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The Geometry of Imaginary Length in Maxwell's Equations and Relativity FELIX T. SMITH, retired — Since the beginnings of relativity the reason for the imaginary time-dependent component in its (x, y, z, ict) 4-space and in Minkowski's space-time has been a mystery. The investigation of an unresolved issue in the structure of Maxwell's equations leads unexpectedly to a recognition that the central imaginary quantity is a length and not a time. The geometry of this Maxwellian system is found to be both minutely time dependent with the Hubble expansion and Lobachevskian with a negative curvature. Because curvature is an inverse squared length, $K_{\text{curv}} = R_{\text{curv}}^{-2}$, this negative curvature of the nonEuclidean geometry creates a generalized curvature length that is imaginary. It is the combination of global expansion with this negative curvature $K_{\text{curv}}^{\text{Lob}} < 0$ that results in a curvature length that is both imaginary and increases with time, $dR_{\text{curv}}(t) = icdt$. The imaginary is thus associated primarily with geometric concepts of length and curvature, connected only secondarily with time because of the expansion. Minkowski's space-time associated the imaginary signature entirely with time and not with length, and cannot be sustained.

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