

CORRESPONDENCE

Clerk-Maxwell centenary

SIR, — It is not my intention to spoil the effect of the perfect tribute paid by Professor Domb in *Nature* (15 November, page 235) to Maxwell on the occasion of the centenary of his death. But could I be permitted to make a minor point and to mention Maxwell's ideas about the principle of relativity of motion?

Professor Domb's remark that the true quality of Maxwell's genius became apparent only with the development of twentieth century physics, might lead some to believe that his genius was lost on his immediate successors in the nineteenth century. Far from it. Perhaps, Boltzmann gave the most eloquent praise to Maxwell's equations (of electromagnetism). On reading these equations Boltzmann exclaimed, "War es ein Gott, der diese Zeichen Schrieb?" (Was it a God, who wrote these signs?) (*Mensch, Physiker, Philosoph.*) Berlin 1957, page 31).

The word "relativity" was first coined by Samuel Coleridge in the year 1834 but he used it in a philosophical sense. It appears that Maxwell was the first ever to use the word relativity with reference to the doctrine of relativity of motion, and this not only for mechanical but also for electromagnetic phenomena. True, he suggested experiments to determine the putative motion of the Earth relative to the "ether" and in fact made an experiment himself to measure this motion, using a rotating spectroscope, prism and partially silvered mirrors but got a negative result (*Phil. Trans.* 1868, page 532). Therefore Maxwell was not sure whether motion relative to the ether could be observed, but he ultimately moved to a firm belief in the relativity of all phenomena.

It is not widely known that in *A Treatise on Electricity and Magnetism* published in the year 1873, Maxwell devoted two articles, to the modifications of the equations of "electromotive intensity" when referred to moving axes. Using a method which is questionable, he yet came to the conclusion that "the electromotive intensity (in the moving system) is expressed by a formula of the same type", and added, "In all phenomena, therefore, relating to closed circuits and the currents in them, it is indifferent whether the axes to which we refer the system be at rest or in motion". This was more than an intimation of things to come.

Four years later in the year 1877, Maxwell published the book *Matter and Motion*, in which he used the word 'relativity' and affirmed, "Our whole progress up to this point may be described as a gradual development of the doctrine of relativity of all physical phenomena." Obviously he expected that the principle would be found to be universally valid. Penetrating deep into the future he proclaimed, "There are no landmarks in space . . . we have no log which we can cast to take a dead reckoning by . . . we may compute our motion with respect to our neighbouring bodies, but we do not know how these may be moving in space."

However, he thought as Newton before him did, that the doctrine of relativity broke down in the case of rotational motion, saying, "But though it is impossible to determine the absolute velocity of a body in space, it is possible to determine whether the direction of a line in a material system is constant or variable. For instance, it is possible by observations made on the Earth alone, without reference to the heavenly bodies, to determine whether the Earth is rotating or not". Maxwell then quoted Newton's bucket-experiment, carrying the bucket in thought to the North Pole. However, finding the calculated depression of the water-surface in the bucket

too small for measurement, Maxwell remarked that the most satisfactory experimental proof was Foucault's pendulum, the rotation of which (except at the equator) establishes the absolute rotation of the Earth, although the stars and the pendulum are in no visible manner connected.

Probably Poincaré, who developed these ideas soon after, and used the phrase "Le principe de relativité," followed in Maxwell's footsteps — and, of course, travelled farther. Otherwise, how could we explain the exact transliteration of "relativity" into "relativité"?

Yours faithfully,
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Dioxin detection

SIR, — *Nature* is too important a scientific forum to leave unchallenged the inaccuracies contained in the report (8 March, 1979, page 109) of my comments about comparative laboratory measurements of 2,3,7,8-tetrachlorodibenzo-paradoxin (TCDD or dioxin).

Alastair Hay failed to provide any context to my comments and they appear to be an admission that Dow's analytical capabilities are poor in evaluating the dioxin content of environmental samples. This, of course, is not true. Dow chemists are now confident that the 2,3,7,8-TCDD molecule can be isolated from its isomers and detected at the 5 parts per trillion (10^{12}) level in environmental samples.

With that as background, let me move to the incident reported in your 8 March issue — the EPA study to evaluate the ability of the Agency's Mississippi Test Facility to "spike" and clean up samples of beef fat and human milk; and the determination of abilities of various laboratories (University of Nebraska, Harvard University, EPA's PTSEL Laboratory at Research Triangle Park, Wright State University and Dow Chemical) to measure TCDD in final extracts.

Beef fat was spiked and extracted by EPA Mississippi Test Facility using an acid/base procedure. Identical samples were shipped to Lab A and Lab B. An equivalent set was shipped to Lab C at a different time. Other extracts of beef fat were shipped to Lab D and Lab E. All the laboratories made measurements of TCDD. Of the total 20 unspiked samples measured, 10 gave false positive results. The 15 samples spiked with 0.5 to 9 ppt TCDD showed seven false positive results and zero false negative results. Lab C did not show false results below 9 ppt because its detection limit was too high to make measurements. The 94 samples spiked with 9-81 ppt TCDD showed two false negative results and one false positive.

Spiked beef fat was shipped to Lab D to evaluate its neutral extraction procedure for TCDD. These extracts were examined by Lab D and Lab C. Of six extracts of unspiked samples, one showed false positive results. The 18 spiked below 9 ppt showed six false positive results and zero false negative results. Above 9 ppt, two of 38 extracts gave false positive results and one false negative.

Extracts of human milk were shipped to Lab A and Lab B. Of 12 unspiked extracts, 11 gave false positive results. Of 12 extracts spiked with 0.5 to 9 ppt TCDD, two gave false positive results and three false negative. The 53 extracts spiked above 9 ppt TCDD gave no false positive results and no false negative results.

So the collaborators correctly concluded that the method gave acceptable results above 9 ppt but none of the laboratories was able to produce satisfactory data below 9 ppt.

These facts may be accounted for by any or

all of the following reasons: the clean-up may be unsuitable for the particular mass spectrometer being used; the extracts may have stood too long before measurement; or the mass spectrometer may not have been performing properly.

The results obtained in this study in no way compromise results obtained by the various laboratories in other studies in which they did their own extractions and clean up.

Yours faithfully,
WARREN B. CRUMMETT

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Closed universities better than "sophistry centres"

SIR, — It was obvious that somebody would point out that the 1960s expansion of universities has overstretched resources, and now the words have come, from the mouth of Lord Todd and others. Since the resources derive from the taxpayers, one has only to persuade them that what Lord Todd says is true and it will become so — universities have little else in the way of income, at least as far as scientific research is concerned.

But is the answer to encourage low-caste universities to give up research? Lord Todd is surely as aware as anybody else how research stimulates — even positively goads — teachers into keeping ahead, delving in hidden places and generally searching out the truth. Who benefits most? — the students of course. Without research, no chemistry department is any good at all, and the outcome of Lord Todd's suggestion will be to create not teaching centres but sophistry centres.

If things are so bad we should not be aghast at the idea of closing down a few universities completely; it would be better than trying to keep alive an impotent, wishy-washy, limping sort of place in every university town.

Yours faithfully,
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Iranian terrorists

SIR, — The cynical apology of the Iranian terrorists in *Nature* (29 November, page 439) reminds one of Geoffrey Dawson's infamous editorial in *The Times* of 7 September, 1938. Brutal terror will always appeal to a certain kind of intelligentsia. Let them have their fun, but please spare us the hypocrisy of preaching to the victims and not to the henchmen. Europe no longer has a Churchill to redeem a Munich.

Yours faithfully,
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Islamic science

SIR, — I appreciate that the Islamic world has lived under western colonisation and oppression, particularly economic oppression, for centuries. However, I found that the article 'A revival for Islam, a boost for science?' (22 November, page 354) has a religious bias and is highly racist and chauvinistic. I do not recall any great scientist from Galileo to Einstein mentioning a religious science.

A quotation on page 354 states: ". . . The new civilisation of Islam will be capable of boosting scientific activity and scientific knowledge to heights and achievements unknown to man before". Surely boosting would have been more appropriate round. However, the simplest, scientific question that the statement begs is: why?

Your faithfully,
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