Stefan Marinov and "friends"

SIR—The article¹ "Stefan Marinov wins friends" oversimplifies the circumstances in which it would be possible to test the possibility of weak failures of Einstein's special theory of relativity. We wish to call attention to a few conceptual points and to clear up the relationship between our paper and those of Marinov, whose experiments we do not endorse.

In our paper², besides the absolute coordinates in the preferred system and Einstein coordinates (this is not relativity!) in the moving system, we also used the co-moving coordinates in the so-called "new system", which differ from Einstein's coordinates by a Lorentz transformation of the absolute coordinates.

I would like to make these points:

- We postulate (it does not "emerge") that rotating bodies in the moving frame remain rigid in the new system, thus they are not rigid, either in Einstein's co-moving coordinates or in the preferred coordinate frame (postulate A).

- The isotropy of the velocity of light is sacrificed in the new system but is preserved in Einstein's coordinates (used throughout in our paper because of our conviction that most, if not all, of physics is Lorentz invariant). The anisotropy of light in the new system is a coordinate effect, and coordinates are only labels, not "physics".

- We postulate that the angular velocities of the points of freely rotating bodies, at rest in the moving frame, are constant in the new system, so that they are not constant either in the preferred system or in Einstein's coordinates (postulate B).

- We do not propose tests of the modified transformations (the "new system") but of postulates A and B.

On the Marinov issue, I wish to state in a friendly spirit that my interest in possible weak violations of special relativity was aroused at the beginning of 1980 by the analysis of Marinov's controversial papers. The ideas which lead to Marinov's experiments do not conflict with previous experimental results. He described a possible violation of special relativity that seems not to have been considered earlier, that a rotating rod with a transitional velocity V along its axis may not be twisted around the axis when viewed from the absolute system (or from the new system), contrary to the predictions of special relativity. Then it should be counter-twisted when viewed from Einstein's frame.

Marinov was thus implicitly postulating that the rotating axle provides a non-einsteinian clock synchronization procedure which is found to give the absolute time in the new system. Einstein synchronization, using a light pulse, gives Einstein time. Then, contrary to Marinov (who wanted to overthrow special relativity) it

seemed to me appropriate in 1980 that one way of introducing weak violations of special relativity, and of providing for non-relativistic synchronizations, would be to assume postulates A and B, in which case the best coordinate system to use would be Einstein's.

Although Marinov claims that his experiments confirm his postulate, I am convinced that, when repeated independently, they will not reproduce his results. There are a number of contradictions in his two papers. Thus the "coupled mirrors experiment" (to which we referred, not the coupled shutters) is in contradiction with the Fresnel-Newton ether theory which Marinov claims to be using. I shall analyse these experiments in a forthcoming paper and propose modifications in them so that they can really test Marinov's postulate.

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1. Maddox, J. *Nature* **316**, 209 (1985).

2. Maciel, A.K. & Tiomno, J. *Phys. Rev. Lett.* **55**, 143 (1985).

Another novel effect in classical electrostatics

SIR—Recent correspondence in these pages has been concerned with an unexpected result for the minimum energy configuration of a system of equal point charges placed inside a circle. A distinct, but in some ways related, novel result is concerned with the existence of a bound system of positive and negative charges. Thus, consider a single positive point charge fixed at the centre of a circle and equal negative point charges (in general, different in magnitude from that of the positive charge) constrained to remain in the region outside the circle. Negative charges will be attracted by the positive charge to the circumference of the circle and if there are N such charges their mutual repulsion will ensure that they are equally spaced around the circumference. In this case, what is the maximum number of negative charges that can be electronically bound to the circumference by the single positive charge at the centre; that is, what is the number of negative charges that 'saturate' the attractive effect of the positive charge, and what will be the net charge of such a 'saturated' system? Intuitively one might suppose the number required to 'saturate' is the minimum number to render the net charge on the system non-positive. However, we shall see that in general this is not so.

We suppose the negative charges each to have magnitude q times that of the positive charge, and simple energy considerations then show that the maximum value of q for given N is

$$q_m(N) = [g(N) - g(N-1)]^{-1}$$

where $g(N) = (N/4) \sum_{p=1}^{N-1} \operatorname{cosec}(p\pi/N)$.

If we consider the situation where the maximum number of bound negative charges is N , then the maximum and minimum net charge on such a 'saturated' system for varying q will be, respectively, $X_{\max}$ and $X_{\min}$ times the positive charge, where

$$X_{\max}(N) = 1 - Nq_m(N+1),$$

$$X_{\min}(N) = 1 - Nq_m(N)$$

These results are illustrated by the following table.

N	$q_m(N)$	$X_{\min}(N)$	$X_{\max}(N)$
1	∞	∞	-1.000
2	2.000	-3.000	-0.623
3	0.812	-1.435	-0.431
4	0.477	-0.908	-0.310
5	0.327	-0.637	-0.225
10	0.115	-0.149	-0.005
11	0.100	-0.105	+0.021
12	0.089	-0.068	+0.043
13	0.080	-0.037	+0.063
14	0.072	-0.009	+0.081
15	0.066	+0.015	+0.097

Thus for a given value of q there will be a maximum value $N_m(q)$ corresponding to 'saturation'. For $q \gg 1$, $N_m(q) = 1$ and $X_m(q) = 1 - qN_m(q)$ is negative. As q decreases, X_m remains negative with $|X_m|$ decreasing until q passes through the value 2, when $|X_m|$ increases discontinuously from 1 to 3 corresponding to N_m changing to 2 at $q = 2$. For further decrease in q , X_m remains negative with monotonically decreasing magnitude until this magnitude undergoes a further discontinuous increase at $q \approx 0.812$ as N_m changes to 3. This pattern is then repeated continually as q decreases further. However, when q has decreased to $1/11$, $N_m = 11$ and X_m then becomes zero before becoming positive for further decrease in q , followed by it becoming negative again as N_m increases to 12. X_m then oscillates between negative and positive values, becoming zero for $q = 1/12$, $1/13$ and $1/14$ (with corresponding $N_m = 12, 13, 14$). For $q < 1/14$, X_m remains positive, tending to the value of $+1$ as $q \rightarrow 0$ and $N_m \rightarrow \infty$.

We conclude therefore that in general 'saturation' does not correspond to the intuitive idea mentioned at the end of the first paragraph. In particular, the only 'saturated' systems which are electrically neutral are those for which $q = 1/N_m$ with $N_m = 11, 12, 13, 14$. For larger values of q the 'saturated' system always has a net negative charge, while for smaller values of q it is always positive. One wonders whether these ideas have application to any real physical system.

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