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Sir Roger Penrose*, University of Oxford. *Spacetime conformal geometry, and a new extended cosmology.*

The conformal geometry of spacetime (defined, in effect, by the 9 ratios of the 10 metric components), being equivalent to the location of the light cones, is more primitive than the metric structure. Certain parts of physics respond only to this conformal geometry, these becoming dominant both at the “Big Bang” and in the remote future, allowing conformal extensions both to the past and future. A proposed new cosmology takes advantage of this remarkable fact, providing a scheme which unites three of the most puzzling aspects of modern cosmology: (1) the extreme specialness of the initial Big-Bang state underlying the second law of thermodynamics, (2) the presence of a positive cosmological constant (or “dark energy”), and (3) the presence of a mysterious dark matter which dominates the mass of the universe. (Received September 13, 2006)