizing the difficulties in distinguishing between such events and events that only seem random due to our limited knowledge. Contrasting two hypotheses of a deterministic world and one where objective randomness exists, he mentions the illusory nature of our subjective impression of freedom of choice. He never got into the problem that quantum randomness, if only amplified, leaves much to be desired in terms of decision-making. Essentially, he seemed to be arguing that a deterministic world would be a sad place in which he doesn’t want to live, so he rejects a deterministic world. I’ve never found this all too common argument very convincing.

Notably, Herkenrath mentioned that organisms are more than matter. Not sure what to make of this. He defined autonomy as the ability to make decisions that are not determined by the environment. Herkenrath went on to describe classes of decisions, such as subconscious and conscious decisions. How brains make these different forms of decisions will be featured in different talks at the symposium. Herkenrath defined a third class of decisions those that have come about by explicit (subconscious or conscious) randomization. A fourth class is proposed, where a uniform distribution is consciously generated, e.g. a human using a lottery.

Falkenburg: “Causality, Chance and Life”

The second speaker of the first day was [Brigitte Falkenburg](#), author of “[Mythos Determinismus](#)” ([book critique](#)). She started out wondering how neural determinists understand evolution.

In Falkenburg’s tour de force through the idea history of chance and necessity, we first learned that the concept of chance itself can be traced back to [Leibniz](#), who described events that may have happened otherwise. Leibniz claimed in his metaphysics that objective chance does not exist, as the whole world is rational and determined. According to Leibniz, everything has a

[sufficient reason](#). In a very scholarly segue mentioning the dispute between Leibniz and [Newton](#) about who invented calculus, she moved to the relationship between the laws of nature and chance. [Kant](#) extended Newton's mechanistic laws from the solar system to the entire universe ([Kant-Laplace hypothesis](#)). In his "critique of pure reason" Kant later concluded that Leibniz's 'sufficient reasons' are better described as 'causes' and formulated the principle of causality as an 'a priori' of human thinking. This was the start of the demand for causal explanations in the empirical sciences: science never stops asking for causes. However, Kant's critique did not fully pervade the subsequent thinking, leading instead to [Laplace's](#) determinism. Laplace was convinced that our insufficient knowledge is the only reason for apparent (subjective) randomness, and a more knowledgeable intelligence would be able to tell the future (cf. [Laplace's demon](#)).

With this backdrop of the idea history of causality, Falkenburg went on to discuss modern concepts of causality away from equating it with determinism. Both [Hume](#) and Kant defined causality as a mode of thinking, i.e., psychologically, rather than as a property of the universe. According to them, a causal relationship between events is subjective rather than objective. [Mill's](#) and [Russell's](#) positivism later did away with causality as "a relic of a bygone era" (Russell). One argument is that a cause can be seen as just a natural law and the initial state of a system. Deterministic laws are invariant to a reversal of time – as such, causes can also lie in the future.

Today's philosophical variants of causality concepts reflect this comparatively weak view of causality, which are very different from the way we scientists would intuitively understand it. In a short discussion of the concept of causality in physics, she quickly went through classical mechanics, thermodynamics and quantum mechanics and special relativity, emphasizing that we still do not have a theory unifying these different approaches (she called it 'patchwork physics').

Towards the end, Falkenburg discussed the connection between causality and time, emphasizing that the arrow of time cannot have a deterministic basis and all deterministic laws are time reversible. As such, extreme determinism comes with a high metaphysical price: time becomes an illusion. According to Falkenburg, causality is hence not the same as determinism: a causal process is not necessarily deterministic, it can be composed of determinate and indeterminate components. Thus, if you do not think time is an illusion and all possible outcomes coexist, causality does not imply determinism and chance can be a cause as in, e.g. evolution.

At the very end she mentioned [Greenfield](#) and the limits of the natural sciences in reducing consciousness to materialism. I'm starting to get the impression that rejecting determinism all too often goes hand in hand with woo peddling. Why is that?