

Abstract Submitted  
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**Symmetries of the Gravitational Field and Symmetric Criticality**<sup>1</sup> GUILLERMO FRAUSTO, CHARLES TORRE, Utah State University — method of symmetry reduction. Lies methods have often been applied to the Lagrangians underlying the PDEs of physics, but (as Stephen Hawking first showed in the context of General Relativity) it is possible that the symmetry reduction of Lagrangians can fail in the sense that the reduced Lagrangian gives the wrong PDEs. This issue was resolved by Anderson, Fels, Torre, who gave necessary and sufficient conditions on a symmetry group such that the reduction of any Lagrangian will be successful. The goal of this project is to apply these conditions to gravitational field theories. All possible symmetry groups (and hence all possible symmetry reductions) of gravitational fields have been enumerated by Hicks. There are about 100 such groups. I use the math software Maple, with the differential geometry software package created by Ian Anderson and Charles Torre, to check once and for all the conditions of Anderson, Fels, Torre. This is done by calculating the Lie algebra cohomology of the symmetry group relative to its isotropy subgroup and the vector space of isotropy.

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