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Extended Abstract

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Mass and its changing mode with speed density and its expansion in Einsteins relativity

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To achieve the relation between mass and velocity, we must be aware of the factors affecting the mass when it is speeding. Stagnation, momentum and time are the most essential factors of speed recognition, and the precise definition of them helps the relationship between mass and velocity. The purpose of this study is to investigate the factors affecting rest mass when it is speeding, and what factors affect velocity, and what factors are ineffective at high speeds. If we correctly express the relation of velocity with pressure, gravity, and density, we will reach the relation between mass and velocity. The velocity causes expansion and contraction, and modifies the state of the mass when a mass travels 299792458 meters in one second, it converts into energy, and when it travels 299792458 meters in less than a second, it converts into anti-mass or meta-energy. Dark energy and dark matter constitute 95% of the observable Universe. Yet the physical nature of these two phenomena remains a mystery. Einstein suggested a long-forgotten solution: gravitationally repulsive negative masses, which drive cosmic expansion and cannot coalesce into light-emitting structures. However, contemporary cosmological results are derived upon the reasonable assumption that the Universe only contains positive masses. By reconsidering this assumption, I have constructed a toy model which suggests that both dark phenomena can be unified into a single negative mass fluid. The model is a modified ΛCDM cosmology, and indicates that continuously-created negative masses can resemble the cosmological constant and can flatten the rotation curves of galaxies. The model leads to a cyclic universe with a time-variable Hubble parameter, potentially providing compatibility with the current tension that is emerging in cosmological measurements. In the first three-dimensional N-body simulations of negative mass matter in the scientific literature, this exotic material naturally forms haloes around galaxies that extend to several galactic radii. These haloes are not cuspy. The proposed cosmological model is therefore able to predict the observed distribution of dark matter in galaxies from first principles. The model makes several testable predictions and seems to have the potential to be consistent with observational evidence from distant supernovae, the cosmic microwave background, and galaxy clusters. These findings may imply that negative masses are a real and physical aspect of our Universe, or alternatively may imply the existence of a superseding theory that in some limit can be modelled by effective negative masses. Both cases lead to the surprising conclusion that the compelling puzzle of the dark Universe may have been due to a simple sign error.

What led Einstein to believe that negative masses could provide a solution to the cosmological constant is therefore of interest. To understand the physics of negative masses further, we need to "polarise" the Universe so that mass consists of both positive and negative counterparts. Polarisation appears to be a fundamental property of the Universe. Indeed, all well-understood physical forces can be described through division into two opposing polarised states. For example, electric charges (+ and −), magnetic charges (N and S), and even quantum information (0 and 1) all appear to be fundamentally polarised phenomena. It could therefore be perceived as odd that gravitational charges – conventionally called masses – appear to only consist of positive monopoles. While electromagnetism and quantum theory appear quite comprehensively understood, there are numerous indications that our understanding of the nature of mass remains incomplete on all spatial scales. In the standard model of particle physics (e.g. ATLAS Collaboration 2012), the mass of fundamental particles such as the nine charged fermions (six quarks and three leptons) and the Higgs boson are all free parameters that cannot be calculated from first principles. In cosmology, the observed matter in the Universe only accounts for 5% of the observed gravity, while the remaining 26% and 69% are accounted for via dark matter and dark energy respectively (e.g. Planck Collaboration XIII 2016). The physical nature of both these dark phenomena is completely unknown, and the quest to identify the Universe's missing mass has even given rise to modifications to Newton's and Einstein's theories of gravity.

Bottom Note: *This work is partly presented at 4th International Conference on Astrophysics and Particle Physics*