In *Wireless World* of April 1983, p.48, Jones gives an impressive list of oversights and omissions which were present in the interpretation of the Michelson and Morley experiment. However, I missed one important problem I have always felt when dealing with this problem.

In this experiment it is always taken for granted that the velocity of light does not change at reflection. However, how can one be sure about that? Apart from Romer and similar determinations of the velocity of light I do not know of any other way of determining the velocity of light, thus without mirrors and lenses. On the contrary, from the point of view of light as a stream of photons it is at least just as likely that light might change its velocity at reflection: if a photon excites an electron which on its turn produces another photon there is no reason why the velocity of light of the original photon should be the same as the newly created one. But if the velocity of light may change at reflection, already for this reason the experiments of Michelson and Morley cannot produce a difference in the velocity of light (after reflection).
Dr M. Osinga
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I was very interested to read M. G. Wellard's letter (January), including his comments on N. Rudakov's book "Fiction Stranger than Truth", which I have also read with considerable interest.

Wellard states that Rudakov has collected "more than enough evidence to show that the physics Establishment is in the hands of ideological extremists". It is a little unfortunate that he then goes on to mention, as a sample of that evidence, a somewhat exaggerated statement of Rudakov's. Wellard refers to Rudakov's citation of a review of one of Harold Aspden's books, and repeats Rudakov's assertion that the review says that Aspden is a crackpot. Although the review is somewhat pejorative, it is an exaggeration to say that it calls Aspden a crackpot.

On the same page of his book (p.9), Rudakov writes that "Lyttleton is of the opinion that the truth of relativity seems so self-evident as to be beyond need of discussion by any sane people." Although he does not give the source, he is fairly obviously referring to a letter to *The Times*, which is reproduced on pages 10-11 of Herbert Dingle's book "Science at the Crossroads". A careful reading of the letter shows that what Lyttleton wrote is completely different from what Rudakov attributes to him.

As Rudakov rightly says, (p.7), "Silence is the main weapon of the relativists." There is also ample evidence that members of the scientific community view scientific heretics with scorn and refuse to take their arguments seriously, and I was glad to see Wellard's reference to the scornful heading of an article in *New Scientist*. After perusing the relevant correspondence and seeing the heading "Einstein 6, Cranks 1", the reader may possibly conjure up a picture of Einstein playing golf. Whatever game the writer of the heading had in mind, it certainly was not cricket!
Ian McCausland
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The principle of indeterminacy is not a topic which I have studied to any great extent, but I would like to put a question to Dr Murray. He

argues in your March issue that it is possible to determine what the velocity of an electron *was* "to any accuracy we please". But all electrons look alike. How then can we know whether the electron on which the second observation of position was made is the same as that on which the first observation was made?
K. S. Hall
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London

## FORTH COMPUTER

In his article on a Forth computer Brian Woodroffe takes the dangerous step of comparing microprocessor c.p.us by preparing a number of examples of small isolated sections of code. Whilst I do not wish to take a standpoint in favour of any particular device I would like to point out that this sort of comparison is, at best, worthless and can be misleading. To quote one counter example, the 8088 '+' operation could be carried out via the instructions

```
POP AX
MOV BP SP
ADD [BP] AX
```

equal to the 6809 in terms of instructions, or, BP has a fixed relation to SP, as is the case in most executing programs,

```
POP AX
ADD [BP + α]   AX
```

where X is an assembly time constant. I hasten to point out that I am not trying to challenge his choice of processor but simply to point out that his reasoning is flawed. I have no doubt that any software engineer (sorry Mr Catt) familiar with the other c.p.u. mentioned could improve upon the quoted examples.
J. O'Connor
Crewe

## ELECTROMAGNETIC DOPPLER

In the May issue Mr S. Hobson offers his explanation of e. m. Doppler. His assertion that the mechanism is 'v' is not helpful, 'v' is the cause, a change in frequency is the effect; the mechanism sought is that which links the two. The description he gives for 'wave crests' is equally valid if applied to a string of bullets fired at B by A and in this case the velocity of the bullets as seen by B would be the equivalent of (c-v).

What S. H. does is to divorce the fact that the light travels from A to B from the fact that A and B are moving apart, carefully avoiding describing the resultant composite motion. His final suggestion that v is not velocity but rate of change of distance is playing with words.

The light must leave A and must arrive at B and at each must have an observed velocity, frequency and wavelength which together conform to the equation:

$$v = f\lambda$$

The light leaves A at velocity c. If at B one assumed that it still travels at c relative to A then its velocity relative to B will be c-v. We can write

$$\text{at A} \quad c = f_A \lambda$$
$$\text{at B} \quad c\text{-v} = f_B \lambda$$
$$\text{and} \quad \frac{f_A}{f_B} = c\text{-v}$$

This then is a common-sense description of events which very elegantly produces the right answer but is of course heresy.

If it was not possible by observing the light from a source to tell whether or not the source is moving, one could logically deduce that the motion of light is unaffected by the velocity of the source. As it is possible to tell if a source is moving, then clearly something is affected by movement. If the frequency of a periodic function is lower, then either it is going past more slowly or the 'wave crests' are further apart. If one is not a heretic, light cannot be going slower, therefore the wavelength must have increased. What causes the wavelength to change? Where does the change take place?

Suppose at the moment of measurement B passes a third observer D stationary with respect to A. If the change in frequency observed by B is attributed to a yet unexplained change in wavelength which has occurred at a yet unspecified point between A and B how is it that D does not also observe this change in wavelength. He is at the same point of time and space as B, is observing the same wave as B observes, passing him at the same velocity as it passes B.

Heresy is so much simpler.
J. Kennaugh
Cornwall

Like your correspondent Kennaugh in *Wireless World*, May, 1983 I have been looking at the Doppler theory.

If one considers a particle stream where there is velocity, frequency and separation instead of velocity, frequency and wavelength then the Doppler effects can still be expected.

In calculating the relative velocities of the source and the particles with respect to the observer one can invoke the presence of an 'ether' against which the velocities are measured. These can then be summed to get the relative velocities and to remove the 'ether'. This may at first sight appear to be a pointless exercise but if it is done for an Einsteinian system then it is obvious that for every value of a relative velocity (of the source with respect to the observer) there is an infinite set of pairs of velocities (of each with respect to the 'ether') that produce the same Doppler effect. With a non-Einsteinian system there is only one set of velocities that produces the effect.

The reason for this is that in a non-Einsteinian system the movement of the source produces a change in the velocity and the separation of the particles but not the frequency whereas a movement of the observer produces a change in the velocity and the frequency of the particles but not the separations. Thus the movements of the source and the observer do not cause the same change in the Doppler effect whereas in an einsteinian system they do.

An interesting consequence of this is that in a non-Einsteinian system the universe has built into it a means of identifying which object, source or observer has changed its motion. The contributions of each body to the total relative velocity can thus be calculated.

It would appear, therefore, that some velocities are relative and some absolutely so.
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