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On Eduardo R. Caianiello's Cybernetic Physics

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Contemporary physics developed in the twentieth century through a succession of revolutions that upset its epistemological status with the prospect of a new ontology and a new gnoseology. From the physics of chaos to the theories of relativity, from quantum physics to quantum-relativistic field theory and the theory of the S matrix ("scattering matrix"). Recently, the transversal scientific paradigm of information has been definitively establishing itself: above all, through its concretization in the realization of machines, as widespread as personal computers, capable of processing and transmitting information up to an even greater ability to virtually simulate any type of physical reality. A new informational conception of Nature emerged, of the Universe as a potentially infinite computer. However, there is still a lack of a mathematical formulation of physics and cosmology in terms of information. In recent years, the research of Eduardo R. Caianiello (1921-1993), a Neapolitan physicist and cybernetist, has been linked to this goal, who, in 1980, formulated quantum theory in an 8-dimensional non-Euclidean relativistic phase space. The operators of Heisenberg algebra (also position and time) are expressed in a quantization by means of covariant derivatives and the quantum commutation relations are interpreted as components of the curvature tensor. The geometric curvature thus expresses the quantum uncertainty in terms of informational entropy (it is a complex information geometry: the ds^2 coincides with the cross-entropy). The algebra is that of the octonions. Caianiello reformulated physics on the basis of information theory opening a way to a great revolution.

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