

## Can mass be converted into energy or vice versa? Questions and Answers by Dr. Manfred Pohl

This fundamental question about understanding physical relationships cannot be explained clearly enough, as it is of crucial importance for many other questions. I will now present it again in a somewhat popular scientific form to reach those who are not so keen on mathematical derivations.

And I will anticipate the answer: No, even though many still believe it, such a conversion does not exist. It cannot exist because mass and energy are conserved quantities.

Someone who believes they can convert mass into energy cannot be a physicist, because a physicist knows that mass and energy are conserved quantities, meaning that both mass and energy cannot be created and cannot disappear. But if one could convert mass into energy, then mass would have to disappear and energy would be created in its place. But then mass and energy would not be conserved quantities. The person in question must have overlooked this, or they deny this fact despite all evidence. The reverse process, converting energy into mass, leads to no different result for the same reason.

Even from a mathematical perspective, such a person has serious problems with reality. If, in a closed system, one were to convert any portion  $E_1$  of the total energy  $E_{total} = E + E_1 = const$ , which is invariable due to the law of conservation of energy, into mass  $m$ , the result would be that the sum of energy and mass  $E_{total} = E + m = const$  is constant. This would mean, however, that an increase in mass led to a decrease in energy, and vice versa. With this explanation, however, mass and energy could not be equivalent. However, the equivalence of mass and energy has also been proven both theoretically and experimentally. It also follows from the equation  $E = m \cdot c^2$ . However, due to the constancy of the speed of light  $c$ , the ratio of energy to mass  $E/m$  is constant, but not the sum. This means that an increase in mass leads to greater energy, and vice versa. Albert Einstein expressed this with the words: "Mass is a measure of the energy content of a body."

You can also recognize problems with such a person if they have no doubts about calculating the sum of mass and energy. If they were a physicist, they would see that 1 kg and 1 J (joule -  $kg \cdot m^2/s^2$ ) cannot be added together because the summands are of different natures. The sum would have no physical content; in short, it would be meaningless. Just as meaningless as trying to calculate the sum of 3 cats and 4 chairs.

So, before making such a statement, one can only advise someone who believes that mass can be converted into energy, or vice versa, to make sure that they understand fundamental physical relationships and simple mathematical relationships and can apply them correctly. Without this assumption, their explanations make no sense.

Unfortunately, ambiguities of the kind described are also widespread among many physicists and are presented in numerous publications as standard concepts that require no proof. However, they have fatal consequences for physics. Four examples may illustrate this:

- They lead, for example, to the assumption that there is such a thing as "pure" energy, that is, energy that has no mass. For example, energetic radiation is often

presented as massless, which then makes its deflection by gravitational forces unexplainable. However, one can easily see from the equation  $E = m \cdot c^2$  that energy is zero if mass is zero, i.e., nonexistent. This means that without mass, there is no energy.

- They lead, for example, to the assumption that energy can arise from nothing. After all, it is still said that the universe originated from nothing 13.8 billion years ago. Under this assumption, attempts are still occasionally made to invent a perpetual motion machine—a machine that performs work without the input of energy, thus generating the energy for its operation from nothing.
- They lead, for example, to the assumption that the universe has undergone an inflationary phase of expansion at multiple times the speed of light. The speed of light in a vacuum is not considered a natural constant, thus denying the theory of relativity. Only recently, new speculations have been spread that, with a WARP drive (WARP – Wavelength Routing Protocol), so-called solitons could move through space at speeds greater than the speed of light.
- They lead, for example, to the assumption that particle reactions involve a mass defect, in which mass is destroyed. As a result, the resulting reaction products are lighter than the sum of the initial products, without any mass being emitted. However, because mass is a conserved quantity, this explanation cannot be correct. No one clearly states that in such exothermic reactions, in which energy is lost, its equivalent mass must also be emitted.

If one supplements this list of consequences for physics with further such errors, one sees that the crisis in physics already addressed by Max Planck has not yet been overcome even today. I have explained this in more detail at <http://hauptplatz.unipohl.de/Wissenschaft/PhysikerPhysikFragen.pdf>. There one also sees that some physicists indeed have surprising gaps in their knowledge of fundamental issues. Amazingly, this is precisely the clientele that tells other colleagues, including me, that it is – quote – "quite obvious that he hasn't understood fundamental aspects of modern physics and astrophysics," and tries to dismiss my views as "outdated physics," whatever that might be.

But the above-mentioned and other such illusory ideas about basic relationships have only deepened the crisis in recent decades. Overcoming it can only be achieved through the consistent application of the dialectical-materialist method in observing nature.