

Abstract Submitted
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Quantum of Information CASLAV BRUKNER, ANTON ZEILINGER,
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Vienna, Austria — The violation of local realism is today a well established experi-
mental fact. From it follows that either locality or realism or both cannot provide a
foundational basis of Nature. Relaxing the locality condition would essentially not
change the epistemological structure of classical physics but only extend its limits.
Abandonment of reality, however, would require a radical revision of the conceptual
background of all our theories so far. Is a novel conceptual basis of quantum theory
feasible, in which the impossibility of defining external reality independent and prior
to observation naturally emerges? We suggest the finiteness of information content
of a quantum system as providing such basis. Any realistic theory that could arrive
at an accurate prediction of a particular event would require the system to carry
information as to which specific result will be observed for all possible future mea-
surements. Because the system cannot carry more information than is in principle
available, there must exist measurements for which individual events contain an ele-
ment of irreducible randomness. Quantum entanglement arises from the possibility
that information in a composite system resides more in the correlations than in prop-
erties of individuals. In the talk we will report on recent efforts towards providing
derivations of the elements of the Hilbert space structure from the quantization of
information.

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