**On a Broken Formal Symmetry between Kinetic and Gravitational Energy** ARMIN NIKKHAH SHIRAZI, University of Michigan — Historically, the discovery of symmetries has played an important role in the progress of our fundamental understanding of nature. This paper will demonstrate that there exists in Newtonian theory in a spherical gravitational field a formal symmetry between the kinetic (KE) and gravitational potential energy (GPE) of a test mass. Put differently, there exists a way of expressing GPE such that the form of the mathematical expression remains invariant under an interchange of KE and GPE. When extended to relativity by a suitable assumption, it leads to a framework that bridges the general relativistic and Newtonian conceptions of gravitational energy, even though the symmetry is broken except in the infinitesimal limit. Recognizing this symmetry at infinitesimal scales makes it possible to write a relativistic equation of an individual graviton, the properties of which under under one interpretation may be unexpected.

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