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Smulsky,J.J. 1992. "The Main Problem of Modern Physics", Apeiron, No. 14, p. 18.

Correspondence, conference threads and debate

The main problem of modern physics

In a recent, very interesting paper, Thomas E. Phipps, Jr. (1990) proposes a new expression for the force law for interactions between two point charged bodies:

$$\vec{F} = \frac{ee'\vec{r}}{r^2}\left(\sqrt{1-\beta^2} + \frac{r}{c\sqrt{1-\beta^2}}\frac{d\beta}{dt}\right) \tag{1}$$

We know that motionless charges interact with one another according to Coulomb's law:

$$\vec{F} = \frac{ee'\vec{r}}{r^3} \tag{2}$$

When one charge moves relative to the other, the interaction law changes, although no such law has been stated until recently.

In the Special Theory of Relativity (STR), the problem of interactions between charges has been resolved by the energy method and Lorentz contraction/dilation of distance and time. However, STR does not use the concept of a force. If a force law can be found for interactions between moving charges, we can solve all problems of electrodynamics without STR.

Many investigators have suggested expressions for an intercharge force law. If Coulomb's law depends on the distance between two bodies, in this case the force must also depend on the relative speed v between the two bodies. Ideally, we would want to measure this force directly, independently of relative distance r and velocity v. But this has not been done. Experimental laws are available, such as Ampère's and Faraday's laws, and others for the interactions between moving charges. In 1969, I derived an intercharge force law:

$$\vec{F} = \frac{ee'(1-\beta^2)\vec{r}}{\left(r^2 - \left[\vec{\beta}\times\vec{r}\right]^2\right)^{3/2}} \tag{3}$$

I was convinced (Smulsky 1992) that this law was able to solve all the problems that are now solved by STR. Interestingly, the same expression (3) has been obtained by other investigators, although they used STR, and the expression has a different meaning. However, Thomas G. Barnes *et al.* (1977) derived the same formula on the basis of classical mechanics with a slightly different method from mine. They derived it as an electrical field E, and consequently I do not believe they viewed it as an expression of electrical force F.

In the Phipps law (1), the force depends on r and v, as well as acceleration $c\,{}^{d\beta}\!/_{dt}$. Phipps is able to avoid one of the defects of Weber's law. Yet both his law and Weber's should be expressed ~~differently~~ not evidently, since force depends on acceleration. In accordance with Newton's second law, the force is proportional to acceleration. As a result, the formula for the force should not contain acceleration.

I believe that Phipps's derivation (1986, 1990) is mathematically correct. But there is one important oversight. When force depends on speed, work A by force F at distance l depends on speed:

$$A = \int F dl = f(v)$$

In this case, we cannot use the concept of potential energy V, and the equality $F = -{}^{dV}\!/_{dr}$ (Phipps 1990, formula 5).

The excellent discussion by Phipps convinces us of this conclusion, especially when we see that the results of formula (5) do not coincide with formula (14). Our conclusion also applies to Weber's law and other laws containing acceleration.

I believe that the problem of the intercharge force is very important, and that further serious discussion is necessary.

Barnes, Thomas G., Pember, R.R. and Armstrong, H.L., 1977, "A Classical Foundation for Electrodynamics", *Creation Research Society Quarterly*, 14, 38.

Phipps, T.E. Jr., 1990, "Weber-type laws of Action-at-a-Distance in Modern Physics", *Apeiron*, 8, 8.

Phipps, T.E. Jr., 1986, *Heretical Verities: Mathematical Themes in Physical Description*, Urbana, Il., Classical Non-Fiction Library, 637 pp.

Smulsky, J.J., 1992, "A New Approach to Electrodynamics and the Theory of Gravitation", in *What Physics for the Next Century?*, Proceedings of the International Conference, Ischia, Italy, pp. 336-344.

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