

# On the Persistence of Particles

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## Abstract

This paper is about the metaphysical debate whether objects persist over time by the selfsame object existing at different times (nowadays called 'endurance' by metaphysicians), or by different temporal parts, or stages, existing at different times (called 'perdurantism'). I aim to illuminate the debate by using some elementary kinematics and real analysis: resources which metaphysicians have, surprisingly, not availed themselves of. There are two main results, which are of interest to both endurantists and perdurantists.

(1): I describe a precise formal equivalence between the way that the two metaphysical positions represent the motion of the objects of classical mechanics (both point-particles and continua).

(2): I make precise, and prove a result about, the idea that the persistence of objects moving in a void is to be analysed in terms of tracking the continuous curves in spacetime that connect points occupied by matter. The result is entirely elementary: it is a corollary of the Heine-Borel theorem.

**Keywords:** Persistence, temporal parts, endurantism, perdurantism, criteria of identity, particles, spatiotemporal continuity, Heine-Borel theorem

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**Additional Information:** Dedicated to the memory of Jim Cushing; forthcoming in Foundations of Physics