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Spacetime Dynamics from Spin Dynamics: Scalar and Pseudoscalar Fields JAMES CRAWFORD, Penn State University — Two fundamental unresolved issues in gravitational physics are the origin of the cosmological constant (dark energy) and the origin of mass. It is remarkable that these two seemingly disparate quantities appear to have the same order of magnitude: the cosmological constant is of order $\Lambda \sim (5meV)^4$ and the neutrino mixing parameters suggest neutrino masses also on the order $m_\nu \sim 5meV$. Since all matter particles are represented by spinor fields, it seems natural to inquire whether the gravitational interaction of the spinor fields can illuminate the situation. To this end, a theory of gravity where the Lagrangian density is taken to be quadratic in the spin curvature is being studied. Relaxing the Schrodinger condition allows the introduction of new fields into the spin connection. This results in the spin curvature containing not only spacetime curvature but also torsion as well as contributions from other fields. If we add only a scalar field the theory generates mass for the spinors but its cosmological solution oscillates. On the other hand, if we add only a pseudoscalar field the cosmological solution accelerates but yields no mass for the spinors. Here I discuss the situation where both a scalar and pseudoscalar are included in the theory.

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