Kaluza-Klein expansion of pure gravity on general spaces\textsuperscript{1} ELLIOTT TAMMARO, MICHAEL SCHULZ, Bryn Mawr College — When the topology of spacetime is a product space with compact internal factor, higher dimensional gravity on the full spacetime has an equivalent lower dimensional formulation involving infinite towers of lower dimensional fields, via the Kaluza-Klein mechanism. For pure classical Einstein gravity, we derive the full lower dimensional action, which surprisingly, has not appeared in the literature except in the special case of 5D with an internal circle. In this action, scalar fields parametrize the space of Riemannian metrics on the internal manifold, vector fields gauge the internal diffeomorphism group, and symmetric tensors implement lower dimensional Einstein gravity plus a tower of analogous fields transforming under the gauge group. Any particular choice of scalars spontaneously breaks the gauge group to the isometry group of the corresponding internal metric, and for spatially homogeneous solutions, the reduced scalar manifold is the moduli space of Ricci flat internal metrics. A final noteworthy feature of this action is that there is generically no consistent truncation to massless modes.

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