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The Geometry of Time in General Relativity ALEXANDER MAYER, Pritzker Fellowship — A conceptual model of special relativity that rests on relative temporal geometry motivated by H. Minkowski, rather than relative temporal rate motivated by H. Lorentz, provides a more robust intellectual foundation for the synthesis of special relativity with accelerated reference frames than Einstein's perspective yielded in 1909-1915. Minkowski's geometry implies local orthogonality of space and time dimensions for a freefalling reference frame; for an idealized region of "flat" spacetime devoid of gravitational influence, all local time coordinates associated with the neighborhood of all distinct points in space are parallel. Geometric deformation of spacetime due to the presence of mass implies that no two of these local time coordinates in the "curved" spacetime remain parallel. Relativistic effects between points in the gravitational field are most accurately described, both qualitatively and quantitatively, in terms of the relative angular displacement of local time coordinates associated with those points. In addition to reifying general relativity, temporal geometry provides a means of calculating transverse gravitational redshift, a subtle relativistic gravitational effect implied by first principles that was previously overlooked in gravitational theory. Calculations (presented in Session E, Poster Session 1) accurately predict empirical observation of the effect.

Alexander Mayer
Pritzker Fellowship

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