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Conformal gravity, dark matter and time JEFFREY HAZBOUN, JAMES WHEELER, Utah State Univ — Starting with the conformal symmetries of Euclidean space, we construct a manifold where time manifests as a part of the geometry. Though there is no matter present in the geometry studied here, geometric terms analogous to dark energy and dark matter appear when we write down the Einstein tensor. Specifically, the quotient of the conformal group of Euclidean 4-space by its Weyl subgroup results in a geometry possessing many of the properties of relativistic phase space, including both a natural symplectic form and non-degenerate Killing metric. We show that the general solution possesses orthogonal Lagrangian submanifolds, with the induced metric and the spin connection on the submanifolds necessarily Lorentzian, despite the Euclidean starting point. We also find that two new tensor fields exist in this geometry, not present in Riemannian geometry. The first is a combination of the Weyl vector with the scale factor on the metric, and determines the time-like directions on the submanifolds. The second comes from the components of the spin connection. Finally, we show that in the absence of Cartan curvature or sources, the configuration space has geometric terms equivalent to a perfect fluid and a cosmological constant.

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