

Abstract Submitted  
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**Stress-Energy Tensor in Einstein-Cartan Theory** EUGENE KUR,  
Univ of California - Berkeley — We present a proof connecting the Noether stress-energy tensor with the Hilbert stress-energy tensor for theories coupled to an arbitrary background metric. In particular, we show how applying Noether's theorem to spacetime diffeomorphisms leads to Hilbert's formula  $T^{\mu\nu} \propto \frac{\delta S}{\delta g_{\mu\nu}}$ . The proof immediately yields the symmetry of the stress-energy tensor as well as the vanishing of its covariant divergence. In the case that the theory is coupled to a background tetrad and a background connection, we show that the stress-energy tensor receives contributions from the torsion of the background connection and the spin current of the matter. We discuss the applications of these results to fermions coupled to Einstein-Cartan gravity and to theories of gravity with no matter coupling.

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