Review of: "On the Mass of (Gravitational) Potential Energy"

Richard Oldani[1]

1 Illinois Institute of Technology, United States

The author poses an interesting question about gravitational potential energy. The reviewers have voiced opposition for various reasons but do not offer an improved interpretation of potential energy. In the article, the Hamiltonian of the system is used, which is the sum of the kinetic and potential energies, where kinetic energy is a function of momentum and potential energy is a function of position. This is a manifestation of the conjugate variables position and momentum. He proposes that due to mass-energy equivalence, an increase in potential energy will lead to an increased mass of the interacting system and hypothesizes that the mass will be shared by the material bodies. This proposal is in direct opposition to quantum theory, which denies the exchange of energy and mass by means of continuous distributions. A different solution to the problem of visualizing potential energy in a gravitational system is possible based on the conjugate variables energy and time.

Imagine two atomic clocks, one located in the laboratory and another located at a significantly higher gravitational potential. When compared over a significant time period, the clock located at a higher potential will tick more frequently than the laboratory clock. In other words, if we integrate the conjugate variables over the time period for each system ∫ΔEΔt, the clock located at the higher potential exhibits an increased energy. The higher potential energy is expressed in a quantum mechanically consistent way. Since all matter is periodic, it is possible that the gravitational potential energy of any material body increases its internal periodicity compared to a material body at a lower gravitational potential. Other examples listed by the author could be conceived of as having structural explanations. This would result in a physical model of potential energy that is consistent with quantum mechanics.

Due to suggestions from the editorial staff (AI), I offer a more complete description of my solution to the problem of potential energy at: doi: 10.20944/preprints202009.0215.v8