Does the Inertia of a Body *Really* Depend Upon its Energy-Content?

Thomas Nordström, PhD

In this paper I will investigate the postulates of m = L/c^2 or in its famous form E = mc^2, i.e. mass has energy[1].
There are two concepts to discuss, i.e. inertia and energy.

To illuminate these concepts[2] I present two new postulates, 1-2, and one requirement 3:
1) Nothing exists in isolation, i.e. everything exists in relations.
2) Motion is a fundamental quality and property of the Universe and Nature.
3) Every concept has to represent the physical reality directly and concretely.

The concept *Energy* has an outstanding position in physics. However, based on the requirement, the concept energy does not fulfil the demand; and based on2-3 there is no rest energy E_0 in universe.

The concept *Inertia* does not fulfil postulate 2 and the requirement 3, i.e. a body in rest doesn´t exist and a body in linear motion doesn´t exist. Hence, Inertia does not represent the physical reality concretely and directly; and inthe Universe there is no rest mass m_0, based on the second postulate.

Since c denotes the speed of light, c^2 is pure mathematics since it does not have any direct representation in the reality, which is needed due to the third postulate; hence c^2 is not valid.

We can also notice that none of the concepts E, m_0 and c^2 fulfils the criterion by Einstein himself: "*Every element of the physical reality must have a counterpart in the physical theory*"[3].

Then the conclusion is:
1) The equation E = mc^2 is not valid. It is only the element *m*of the physical reality that has a counterpart in the physical theory.
2) The equation $E_0 = m_0 c^2$ is not valid.

Before we solve the problem by using concepts that directly and concretely represent the physical reality, we need a different theoretical approach.

Based on the first postulate - that nothing exists in isolation, i.e. everything exists in relations - we conclude that all parts and entities in the Universe hang together.

The concept relation relates to reality by demonstrating that there are relations between all parts in the Universe, formalized as aRb, where:
1) a, b, c, d … are any system, subsystem, unit, part in any field of the Universe, e.g. suns, planets, moons, galaxies, leptons, hadrons, mesons, baryons, nuclei, atoms and molecules.
2) The relation R is a flow (wave) of packages, p_{1-n}, between a, b, c, d … in any field of the Universe.

Based on the postulate - *Nothing exists in isolation, i.e. everything exists in relations*- in combination with 1and 2 above, The Principle of Relations is X = aRb, where X stands for E (Energy).

Between all systems and between all parts of any system, S, there is a continuous flow of packages, and the formula is: S = ap$_{1-n}$b.
The last sentence in Einstein´s paper is: "If the theory corresponds to the facts, radiation conveys inertia between the emitting and absorbing bodies."

Let´s call the emitting and absorbing bodies *a* and *b;* then *radiation conveys inertia* between them. Now, if we call radiation *r* (not to be confused with R, Relation), then we get *arb*, i.e. a special variant of aRb. We can now translate E=mc^2 to X=aRb, via *arb*. (Please read this slowly more than once.)

Inertia has then in Einstein´s paper two meanings, i.e. Trägheit/Density and mass, as it seems. If inertia means mass, which can be reasonable, then we can equate *radiation conveys inertia* with *radiation conveys mass.* If we then have the interpretation of radiation as transmitting, then we can call it *flow of packages* as in a beam of light. If L denotes Light, then L = p$_{1-n}$, where p$_{1-n}$= Υ_{1-n}, where Υ stands for photons.

The sentence … *radiation conveys inertia* ... will have several possible meanings:
1) Radiation conveys mass.
2) Flow conveys mass.
3) A flow of packages transmits mass.
4) A flow of packages transports mass.

Based on X = aRb and S = ap$_{1-n}$b any system is and can be described as complex flows. We might call them wave functions, since a wave function is a flow of masses, i.e. $\Psi(x,t) = p_{1-n}$.
Then 1-7 below deals with the same reality, i.e. how masses behave:
1) E = mc^{2}rewritten from m = L/c^2
2) mc^2 = ap$_{1-n}$b
3) E = arb = aRb
4) arb = ap$_{1-n}$b

5) $mc^2 = arb$

6) $E = mc^2 = arb$

7) $E = mc^2 = a(\Psi(x,t) = p_{1-n})b$

A wave consists of masses which stand in relation with systems. From system *a* a wave of masses moves to system *b*. This is valid for all masses in the Universe, e.g. galaxies, planets, suns, moons, atoms and molecules.

We need to find out how the emitted and the absorbed masses of the systems *a* and *b* operate and function.

Now, since E cannot be used, we will use the concept *package, p*, which directly represents the physical reality, where p_{1-n} denotes the flows of packages. It also fulfils Einstein´s criterion "every element of the physical reality must have a counterpart in the physical theory".

The conclusion in Einstein´s paper is that *"If the theory corresponds to the facts, radiation conveys inertia between the emitting and absorbing bodies".*[4]

This conclusion might be correct regardless of the theory of Einstein. It might as well be aRb that is tested, i.e. aRb states that between two bodies there are flows of packages affecting the content of mass, size and structure of both bodies.

So, the conclusion can be the same, but based on different theories. Then, based on The Principle of Relations, i.e. X = aRb, we can also investigate energy.

Notes

1) Origin of E=mc² in Einstein's Sep. 27 1905 Paper A.Einstein, Annalen der Physik 18 (1905) 639-641. DOES THE INERTIA OF A BODY DEPEND UPON ITS ENERGY-CONTENT? This article can be seen as one of the most important in the history of physics. Then we must question the logic if we want to develop physics.

2) The article is based on the thesis of the book *The Theoretical Foundation of Physical Reality. Thomas Nordström. Published by AuthorHOUSE 2020.*

3) Physical Review, May 15, 1935, Volume 47, page 777; Can Quantum-Mechanical Description of Physical Reality be Considered Complete? A. EINSTEIN, B. PODOLSKY and N. ROSEN, *Institute for Advanced Study, Princeton, New Jersey.*

4) This last sentence in the famous paper of Einstein "Does the Inertia of a Body Depend upon its Energy-Content" is based on the English translation of his original 1905 Germanlanguage paper (published as Ist die Trägheit eines Körpers von seinem Energiegehalt abhängig?, in Annalen der Physik. 18:639, 1905) which appeared in the book The Principle of Relativity, published in 1923 by Methuen and Company, Ltd. of London.