

where he began a very fruitful series of researches in fungal antibiotics.

Robertson succeeded Sir Ian Heilbron to the Heath Harrison Chair of Organic Chemistry at Liverpool in 1933, a post he held until he retired at the age of sixty in October 1957. During this period he carried out a brilliant series of investigations on the hydroxy-carbinol and heterocyclic oxygen compounds of natural occurrence which included many of the non-nitrogenous bitter principles of plants, as well as a variety of fish poisons and insecticides. During the twenty-four years of his occupancy of the Liverpool chair his output of original work was prodigious and marked throughout by brilliance of perception and execution. Among his many triumphs was the clarification of the chemistry of the rotenone group, the insecticidal compounds of derris root, of usnic acid and of many complex colouring matters and pigments of the insoluble red woods. In these studies he solved a long series of structural problems which had baffled earlier workers. His other successes included the unravelling of the structure of natural furano-coumarins and furano-chromones, and of the mould colouring matters, citromycesin, citrinin and violacein. He also made notable contributions to the chemistry of melanin.

Robertson was one of the outstanding organic chemists of our time and his work on the chemistry of natural products opened up new fields of study. He was elected to the Royal Society in 1941 and was awarded the Davy Medal of the society in 1952 for his researches in the chemistry of natural products.

He was a man of charm and kindness who won the affection and admiration of all who came into contact with him. He was an enthusiastic and inspiring leader of research and an adherent of the best traditions of science. His interests were wide: he was a very successful farmer, first in Aberdeenshire and later, after his retirement, in Lincolnshire. He had a wide circle of friends and those who had the pleasure of knowing him valued a friendship which will endure as a cherished memory of a fine man. He was not well known at scientific meetings, nor was he a good lecturer, but he was a wise and generous counsellor on university and scientific matters. Shortly after moving to Liverpool he became a member of the Advisory Council for Scientific and Industrial Research, and later (1955-60) was a member of the University Grants Committee. After his retirement he served as a member of the Agricultural Research Council. He was Pro-Vice-Chancellor of the University of Liverpool from 1948 to 1953. He leaves a son, Ewan, who carries on the family tradition in farming.

Many of his students who occupy leading positions in universities and industry throughout the world will mourn the loss of a brilliant organic chemist who brought distinction to his subject and to the University of Liverpool.

Correspondence

DDT in Mothers' Milk

SIR,—Dr Göran Löfroth (*Nature*, **225**, 881; 1970) states that the general public was not told about DDT in human milk until he "and others in 1968 and 1969 pointed it out". This is not so. Publication in the open scientific literature should be equivalent to a public disclosure in these days of alert scientific writers and, as pointed out, the public was told about this matter in a report by the Committee on Appropriations, House of Representatives, Washington, DC. The 1966 statement in the report is:

"In contrast to bottle-fed babies receiving cow's milk, breast-fed babies are ingesting pesticide residues contained in the mother's milk because she ingests foods that legally contain pesticide residues. Studies were

made by the Public Health Service at the Taft Sanitary Engineering Center in Cincinnati, Ohio, and by the Bureau of Occupational Health, State of California, Berkeley, California, in which it was determined that samples of mother's milk contained amounts of pesticide residues far in excess of the pesticide residues permitted by FDA in cows' milk. Further, the study concluded that there were no ill effects on the babies as a result of the pesticide residue in the mother's milk."

Löfroth also says, "Man has not yet been exposed to the organochlorine pesticides for a full lifetime". However, as Hayes¹ points out, "Time slips by so rapidly we tend to forget that DDT has now been commercially available for 20 years, and its military use is even longer. . . . I venture to say that in some sectors of Naples where DDT was used so effectively to combat typhus in 1943 and 1944, 20 years is a generation". He goes on to state that "we have records of workers who have been employed in the formulation of DDT since 1945 or even earlier" and that the absorption of DDT by many formulators is 1,750 times as great as that of the general population of England and Wales (which had an intake one-half of the corresponding level in the USA).

Certainly an exposure at several hundred times the general level for more than 20 years should be equivalent to a lifetime at usual levels (this point is discussed by Hayes¹). Löfroth states that the use of DDT "has been so ingeniously advocated that we no longer have any controls". What about the following? Ceylon had more than 2,000,000 cases of malaria in 1950. This dropped to 17 in 1963. In 1964 the use of DDT was stopped, and by 1968 the malaria incidence was more than one million². Since there are no effective replacements for DDT available in the anti-malaria campaign³, the ban advocated by Löfroth would be followed by millions of deaths.

Yours faithfully,

THOMAS H. JUKES

University of California,
Berkeley, California.

¹ Hayes, jun., W. J., *Proc. Roy. Soc.*, B, **167**, 101 (1967).

² Report, Department of Health, Education and Welfare, Atlanta, Georgia (July 25, 1969).

³ Statement by Vector Biology and Control, WHO, Geneva, to Pesticides Conference at Corvallis, Oregon, August 18, 1969.

Causality and Tachyons

SIR,—Professor Thouless¹ has given an excellent demonstration of the fact that the existence of tachyons would lead to causal paradoxes if (1) the production of low-energy tachyons can be controlled, (2) tachyons can be detected and (3) tachyons can travel over a large enough distance for the difference between their velocity and that of light to be detectable.

There is, however, one condition which would make their existence possible without paradox. This is that the universe is absolutely determined, the order of cause and effect observed by us being a frequent but not essential occurrence.

This would, of course, require the complete abandonment of any idea of free will so that Professor Thouless's "A" is unable to change his predetermined behaviour when he sees the effect of his action before having taken it. This would further require that our conscious awareness is a passive observer scanning a fixed environment along its time axis. This seems to me unlikely though not disprovable.

It is important to point out further that if detectable tachyons do exist, not only must we abandon the possibility of existence of free will but also one of the present bases of our concepts of physics, the Uncertainty Principle. It would be easy to modify Professor Thouless's experiment by giving A a radioactive atom, on the decay of which he sends his tachyon signal out. When therefore, one minute before zero time, he receives his return mes-

sage from B, he can foretell accurately that this particular atom will decay in exactly one minute as well as that he himself is unable to change his mind. It is easier firmly and unambiguously to disbelieve in tachyons. This is my own policy.

Yours faithfully,
J. H. FREMLIN

Department of Physics,
University of Birmingham.

¹ Thouless, D. J., *Nature*, 224, 506 (1969).

Quare Multiplicandum Est

SIR,—There is an oft-repeated myth that the development of mathematics was held up by the cumbersome system of Roman numerals. In fact, Roman multiplication is easy and does not require the use of multiplication tables. The system can be used on an abacus or written out, as the following simple example will show.

To multiply 96 × 16.
To multiply XCVI by XVI.

M	D	C	L	X	V	I	
		+		-	+	+	= × I
	+		-	+	+		= × V
			+	+			= (alt. × alt.)
+		-	+	+			= × X
Total =	+	+		+++	+	+	

It will be seen that using the multiplier a digit at a time we simply move the whole "plus-and-minus pattern" (here plus, space, minus, plus, plus) the requisite number of steps to the left. In addition, when multiplying an alternate digit by itself (the alternates are every second one, V, L, D, etc.) we must write the answer in its place and then repeat it once below and once to the right as in the third line above.

Had we been multiplying by 14 instead of 16 our first row would have been a multiplication by minus one instead of plus one, so we would have reversed all the signs in the pattern while keeping them in their correct places.

Yours faithfully,
MARGARET LAZARIDES

Yeolmbridge House,
Near Launceston,
Cornwall.

Unfair to W's

SIR,—Concerning the article "Can Scientists afford Science?" (*Nature*, 226, 10; 1970), what price the definition of a Publishing Scientist? The Royal Society used to, and the *Journal of Physiology* still does, list joint authors of a paper in alphabetical order. Both journals qualify for inclusion in *Current Contents*. I write with feeling.

Yours faithfully,
R. A. WEALE

Institute of Ophthalmology,
University of London,
Judd Street, London WC1.

University News

Dr C. E. Johnson, AERE, has been appointed professor of experimental physics in the University of Liverpool. The following appointments have been made in the University of London: Professor C. H. Barnett to the chair of anatomy tenable at St Thomas's Hospital Medical School; Professor J. D. Smyth to the chair of parasitology tenable at Imperial College of Science and Technology; Dr A. M. James to the chair of physical chemistry tenable at Bedford College.

International Meetings

July 18–23, 1971, **Molecular Energy Transfer**, Cambridge (Dr A. B. Callear, Department of Physical Chemistry, University of Cambridge, Lensfield, Cambridge).

Sabbatical Itinerants

In the hope of providing some practical assistance in the good cause of mobility between laboratories, *Nature* advertises the needs for housing of families about to take up periods of sabbatical leave. To begin with, no charge will be made for advertisements like this. It is hoped that a period of experiment will show what form these advertisements could most usefully take and whether they are effective.

Wanted: Furnished flat in London, reasonable commuting distance from Imperial College, for visiting professor and wife, June 15 to August 31, 1970. Please contact Dr D. A. Walker, Botany Department, Imperial College, London SW7.

Wanted: Furnished house or flat with 3/4 bedrooms in London, preferably north, for 1–2 months from late June 1970. Please contact Mr or Mrs T. L. Hutchings, "Two Trees", Hernes Road, Oxford OX2 7PT (telephone Oxford 55601).

Wanted: Furnished 2 or, preferably, 3-bedroomed flat or house in North London for Canadian professor with teenage children. Central or other good heating, accessibility to tube, required. Three-bedroomed house in Winnipeg available in exchange. Please contact Dr Peter E. Dresel, 681 Cordova Street, Winnipeg 9, Manitoba, Canada.

Wanted: American scientist, wife, and children aged 12, 11, 8 and 7, wish to exchange 4 or 5-bedroom house or flat within easy reach of Holborn for 5-bedroom house in New Jersey, 20 minutes to midtown New York City. Approximately June 15 to end of July. Car swap possible. Please contact Professor G. F. Elliott, 28 Tylney Avenue, London SE19 (telephone 01–670 0141).

Wanted: Furnished house or apartment (2 bedrooms, central heating) for American university professor, wife, and son aged 4, in London or suburbs (convenient transport to British Museum, Natural History) from September 1, 1970, to March 1, 1971. Please contact Dr K. F. Liem, Department of Anatomy, University of Illinois Medical Center, Chicago, Illinois 60612, USA.

Wanted: To rent from July 1970 to August 1971. Furnished house or apartment, 3 or 4 bedrooms, central heating, in central London, preferably Kensington or Chelsea. Will also consider an exchange for 3 bedroom, 3 bath spacious house in Philadelphia suburb. Please contact Dr L. Warren, 433 Bryn Mawr Avenue, Bala Cynwyd, Pennsylvania 19004, USA.

Vacant: From late July to late September, 4-bedroomed, furnished house in north London about 40 minutes from central London. Please contact Dr John Tooze, Imperial Cancer Research Fund, Lincoln's Inn Fields, London WC2.

Vacant: 3-bedroomed, centrally heated house with garage and garden in Bearsden, Glasgow, from September 1970 to September 1971. Please contact Dr I. R. Pendleton, Microbiology Department, University of Glasgow W2.