FEEDBACK

RELATIVITY

Michael Dobson, in the August issue, claims that I neglect 'the force accelerating the clock balance wheel round'. I am careful that this is not so. For this reason I used a freely rotating disc as my clock. I specifically say in the section on Time and Relative Motion that 'to quantify the motion of a spring and balance wheel requires relativistic knowledge which we do not have at this stage of the argument'.

If one accepts that mechanical force as we experience or measure it is given by

force = rate of change of linear momentum $= \frac{d}{dt}(mv)$,

then it is easy to show that

torque = rate of change of angular momentum $= \frac{d}{dt}(I\omega)$

follows irrespective of how I is changed. My freely rotating disc experiences zero torque; hence its angular momentum is constant and it slows down (ω reduces) as its moment of inertia I increases and, conversely, speeds up as I reduces.

This phenomena is commonly observed, for example, in skating. When a skater is spinning we have all seen his (her) speed of rotation increase as he (or she) pulls in legs and arms. In this case the moment of inertia, I, is reduced and ω increases to keep $I\omega$ constant.

This answers the rest of the letter; for example, I do not need to argue about table recoil and no ambiguous equations are used to describe experimental affects.

A.H. Winterflood clearly understands why I reverse the usual argument but regards the hypothesis that 'energy has inertia mass' as equally crazy as the usual one about the speed of light.

It is generally accepted that

force = rate of change of momentum $= \frac{d}{dt}(mv)$

provides a recognition of mechanical force and a basis for measuring it. When force is zero we get Newton's first law and momentum, mv, is what Newton meant by 'quantity of motion' in his second law.

Accepting this definition of force and also that

Mechanical work = force × distance

there is shoals of evidence that energy and mass go together in the way I express it. This evidence lies in particle accelerators, radiation effects, interactions between particles, nuclear energy etc, etc.

If you insist that the concept 'energy has inertial mass' is crazy, then in order to explain what is consistently observed, you have to reconstruct the whole system of measurement and definition of energy. You will, for example, need to say that what is felt as a severe bang is not energy and/or propose complex laws such as in Michael Dobson's letter according to which the action of force in some unexplained way depends on velocity with a factor $(1-v^2/c^2)^{1/2}$. You end up with far more 'mind boggling' rules than the one simple rule I propose, and also a requirement to explain them.

The task may be beyond human wit so far but it is not impossible. As commented in my article I am convinced that nature is essentially simple and that the basic laws are virtually self evident propositions. Newton's laws of motion and conservation of energy can be seen in this way. James MacHarg in his letter perhaps gives a basis for thinking that 'energy has inertial mass is also a self-evident proposition.

James MacHarg describes the concept of inertial mass very clearly as requiring acceleration and therefore preventing instantaneous change. He implies an objection to the proposition that energy has inertial mass but does not explain why. On the contrary his own idea makes it very reasonable. Since a packet of energy should not be instantaneously movable from A to B as we see it, then it must have inertial mass! The only other step that he needs to make to agree my line of argument is that the packet of energy sees itself as one event.

He makes another important point that we only see what we see and not what actually happens. This is why it is essential to base any positive theory on experimental procedures, i.e. measurements and definition of time, distance, energy, mass etc.

Albert was, of course, swallowed by the lion. When the savage understood he swallowed his ego and re-instated Albert.

M.H. Butterfield
Wimborne
Dorset.

May I thank all those readers who, as well as taking the trouble to fill in the recent questionnaire, wrote to offer criticism and to express their views on content and presentation. These opinions are helpful to the editorial team and are not treated lightly. In the very near future, readers will see many of their suggestions implemented.

EDITOR

MATHEMATICAL RAKE'S PROGRESS

Wireless World is to be congratulated for providing a forum for discussion of various 'non-establishment' views. I am thinking particularly of those of Ivor Catt, but there have been others in the past. Unfortunately, a subject (whether it be maths, physics or ice-skating) is easy when you cannot do it, but very difficult when you can do it – or in other words a little knowledge is a dangerous thing. It is apparent that many of your correspondents fall into this trap, though I must qualify this with the thought that I may be falling into it too.

C.F. Coleman (Letters, July 1986) seems to doubt the 'well-known' phenomenon that the output of a low pass filter happens before the input pulse arrives. Well it *does*. If a perfectly square pulse or edge is fed to a perfect low-pass filter (by which we mean one that passes all frequencies below the cut-off with zero attenuation, and that stops all frequencies above the cutoff with infinite attenuation), the calculated output starts to happen before the input. This is, of course, impossible, so we deduce that either the maths is wrong, or that it will be impossible to make such a filter in the real world. The maths is quite a simple application of a Fourier transform and I can supply Mr Coleman with a derivation if he requires one. I am surprised that Mr Coleman has apparently not heard of this phenomenon, since he seems to be a firm believer in Fourier transforms. There are times however, (for example when a voltage step travels down a transmission line), when to dress the problem up in Fourier transform theory would make it needlessly and horribly complicated.

The situation as it relates to the 'low-pass filter' problem is that Fourier transforms are an abstract tool (one of a family of integral transforms) which bear no relation to the physical world. When we try and use them, we can only do so if they are a good model for observed phenomena. The ideal low-pass filter is outside our experience, and it is a difficult thing to say whether the maths is right or wrong. If it is wrong then the theory needs modifying just as Newtonian dynamics needs modifying to take into account certain conditions.

Mathematics can be studied in its own right, but when it is used to help solve physical problems we must remember that it is a tool, and one does not use a sledgehammer to crack a nut. We must choose the right tool for the job, and this means a level of understanding to which people are not always trained.

David Gibson
Broadstone
Dorset.

S5/8

While I would endorse one of Mr Hardie's objections to RS232, i.e. the lack of connector standardization, I must take issue with almost every aspect of the proposed S5/8.

What is the use of introducing this standard in Britain without first reaching agreement with other countries; in particular America and Japan? The use of S5/8 in this country alone will result in even more of the "break out boxes" and adaptors rightly despised by Mr Hardie.

Having slated the industry standard D type connectors, Mr Hardie proposes to use one of the worst connectors on the market! The DIN connector is only just suitable for the domestic audio equipment, for which it was introduced. It is certainly not robust enough for office use, and beyond consideration in an industrial environment.

The high-voltage bipolar signalling of RS232 is criticized, and a low-voltage ground-reference system proposed. This is surely retrograde. Where mains powered equipment is used, ground potentials can easily exceed the logic margins. This is the very reason for which RS232 was designed!

With good design it is quite possible to incorporate RS232 into battery equipment. Epson, for example, produce a small portable computer with RS232 and disc drive – all battery powered.

If a new standard is to be introduced, I would prefer to see a differential, line-matched system, based upon RS422. Suitable interfaces for this such as the MC3486/7 have been with us for years, and are inexpensive. This would have the added advantage of much longer lead lengths than presently practicable.