Review of: "Does energy always have mass?"

Grit Kalies[1]

1 Hochschule für Technik und Wirtschaft Dresden (FH)

Potential competing interests: No potential competing interests to declare.

This paper asks the right questions and comes to an important and correct logical answer: While any mass of an object means that it has an equivalent form of energy, the inverse is not true: Not every form of energy contributes to the mass of a body. Or in the words of the author: "that energy not always has mass".

The author thinks for himself and is not predetermined and dictated by authorities. And indeed, the major energetic problems of modern physics result precisely from the misinterpretation of $E = mc^2$ as total energy.

Please also allow me to briefly discuss some contents of the reviews to the paper: The reviewers who claim that it is known that electromagnetic energy E_{hf} does "not have mass" or does not contribute to the mass of an object are short-sighted. Since Poincaré it is known and experimentally proven that a photon gas in a cavity behaves like a fluid with the dynamic mass. And free photons have dynamic mass, too. How else could one explain why photons can hit solar sails and accelerate them? Also, Planck had already known since 1904 that a warmer body (containing more photons and thus more E_{hf}) is heavier. Every form of energy contributes to the mass of a body, with the exception of positional energy E_{pot}, because the mass-proportionality of E_{pot} assumed by Einstein contradicts the conservation of energy: https://www.htw-dresden.de/en/luc/research/translate-to-english-thermodynamik/thermodynamics-vs-relativity

Instead of the total energy $E = mc^2$ heuristically stated by Einstein, there is: $E = mc^2 + E_{pot}$. Here, E_{pot} is not interaction energy or binding energy, but the positional potential energy. Some of the consequences of $E = mc^2 + E_{pot}$ are described in:

G. Kalies, D. D. Do, AIP Adv. 13 (2023), 065121-1–14. doi: 10.1063/5.0147910

G. Kalies, D. D. Do, S. Arnrich, AIP Adv. 13 (2023), 055317-1–12. doi: 10.1063/5.0147915

G. Kalies, D. D. Do, AIP Adv. 13 (2023), 095322-1–11. doi: 10.1063/5.0166847

G. Kalies, D. D. Do, AIP Adv. 13 (2023), 095126-1–16. doi: 10.1063/5.0166916

G. Kalies, D. D. Do, Momentum work and the energetic foundations of physics. V. Interaction of real wave objects via processes, AIP Adv., to appear.