model of the relative motions of the heavenly bodies used by Lorentz in his calculations is one step removed from the flat earth theory and just as dangerous.

Michelson, Morley, Lorentz and Einstein assumed the velocity vector of Stoke's hypothetical ether wind was equal in magnitude but opposite in direction to the earth's orbital velocity vector relative to the sun, which they believed to be stationary at the centre of the universe. They believed the orbital directions of the vectors were absolute and constant relative to the supposedly stationary sun, and that both vectors were directed parallel to the plane of Michelson and Morley's apparatus.

They were unaware of the real experimental fact that the direction of the earth's absolute velocity vector is a continuous variable relative to the plane of Michelson and Morley's apparatus, and that Stokes's ether wind blows seasonally and daily at continuously varying angles through the ceiling of Michelson and Morley's laboratory.

Any theory based on a false model of the universe is false. The stationary sun and stars model is as false as the flat earth model in explaining the Doppler shift of receding galaxies. Hence Einstein's self-contradictory assumption that as his 'fixed stars' were stationary in Newton's stationary space, the magnitude of a star's red-shift is a function of the intensity of the star's gravitational field. Proved mathematically, of course.

M.G. Wellard
Kenley
Surrey

RELATIVITY

In Dr W.A. Murrays' article on Relativity (*WW* May, 84) some assumptions were made that I feel were not quite as cut and dried as he made them seem.

Firstly, Time Dilation has been experimentally demonstrated with the aid of the atomic clocks on board the later Apollo space missions. These results agreed closely with those predicted by Special Relativity.

Secondly, relativistic principles have been shown to affect sub-atomic particles travelling at speeds in excess of 0.9c. It has thus been shown that the physical velocity limit of c is a reality when the $E=Mc^2$ equation is used. If one assumes that mass is constant, as Dr Murray presumably does, then where does the exponential increase in energy input arise?

Thirdly, in his argument on the train experiment it would appear that a subtle change takes place between the disproving of Einstein assumptions and its paraphrasing on the following page.

In Einstein's argument the flash at A and B take place at the moment M and M' coincide, hence it is to the observers future positions that the light will arrive.

However, in Dr Murray's analysis he maintains that the light will travel the distance A-M and A-M' in the same time, hence reaching both observers simultaneously. In other words he has their future positions coinciding, not their present ones.

But in the paraphrasing of the above paragraph this has been changed back in order to refute the Einsteinian argument, which naturally will not agree with the author's assumptions.

I must point out that I neither agree or disagree with Einsteinian Relativity, but surely a principle that can be demonstrated to work would require a very strong argument to topple.

G.R. Moore
Braintree
Essex

I have been following the arguments about Einstein's train hypothesis with amazement and incredulity. There have been so many assertions and counterclaims that now we cannot see the wood for the trains.

In the February 1985 issue, Messrs Marquis and Scott Murray fall into opposite ends of the same trap, in describing apparently similar but actually different cases.

In Mr Marquis's case, M' and M perceive the flashes simultaneously, but will measure different distances. The error here is to transfer measurements from one world to the other. Scott Murray's observers would measure identical distances, but perceive the flashes at different times; he begs the question by transferring Ms definition of simultaneity to the world of M'.

An incident recently brought to my attention is a good illustration of the problem. My friend Tom was sitting in his signal box, watching the up and down trains rattling past, when he noticed two flashes of lightning at different points of the track. His portable Lightning Detector informed him that the flashes had arrived at precisely the same instant. Dick on the up-train and Harry on the down-train happened to be opposite the signal box then, and got similar results from their instruments.

Tom subsequently discovered that the scorch marks on the track were precisely equidistant from his box. Dick and Harry found that the scorch marks on their respective trains were not equidistant from their seats; the differences were several thousand nanometres.

When the three of them compared notes that evening in the taproom of the Monkey's Nest, there was some initial disagreement, not only over the simultaneity of the flashes but also which came first. However, when Dick and Harry made allowance for the velocity of light and of their respective trains, all agreed that the flashes had been truly simultaneous in their present frame of reference. Old Lorentz in the corner muttered something about comparing the sums of the pairs of measurements, as well as the differences, but a game of dominoes was now in progress and this was not taken up.

Had Dick and Harry remained on their trains for ever, each would have been confident that the lightning strikes had NOT been simultaneous. Both would have been correct, even though the order of occurrence was not the same.

I trust that this incident adequately explains the situation, and will terminate this particular dispute.

R. Priestley
Southsea
Hants

Let there be a pyramid upon an ever-changing foundation of information, its four courses being (upwards) systems, scientific laws, abstract laws, and Causation. Let Max Planck sit on top of it as an abstract quantum of energy positively glowing with absolution. Let a special relation in the shape of a creative ape called Roy Hodges MIEE run down and up the pyramid, translating the abstraction of method into material means and vice versa, so demonstrating the creative and analytical process of visualisation so abhorred by digital theoreticists who use computers when they run out of fingers, so to get it as declinatory as the average monetarist.

One might now be deboggled as Mr A.H. Winterflood was when he grasped that energy is and mass becomes — between them lies a Constant Time Function, the fastest thing on wheels, which also has a reverse gear so allowing Mr Hodges to run up as well as down. (Wheels are frictional — when energy is in abstraction it has none, so it can go as fast as it is pushed).

Special Relativity applies when correcting the error of scale seen in our tiny Cyclopsian local frame after leaping from it either to a microcosm (an abstraction) or to the macrocosm (another abstraction). For those bogged down in the mud of our local frame the golden oldies are quite accurate enough for everyday use — may they rest in their wellies.

A pleasantly harmonic orchestration of an original theme, Mr Hodges! Let us rename it the Planck-Hodges Constant, whose dimensions are Md^2/t, or in this context Mdc, where d is the single directional dimension of linear movement of a quantum of energy towards a mass M: the change occurs at c (regardless of the speed of approach) and represents the change of state of mass from which we deduce the existence of energy, even in the case of human receptors (for those who possess them).

The photon leaving an atom is a little more tired than the one arriving, having wound it up a bit during its brief stay. It's that entropy thing.

Now, gentlefolk, what happens to the energy radiated by an atom which is moving at the speed of light? Seemingly it is caught in the act of being radiated, so what happens to

the atom? And what happens to an atom rushing at the speed of light towards a source of energy? It can only translate the energy (or whatever it does to it) at the speed of light: one likes to imagine that there is a limit for relativistic mass just as there is for everything else.

Might the four horsemen of quadrature have a little something to say upon the matter? Or the mass-energy dualism? Or are we coming to the monistic conclusion that there is no such thing as energy, that all mass is inherently static, all movement being imaginary and causation non-existent?

Thank you for your revelation, Mr Hodges: wellies rot eventually. But do tell us; in considering the photon, who are they that play pass-the-parcel?

J.A. MacHarg
Wooler
Northumberland

In the February Letters Dr Scott Murray once again quotes Einstein with the provisos (as judged from the embankment) and (considered with reference to the embankment) faithfully included, and once again proceeds to argue as if he were blind to their presence in the text, as I previously pointed out in the December 84 letters, and A.J. Clayton in the January letters.

However the real crunch comes with the second half of his letter, and with his description of Figs 5 and 6 as Minkowski diagrams. A basic feature of a Minkowski diagram is that any event or encounter which is represented at all is represented by one point and one point only. Thus Dr Murray's figures and the discussion in which he talks about a single event being represented by two distinct points show not only that he doesn't understand Minkowski diagrams, but also that he doesn't even understand the physical interpretation of Lorentz transformations. In fact they relate the coordinations attributed to a given event relative to the two noncoincident sets of time and position axes which according to special relativity are used by any two observers such as M and M' who are at rest in two distinct inertial frames. No one worries about a point having different coordinates with respect to two sets of spatial axes which are rotated with respect to one another; special relativity says that something rather similar occurs with mixed time and space axes.

If his Fig. 5 had really been a Minkowski diagram he would have shown the t-axis along the line labelled M, and the x-axis along the line between the points labelled (wrongly) A' and B'. With respect to those two sets of axes the lightning strike at A at time zero in the embankment frame would be represented by the point labelled A', which has the coordinates Dr Murray calculates with respect to these two sets of axes, the embankment axes being oblique. Similarly the strike at B would be respresented by the point labelled B'. The sloping lines through the points labelled A' and B' would then represent the world lines of A and B, while vertical lines through those points would represent the world lines of the observers on the train who are present at the lightning strikes, A' and B'.

The points labelled (wrongly) A and B represent nothing in particular, but the cuts of the line through them with the world lines for A and B would represent the positions relative to the train of those observers at the train time of the encounter between M and M', represented by the intersection of the t' and x' axes. An important feature is that the lines labelled 'c', which represent light rays, bisect both the angle between the x' and t' axes, and the angle between the x and t axes, which means that both the train and the embankment observers imterpret the light flashes as travelling at the speed 'c'. Almost any question one can ask about the interpretation of events by the train and embankment observers can be read off this diagram.

Dr murray asserts that direct demonstrations of any correspondence between the predictions of special relativity and the workings of the world as it is are 'conspicuously non-existent'. The prediction of time dilatation was verified over fifteen years ago by measurements of the lifetime of pi mesos travelling with respect to the laboratory at a speed very close to the speed of light, so that the time dilatation factor was not just marginally larger than one, but over 2.5. The measurements (see refs) agreed with the special relativity predictions to better than 0.5%.

C.F. Coleman
Wantage
Oxon

References

Ayres, D.S, Cormack, A.M, Greenberg, A.J,, Kenney, R.W, Caldwell, D.O, Elings, V.B, Hesse, W.P, and Morrison, R.J, *Phys Rev Lett* 21(1968)261.
Greenberg, A.J, Ayres, D.S, Cormack, A.M, Kenney, R.W, Caldwell, D.O, Elings, V.B, Hesse, W.P, and Morrison, R.J, *Phys Rev Lett* 23(1969)1267.

D.C. SUPPLIES

It may be helpful to Dr Smith to have two additional references brought to his attention. These are:

1. Walz, F.C. and Burkhard Analysis of Capacitive filtering of full wave rectification' *International J. Elect Engng* 1967 5 pp 563-572.
2. Ridler P.F. 'Analysis of single phase capacitor input rectifier circuits' *Proc. IEEE 17* 12 December 1970 pp 2261 — 2266.

Schade's original work was extremely good for the full and half-wave rectifiers, but for the voltage doubler circuits waas seriously in error due to a false assumption. Also his work was done at a time when the low values of load resistance imposed by solid-state circuits were unusual and it did not predict the instantaneous minimum voltage which is needed to ensure that regulators do not 'drop-out'.

The writer can supply, for non-commercial users, a listing of a Pascal program which will produce instantaneous minimum output voltage, peak-peak ripple voltage, peak rectifier current and r.m.s. rectifier current, given the values of $\omega C'R_L$ and r/R where C is the filter capacitance R_L — load resistance and r is the equivalent source resistance.

The calculations take about eight seconds using a 4MHz Z80 machine and the 'Turbo Pascal' compiler.

Professor P.F. Ridler
University of Zimbabwe
Harare

ELECTRO-REDUCTIONISM

Thank you, *Wireless World,* for coining the useful term: electro-reductionism, to describe the fashionable variety of intellectual suicide. But anyone can disprove it; we do not need an irrational leap of faith.

The failure of rationalism to account for your own consciousness means that it is a rotten theory. So its failure to address values, human nature and ultimate questions is only to be expected.

We cannot answer whether a machine could have a conscious mind until we have a model that predicts the know fact of human awareness.

It is the reductionist who is forced to a leap of faith — that science will one-day be able to tackle consciousness. What is consciousness? What is colour? We divide colour into the objective wavelength and physiology model, and the sensation. We divide morality into behaviour, absolute moral imperatives, and subjective conscience. Science refuses to touch the absolutes or the subjectives. And consciousness is both indisputably factual, and subjective.

Which leaves a fact hanging. Which destroys the garbage. Which makes monkeys of them all, as, no doubt, they would agree.

D.H. Potter
Axminster
Devon

RAILROADING RELATIVITY

Over the last year Dr Murray has used a lot of your column inches attacking Einstein and his theories. I have no particular objection to this as a sport, but in his case both of the main lines of his arguments are based on easily demonstrable fallacies.

With regard to Einstein's "rare but crucial conceptual error", Dr Murray asks us to believe that Einstein tells us