Euclidean, Lorentzian, and Physical Time ROLAND ALLEN, ZO-
RAWAR WADIASINGH, Texas A&M University — Lorentzian time is the time
which occurs in the standard equations of physics, with a different status than a
spatial coordinate x. Euclidean time is obtained from Lorentzian time by a Wick
rotation in the complex t plane, and enters into the resulting equations exactly in
the same way as a spatial coordinate x. It seems obvious that the physical time
we experience must be Lorentzian time, and that Euclidean time is just a mathe-
matical artifice which we employ for convenience in calculations. However, Hawking
has suggested, in both his popular book ("A Brief History of Time") and in a more
technical context ("Euclidean Quantum Gravity") that exactly the opposite may be
true: Euclidean time may be more fundamental, making quantum mechanics for-
mally identical to statistical mechanics, and Lorenzian time is introduced by human
observers because it is more convenient for calculations. We present an argument,
based on the path integral formulation of quantum mechanics, which supports this
latter point of view. In addition, we propose that the breaking of the symmetry
between space and time has a simple cosmological origin.

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