LETTERS

MODERN PHYSICS

"Nobody ever became sunburnt as a result of exposure to a differential equation" remarks Dr Murray (The Electromagnetic Analogy, *Wireless World* August, 1982). No, but somebody may have avoided sunburn by taking note of the differential equations which describe the attenuation of ultra-violet radiation in its passage through the atmosphere and the reaction kinetics of the ozone layer. Seriously, though, there seems to be a basic misconception about the role of mathematics in physics, for its role is essentially *predictive* and in no way *explanatory*. One feeds whatever data may be available into a mathematical model and if the operation of the mathematics at least declares the input data to be mutually consistent and preferably also indicates a future state of the physical system which coincides with its actual evolution, then the mathematical model is regarded as a correct representation of the physical system.

A more fundamental and problematic question is whether every physical phenomenon can be "explained" by a mechanical analogy in which one can see a cause-and-effect relationship between the parts, of the type which occurs in the large-scale physical world and can be appreciated by our five senses. The answer appears to be negative, ever since the development of quantum mechanics, which has no parallel in ordinary large-scale mechanics. One has only to cite the application of particle/wave quality both to electrons and to photons; but worst of all, there is even doubt whether causation rules in the world of microphysics which is represented by quantum theory. At this point one has to admit that one cannot "understand" the behaviour of elementary particles in terms of mechanical models. But if one accepts the logic of mathematics, one can accept the logic of mathematical models.

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By the end of the last century it was conceded that space contained no unique reference point.

In a book on mechanics, published in 1888, Oliver Lodge commented "No such thing as absolute rest is known, but it is convenient, in mechanics proper, to consider the earth as a body at rest". This is still the current practice and as a result we have some very funny physics and peculiar paradoxes. In his 1905 paper on moving bodies, Einstein reiterated that there is no absolute rest, adding that his theory would not require an absolutely stationary space or an ether. He then proceeded to invent his own 'stationary'. He suggested we call a set of co-ordinates the "stationary system" and then use them to define the position and movement of a point, employing rigid standards of measurement, a completely impossible task since a fictional reference point can only produce fictional position and velocity.

In fairness to Einstein it should be mentioned that every physics text extant uses the words 'the velocity of a material point' in a manner which requires whimsical decision. We are told, B has a velocity v with respect to A and so travels from B to B' a distance l, in time t, so that l=BB' = vt. By a simple change of mind it could be claimed with equal truth that A has a velocity v with respect to B and moves a distance l = AA'. This dilemma is not solved by introducing conjurers' props like co-ordinate systems or frames of reference, inertial or otherwise.

The solution is simple. In space with no absolute rest only the separation of material bodies and the change of separation with time, can be described. Individual velocity and distance travelled must remain permanently indeterminate.

Mention whould be made of Einstein's co-operative myopic observers, without whose help the theory would not have been possible. The one sitting on an imaginatively moving plank, claimed he saw a flashing lamp (A) screwed to the end of it; the other observer, riding on the declared stationary co-ordinates said he say the lamp fastened to the x axis of his system.

Einstein's science fiction was most successful from his point of view; it earned him notoriety and a better job. How relativity theory became required reading in our universities is something I cannot understand.

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CIRCUIT MODELLING BY HOME COMPUTER

Further to my own article appearing alongside Mr Weaver's in the August issue I compared the technique of my article using Mr Weaver's examples.

I enclose the resulting graph. It is interesting to note that whereas Mr Weaver's technique takes 75 seconds for 15 points, the enclosed graph of his Fig. 1 took 20 seconds to calculate 50 points for the same circuit, and a further minute to print the graph. This shows the undoubted power of a compiler, although the ladder technique is inherently faster than the indefinite admittance matrix technique of my article.

The ladder technique is normally superior for passive networks, but for active networks the indefinite admittance technique is essential.

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