

Theory Cannot Choose from Its Several Possible Interpretations

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Abstract

A theory can be interpreted several different ways. Which interpretation is “the correct interpretation” is well nigh impossible to determine. For that reason, we select the one that best fits our concept of what reality is. That means we choose on the basis of metaphysics.

I shall use as an example the time dilation of special relativity theory,

$$t = \frac{t_0}{\sqrt{1 - v^2/c^2}} \quad (1)$$

which can be interpreted another way: since frequency is the reciprocal of period, we can write

$$f = f_0 \sqrt{1 - v^2/c^2} \quad (2)$$

that produces exactly the same numerical solution. In the case of the atmospheric muon, we can say that time for it is dilated, or we can say that its internal frequency is reduced. Our choice depends on what we believe.

Another example I can use is Einstein's analysis of the increase in energy of a particle in the act of falling in a field,

$$m_0c^2 + U_0 = \frac{m_0c^2}{\sqrt{1-v^2/c^2}} \quad (3)$$

A second mathematically correct statement is

$$[m_0c^2 + U_0]\sqrt{1-v^2/c^2} = m_0c^2 \quad (4)$$

Both of these came from the same theory: the former says that the energy of a particle is augmented by the field energy, whereas the latter says that the original mass energy of the particle is conserved. Which is right? You pay your money and you take your choice.

The problem of interpretation is becoming a serious problem. Quantum mechanics, for example, has at least thirteen (13) interpretations. Which interpretation we choose depends on how we think nature works. Physics has become metaphysics. Our mathematical profundity does not change the fact that we write our mathematics to support what we believe. Physics has become faith.

Bibliography

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