

LETTERS TO THE EDITOR

"CRANKY" VIEWS

In May's letters Mr Williamson made two statements. Firstly he said that the millibel is rubbish, and secondly he said that a magazine of *Wireless World's* stature should not provide a platform for cranky views.

In respect of the former he may be right but in respect of the latter he is definitely not. Let us see what J. S. Mill has to say:

"To refuse a hearing to an opinion because they are certain that it is false is to assume that their certainty is the same as absolute certainty. All silencing of discussion is an assumption of infallibility. Though the silenced opinion be an error, it may, and very commonly does, contain a portion of truth; and since the prevailing opinion on any subject is rarely or never the whole truth it is only by the collision of adverse opinions that the remainder of the truth has any chance of being supplied.

Even if the received opinion be the whole truth, unless it is contested it will be held in the manner of a prejudice, with little comprehension of its rational grounds.

If there are any persons who contest a received opinion let us thank them for it. In an imperfect state of the human mind the interests of truth require a diversity of opinion."

(*On Liberty*, abridged)

And let W. E. Weyl end the subject with a flourish:

"To every shade of thought, religious, scientific, political, economic, and social; to every craze, fad, dogma, heresy, and inspiration; there should be accorded a forum, a soap-box, a ton of type, and, subject to a subsequent responsibility for utterances, full liberty of speech and print."

(*The New Democracy*, 1912)

Long live cranky views.

S. Frost
Edinburgh

VHF PROGRAMME LABELLING TESTS

I would be obliged if you could draw your readers' attention to the fact that the BBC are conducting experimental transmissions on their Radio 4 broadcasts from the Wrotham transmitter which can give rise to apparent interference when receiving stereo transmissions with some types of receiver, as the BBC seem to be keeping quiet about it.

Having experienced interference for the past few months which only affected Radio 4 and then only when a stereo broadcast was being received, which interference vanished when I disabled the stereo decoder, I rang the BBC's Engineering Information Department and was told that this trouble was caused by adjacent channel interference from a continental station, that I should fit an attenuator, and that there was definitely nothing wrong with their transmitted signal. I subsequently found out, quite by chance, that they are in fact making experimental transmissions from Wrotham, and on speaking to their Research Department was told that these were known to affect certain receivers, of which mine (an Alba UA800) was one. The noise on my receiver is somewhat like that of a distant diesel engine ticking over, which is

quite noticeable during quiet passages in music or speech.

On ringing the BBC's Engineering Information Department a week or so later I was again told that my trouble was due to a foreign station. Only after I said that I knew that they were making experimental broadcasts which were affecting my receiver was the existence of these broadcasts admitted, and I was told that they would shortly be extended to Radio 2, as their Research Department had not had any complaints. Personally I cannot see how their Research Department could receive complaints when there has been apparently no publicity about these broadcasts, and it would appear that anyone making enquiries about interference is told that a foreign station is to blame, this despite the fact that the BBC's Research Department appear to know that problems will be experienced with certain receivers.

Some of my colleagues have reported noticing similar background noise with their receivers (various Philips and Ferguson models), but had attributed it to outside interference. It does not in any case make itself apparent very often due to the scarcity of stereo programmes on Radio 4. I would ask anyone who has noticed this effect and who has thought or been told that it is interference to contact the BBC.

I must say that I am somewhat puzzled by the BBC's approach. Although they have usually been quite open in the past about experimental transmissions, and requested feedback from the listeners, it seems that in this case feedback has been blocked for reasons best known to themselves.

R. Camp
Romford
Essex

The BBC replies

May I fill in the background to the points in Mr Camp's letter?

As has been publicised in *Wireless World* and elsewhere, the BBC is investigating proposals for inclusion of data signals in radio broadcasts. If a suitable system can be established it could offer a number of facilities of considerable benefit to the listening public, including channel and programme identification; automatic receiver tuning and switch-on as pre-selected in advance by the listener; automatic receiver search for the type of programme desired (e.g. light music, news); and visual display at the receiver of simple text such as channel and programme title; clock time and news headlines.

Compatibility with existing receivers is clearly an important factor. BBC Research Department has carried out laboratory tests on a range of domestic receivers and these tests have been supplemented by broadcast trials wherein data signals on a 57kHz sub-carrier have been included in Radio 4 v.h.f. transmissions from Wrotham.

The results of these broadcast trials have been assessed by means of questionnaires issued to selected listeners, including receiver manufacturers' representatives. The trials have not been generally publicised since to do so would inevitably mean that many unrelated interference or other diffi-

culties would be ascribed to the data signals and the trials largely vitiated.

Although the trials were unpublicised it would have been quite wrong for us to have wished to deny their existence or to give misleading advice to listeners complaining of interference. I very much regret that this happened to Mr Camp and freely apologise to him. In fact there was no intentional cover-up, simply human failure in that Engineering Information Department engineers answering enquiries were insufficiently alerted to the possibility of interference from this source: that this was so is my responsibility and their suggestion of interference from other stations was reasonable since this is a common problem at this time of year.

The desirability of a system of data signalling on a subcarrier in v.h.f. transmissions has been recognised for some time in many countries. The international (CCIR) Recommendation for f.m. stereophonic broadcasting allows for the use of a 57kHz subcarrier in this way and receiver designs should be capable of handling signals according to this Recommendation: such a subcarrier is widely used in other countries. Some receivers, including Mr Camp's, are not so designed and some other older receivers may suffer some degree of interference unless their stereo multiplex decoders are very carefully aligned.

In September we shall assess very carefully the results of the current trials and Mr Camp's report on his experience will represent useful additional information in this context. We shall wish to be sure that no difficulty will be caused to receivers which are designed with the CCIR recommendation in mind, and to assess the degree of any problems experienced with older receivers.

D. P. Leggatt
Head of Engineering Information
BBC, London W1

MAXWELL'S EQUATIONS REVISITED

As mentioned in the May correspondence columns, we received a large number of letters commenting on Ivor Catt's article in the March issue. Our original intention was to present collectively the main points of all these letters. After discussions between the author and some of the correspondents, however, we finally decided to print one letter which was considered by an independent referee to be fairly representative. (This referee is a senior engineer in a large computer firm.) The letter chosen is followed by a direct reply and some general remarks by the author.

Regarding Mr Catt's latest article, "Maxwell's equations revisited" in the March issue, I feel that he should be relieved of some of his pseudo-mathematical delusions. For example, what exactly does he mean by the equation

$$\frac{\partial h}{\partial x} \frac{dx}{dt} \frac{\partial h}{\partial t} \quad (1)$$

One criticism is that dx/dt can only be used to represent the velocity of the train if x represents the x-co-ordinate of a fixed point

on it. Mr Catt originally introduced x and t as independent variables to define a point in space-time, so dx/dt is a meaningless quantity.

Also, if Mr Catt had really performed a "careful analysis" he would have had great difficulty in deriving equation (1) in the first place, as anyone with even elementary knowledge of partial differential calculus could tell him. Equation (2)

$$\frac{\partial H}{\partial x} \frac{dx}{dt} = \frac{\partial H}{\partial t} \quad (2)$$

falls into the same category of fallacies. Small wonder it never appears in the textbooks!

Mr Catt then goes on to say that "almost anything" is a solution to the equations

$$\frac{\partial E}{\partial x} = \frac{\partial B}{\partial t} \quad (3)$$

$$\frac{\partial H}{\partial x} = \frac{\partial D}{\partial t} \quad (4)$$

This, to put it mildly, is a slight exaggeration of the facts. It is a fact that a sinewave, or a number of sinewaves, is the solution of the equations given the correct boundary conditions. Mr Catt's train is also a solution of the equations but since it obeys a different set of boundary conditions it does not appear as a sinewave. More rigorously, the train profile can be considered as a Fourier series comprising an infinite number of sinewaves with different frequencies and amplitudes, and possibly also some exponential terms.

Having demonstrated the non-existence of any justification for the "theoretical" part of the article, I would like to ask the author if he has any justification for the abuse he proceeds to hurl at mathematicians in general. Mathematics is a tool for the scientist or engineer to enable him to concisely describe physical phenomena. Insight, or a "feel" for the phenomena, is built into the equations and a competent engineer should be able to "look inside" the equations and visualise what they represent. Visualisation of abstract concepts is more difficult but simply because mathematics is used as an aid in describing them does not make the theory "ludicrous and false".

Waveguides, antennae and the like are designed using Maxwell's equations, not by hit-and-miss methods, and behave as predicted by the mathematics. Electromagnetic theory is mathematical by its very nature and if Mr Catt abandons the mathematics he will be left with very little of any practical use.

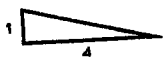
R. C. Hayes
University of Liverpool

The author replies:

Equation (1) relates three things:

- the slope of a surface,
- its forward velocity,
- the rate of rise of the surface.

If the slope is 1 in 4, the forward velocity 10 metres per second, then the rate of rise of the surface is 2½ metres per second. This kind of



relationship is the stuff of which science and engineering is composed of. I think Mr Hayes knows full well what (1) means, since he has studied A-level mechanics.

Equation (2) says that if an unchanging TEM wave moves forward at the speed of light, the gradient of H with forward distance is related to the gradient of H with time. If it is a fallacy, then what is the correct formula?

Or are we not allowed to relate $\partial H/\partial x$ to $\partial H/\partial t$ for a TEM wave?

Let Mr Hayes tell mechanical engineers to convert their trains into a Fourier array of sinewaves, and see how they react! Thank God mechanical engineers are too practical to be sucked into the kind of quagmire that permeates electromagnetic theory! I do not want to travel in a train with some exponential terms designed into or out of it! Would Mr Hayes recommend that the passengers be positioned so as to minimize their harmonic content?

Waveguides, antennae and the like are emphatically not designed using Maxwell's equations, any more than a tribal dance wins the battle that follows.

My successful pioneering attempts to interconnect high speed (1 ns) logic in Motorola in 1964 forced me to abandon all the maths that had grown like weeds to choke electromagnetic theory. A logic step is emphatically not a Fourier array of sinewaves, and you will run into all sorts of nonsense if you kid yourself that it is. Also, you can only successfully decouple the 5-volt supply to sub-nanosecond logic because it is untrue that capacitors have stray series inductance. The regular abandonment, at vast cost, of high speed logic systems during development will only cease if we can infiltrate some common sense into electromagnetic theory, and it stops serving merely as a favourite stamping ground for physically ignorant, fancy maths obscurantists. We must take the blarney out of electromagnetic theory.

The author also makes the following general remarks on the whole of the correspondence:

All twenty-two correspondents ignored the physics and concentrated on the mathematics. It seemed that whether Maxwell's equations mapped meaningfully and usefully onto reality mattered not. All that mattered was that the maths should be internally correct, or at least respected. An engineer like myself, who has sometimes worked as if through a blizzard of irrelevant, convoluted maths, takes the opposite view.

Some of the replies thought the minus sign should be there; some said it should not be. None noticed or contradicted my point, that the minus sign had no physical significance. (In fact it is an outgrowth of partial differentiation. Full differentiation has no minus sign, being a completely different operation from partial differentiation, in which the sign appears regardless of the nature of that which is being differentiated).

Always at a point on a surface in a three dimensional graph, the three slopes are related by

$$\frac{\partial z}{\partial x} \frac{\partial y}{\partial z} \frac{\partial x}{\partial y} = -1$$

The minus sign has nothing to do with electromagnetic theory. This contrasts with

$$\frac{dx}{dy} \frac{dy}{dz} \frac{dz}{dx} = +1$$

which is always true of the gradients of lines in two-dimensional graphs.

I. Catt

IEEE 488 BUS

Mr Ellesfen's article in the June/July issue on the IEEE 488 bus standard is timely, but bitter experience convinces me that he has

over-simplified things a little. The IEEE, IEC, GPIB and HP-IB systems are not all identical. Try interconnecting a 'strict' IEEE instrument (e.g. a Fluke 8502 d.v.m.) to a European GPIB bus instrument — lo and behold, the plugs are different. In fact Mr Ellesfen's Fig. 3 may show a typical GPIB rear panel but those aren't IEEE connectors. I do wish you engineers could agree on these things — it would make life a lot easier for us mere mortals!

John Hennessy
Department of Physics
University of Sheffield

IMPEDANCE MISMATCHING

The article "Impedance Mismatching" by Dr Lidgey in the March issue calls attention to an often overlooked point, because students fail to read the whole definition of equivalence in networks. For instance, one source says:

"If one network can be substituted for another without change in the currents and voltages at the ports, the two networks are externally indistinguishable and are said to be equivalent at the ports. Nothing need be known of the internal network configuration."

An equivalent network is not identical internally but has only identical values of external voltages and currents at the terminals. Thus comes our practice of substitution of "black boxes" to replace whole complex networks.

It is desirable to point out, as is done in the article, that power systems are not matched in impedance as 50 per cent efficiency rather raises the generation costs! But in communications where microwatts of power are very expensive, it is desirable to get out all we can, and so we match.

J. D. Ryder
Ocala
Florida, USA

Reference

1. J. D. Ryder, Introduction to Circuit Analysis p.175. Prentice-Hall, Englewood Cliffs, NJ 1973.

DESIGNING WITH MICROPROCESSORS

I would be grateful if you would allow me to draw attention to an error in Fig. 3 of "Designing with microprocessors" by Zissos and Valan in the May issue. The 8228 status latch shown would not produce the signals shown, since it decodes the status information placed on the data bus during the status pulse, STSTB, which is absent from the diagram. The outputs from the 8228 are much more akin to other processors, and comprise MEMR, MEMW, I/O R, I/O W, and INTA.

The diagram as shown would be correct if the status latch was a simple eight-bit latch clocked by the STSTB line.

P. B. Hodgson
Grantham
Lincs

The authors' reply: We thank Mr Hodgson for pointing out the omission of the STSTB strobe pulse in Fig. 3. This was intentional, for the sake of clarity.
D. Zissos and L. Valan