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Mathematical origin of time arrow YURY SHIMANSKY, Harrington Department of Bioengineering, Arizona Biodesign Institute, Arizona State University, Tempe, AZ 85287 — Laws describing the main types of physical interactions are symmetrical with respect to the direction of time flow. At the same time, many virtually irreversible processes are observed. This "time arrow" paradox usually is associated with the law of entropy increase. The fact that physical systems obey this law regardless of their physical nature suggests that it may be based on a certain, yet unknown, mathematical principle. Here it is demonstrated that, if, on a time *micro* scale, the intensity of fluctuations of a certain parameter depends on the parameter's value, it would appear to an external observer on a time *macro* scale that the parameter tends to be modified in the direction of fluctuation intensity decrease. It is shown that the law of entropy increase is a consequence of this principle, if it is applied to entropy as a state variable of a thermodynamic system. The fundamental nature of this principle suggests that it must operate on virtually every level of physical reality. The principle is of great potential value for understanding mechanisms of self-organization, learning, adaptation, and evolution.

Yury Shimansky
Harrington Department of Bioengineering, Arizona Biodesign Institute
Arizona State University, Tempe, AZ 85287

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