Abstract Submitted
for the PSF17 Meeting of
The American Physical Society

A deeper look into the relationship between mass density and the curvature of spacetime JOHN LAUBENSTEIN, Charitable Management Systems, Inc. — John Wheeler is credited with the quote that is commonly stated as: "Mass tells space-time how to curve, and space-time tells mass how to move." While one needs to be careful in using language to describe mathematics, in this case, the quote is remarkably accurate in describing the Einstein Field Equations (for the simplest case of a non-rotating, non-moving, non-electromagnetic mass where the stress-energy tensor reduces to the mass density of the gravitating body). One the one side of the equality lies an expression for the curvature of spacetime and the other side the mass density of the gravitating body that defines the curvature. However, this type of statement can be applied to any equality where the properties associated on the left side of an equation can be thought of as defining the properties on the right side. For example, per unit mass, kinetic energy defines the velocity squared of an object, just as an object's velocity tells you something about its kinetic energy. Yet, these classical equalities all break down as velocities approach the speed of light. This talk looks at some of the parallels between General Relativity and classical mechanics to ask whether gravitation is really as simple as expressed by John Wheeler's quote.

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Date submitted: 27 Oct 2017 Electronic form version 1.4