From Maxwell’s Electrodynamics to Relativity, a Geometric Journey

FELIX T. SMITH, Retired — Since Poincaré and Minkowski recognized \( ict \) as a fourth coordinate in a four-space associated with the Lorentz transformation, the occurrence of that imaginary participant in the relativistic four-vector has been a mystery of relativistic dynamics. A reexamination of Maxwell’s equations (ME) shows that one of their necessary implications is to bring to light a constraint that distorts the 3-space of our experience from strict Euclidean zero curvature by a time-varying, spatially isotropic term creating a minute curvature \( K_{\text{curv}}(t) \) and therefore a radius of curvature \( r_{\text{curv}}(t) = K_{\text{curv}}^{-1/2}(t) \) (F. T. Smith, Bull. Am. Phys. Soc. 60, #2, Abstr. V1.00294, March, 2015). In the light of Michelson-Morley and the Lorentz transformation, this radius must be imaginary, and the geometric curvature \( K \) must be negative. From the time dependence of the ME the rate of change of the curvature radius is shown to be \( dr_{\text{curv}}/dt = ic \), agreeing exactly with the Hubble expansion. The imaginary magnitude is the radius of curvature; the time itself is not imaginary. Minkowski’s space-time is unjustified. Important consequences for the foundations of special relativity follow.