Hidden Determinism, Probability, and Time's Arrow

Primas, Hans (2002) Hidden Determinism, Probability, and Time's Arrow.

Abstract

In present-day physics the fundamental dynamical laws are taken as a time-translation-invariant and time-reversal-invariant one-parameter groups of automorphisms of the underlying mathematical structure. In this context-independent and empirically inaccessible description there is no past, present or future, hence no distinction between cause and effect. To get the familiar description in terms of causes and effects, the time-reversal symmetry of the fundamental dynamics has to be broken. Thereby one gets two representations, one satisfying the generally accepted rules of retarded causality (" no effect can precede its cause "). The other one describes the strange rules of advanced causality. For entangled (but not necessarily interacting) quantum systems the arrow of time must have the same direction for all subsystems. But for classical systems, or for classical subsystems of quantum systems, this argument does not hold. As a cosequence, classical systems allow the conceptual possibility of advanced causality in addition to retarded causality. Every mathematically formulated dynamics of statistically reproducible events can be extended to a description in terms of a one-parameter group of automorphisms of an enlarged mathematical structure which describes a fictitious hidden determinism. Consequently, randomness in the sense of mathematical probability theory is only a weak generalization of determinism. The popular ideas that in quantum theory there are gaps in the causal chain which allow the accommodation of the freedom of human action are fantasies which have no basis in present-day quantum mechanics. Quantum events are governed by strict statistical laws. Freedom of action is a constitutive necessity of all experimental science which requires a violation of the statistical predictions of physics. We conclude that the presently adopted first principles of theoretical physics can neither explain the autonomy of the psyche nor account for the freedom of action necessary for experimental science.

Keywords:	Determinism Probability Time's arrow Randomness Quantum events Freedom of action Statistical laws
Subjects:	General Issues: Determinism/Indeterminism Specific Sciences: Probability/Statistics Specific Sciences: Physics: Quantum Mechanics
ID Code:	948
Deposited By:	Primas, Hans
Deposited On:	28 December 2002