dramatically when the temperature fell below the λ point at 2.19 K.

A series of well planned experiments showed clearly that the effect was due to the presence of a liquid helium film on the inside of the pumping tube leading to the vessel, a result confirmed by the linear dependence of the evaporation rate on the tube diameter. Combined with an unexplained phenomenon observed in 1922 by Kamerlingh Onnes, when the levels of helium in two concentric dewars were seen to equalize, this led Rollin and Simon to suggest a thin mobile film transporting liquid from the cold lower end in the liquid to the warm upper end where it evaporated. It was in recognition of Rollin's contribution that Keesom in his classic monograph *Helium* coined the name "Rollin film". In 1936, Rollin, with Kurti, Lainé and Simon, carried out experiments at the Laboratoire du Grand Electro-Aimant in Bellevue (Paris) which led to the first liquefaction of helium in France, and the discovery of magnetic ordering in dilute paramagnetic salts at very low temperatures obtained by adiabatic demagnetization.

After two years (1937-39) at the University of California, Berkeley, as a Commonwealth Fund (now Harkness) Fellow, Rollin returned to the Clarendon Laboratory to join an Admiralty team working on receiving tubes and other techniques for centimetre waves. He suggested immediately the use of a secondary emission target to convert velocity modulation into amplitude modulation in a reflex klystron; though this gave a low starting current for oscillation, and tubes at both 10 cm and 3 cm wavelength were already in use in 1940, it proved less stable, because of electrode contamination, than the system adopted later with a reflector at a negative voltage. In the later years of the war, Rollin carried out important development work on magnetrons for wavelengths in the 1 cm wavelength region.

In 1945 he started to extend the then novel technique of nuclear magnetic resonance to solids at low temperatures, using a simplified electronic system which became known as the "Rollin" circuit. In collaboration with J. Hatton, resonance was observed in liquid hydrogen, and in solid ortho-hydrogen the absorption line was found to split into a triplet. Nuclear magnetic resonances due to beryllium-9 and silicon-29 were detected at helium temperatures, the latter in part of a brown beer bottle in which spin-lattice relaxation was speeded by the presence of electronic paramagnetic impurities, the importance of which had become apparent during this work. After a lengthy effort to concentrate helium-3 from its natural abundance (10^{-7}) to 10^{-3} by means of thermal diffusion, the nuclear resonance of helium-3 was sought but no signal could be detected. Instead, the small quantity of enriched helium was used to study the reaction $^3\text{He} + d \rightarrow ^4\text{He} + p$, with the object of looking for excited states of the α particle.

Rollin then returned to an interest stimulated much earlier by Dr (now Professor) R. V. Jones, the development of a sensitive detector of infrared radiation, and devoted himself to the study of semi-conductors. Measurements of very low frequency "flicker" noise were made at low temperatures in germanium, but for the far infrared interest shifted to indium antimonide at liquid helium temperatures. Rollin proposed the use of the phenomenon of "hot electrons" generated in the semi-conductor by the absorption of radiation: the resultant change in their mobility was shown to provide a fast and sensitive detector of radiation at millimetre and sub-millimetre wavelengths.

Rollin was born on June 20, 1911, and went from Watford Grammar School to Wadham College, Oxford, as a scholar in 1930. He obtained first-class honours in physics in 1933, and took his D.Phil. in 1936. He became a university lecturer in Oxford in 1945, and a Fellow of Wolfson College in 1967. In 1964 he married Angela Margaret Moylan, who survives him.

Correspondence

The EMBO Question Debated

SIR,—Your account (*Nature*, 224, 406; 1969) of the recent meeting to discuss British participation in a European molecular biology laboratory did not consider all the factors affecting the desirability of setting up international laboratories. You point out that none of the equipment used in molecular biology is so expensive as to be beyond the reach of a laboratory financed by a university or research council. This distinguishes the EMBO proposal from, for example, CERN. A factor that was not mentioned is the location of the laboratory.

The argument that there is no case for a European molecular biology laboratory is valid. But there could be good reasons for other international laboratories that would use only ordinary equipment. For example, a large laboratory may be needed, for climatic or other reasons, in a region that is not industrialized. An institute in Antarctica is a case in point. More immediately useful would be an institute of food technology situated in the wet tropics and concerned exclusively with producing food (especially protein rich food) from local sources for local consumption. The work of such an institute would complement rather than overlap the work that is being done in industrialized countries; it would call on an abundant supply of scientific goodwill; and, if it is not financed and staffed internationally, it is difficult to see how it could be established because those who are now in most need of food have very little money.

Yours faithfully,

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Private Army of Contributors

SIR,—May I, in the interests of accuracy, make two comments on Dr Macleod's interesting article, "Private Army of Contributors", in the centenary issue of *Nature* (224, 445; 1969)?

(1) The statement that I "was writing a biography of Lockyer in 1927-28" may strengthen a false impression that there exists such a biography, not elsewhere referred to in the supplement, bearing my name. The facts are these: there is only one published biography of Lockyer, variously referred to in the supplement, with the precise title "Life and Work of Sir Norman Lockyer" by T. Mary Lockyer and Winifred L. Lockyer with the assistance of Professor H. Dingle and contributions by Dr Charles E. St John; Professor Megh Nad Saha, FRS; Sir Napier Shaw, FRS; Professor H. N. Russell; the Rev J. Griffith; Sir Richard Gregory and Professor A. Fowler, FRS." Except for the "contributions" referred to, it was written by me, at the suggestion of Sir Richard Gregory, during the years 1922-28, from material selected by Lockyer's widow and daughter, and published by Macmillan in 1928.

(2) I have unearthed the notes I made at the time, and can now give an authentic version of Tait's characteristic verse which, as Dr Macleod says, he recorded as I (imperfectly) spoke it from memory. It is as follows:

Your printers have made but one curious blunder,
Correct it instant, and then for the thunder!

We'll see in a jiffy if this Mr. S—

Has the ghost of a claim to be thought a good fencer.

To my vision his merits have still seemed to dwindle,
Since I found him allied with the great Dr. T—

While I have, for my part, grown cockier and cockier,
Since I found an ally in yourself, Mr. L—

And am always, in consequence, thoroughly willin',
To perform in the pages of *Nature* (M—).

For reasons no longer existing, it was thought inadvisable to include this in the biography, and my note was made roughly in shorthand for my own interest: it is such that I cannot be certain that no proper name was written in full, but otherwise the version is trustworthy.

Yours faithfully,
HERBERT DINGLE

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Surrey.

Environmental Studies

SIR,—The current term "environmental studies" would seem to be of use as a general description of the total or some convenient grouping of parts, but, because of the considerable overlap between the various components, unification has been, and is being, pursued in order to systematize further the whole field and thereby to aid further study. Perhaps the suggestion of the term "envirology", which would refer to closely interrelated and unified studies in geographical, geological, biological and other fields, would be somewhat premature but would at least indicate a desirable target.

The term "envirology" is, however, suggested as being immediately applicable to the study of the physics of the environment, an important and substantial part of which should be instrumentation, largely of an electronic nature. The quantitative assessment of environmental features, based on the principles of physics, is an indispensable aid to understanding and unification; it is and would continue to be of paramount importance in envirology.

I propose these two terms with some diffidence in view of your leader on "Neologismatology" (*Nature*, 223, 659; 1969), and make no claim as to their philological excellence. I suggest, however, that they are brief, euphonious and evocative and, although they may not fill a long established need, will be very useful in the shorthand largely peculiar to the sciences.

Yours faithfully,
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Human Biology

SIR,—This year it has become fashionable to talk of human biology as one might talk of physics or philosophy, and the new school of human sciences at Oxford (see *Nature*, 223, 660; 1969) has encouraged some to see in it a great leap forward. I do wonder, however, what are the concrete gains to be had from uniting human genetics, human ecology, psychology, and so on. One could always make a first degree out of human physiology, human geography and human psychology, for example. This does not seem to be the real issue, for human biology is there if you want to do it.

The event of real interest is that the words "human biology" are on so many lips, but quite without any substance to follow. At this university these are commonly the lips of postgraduate students and young lecturers who have just completed at least seven years' training in nothing but biological science. I have questioned a number of them about their behaviour, but at every attempt the substance of human biology evaporates. Clearly the thorn is on the inside and the outward symptom—endless mention of human biology—has, like the word "ouch", no remedial function. In short, the current enthusiasm for human biology may be an inappropriate solution to a problem that is acutely felt but poorly understood.

It is indeed a good idea to facilitate communication between university departments by bringing them closer together, but I am somewhat incredulous where human biology *per se* is regarded both as an innovation and a programme for action. How can we define human biology? Its essence cannot be obtained when, by distillation, we merely arrive at a series of already existing courses. Nor do I believe that there is a series of hitherto undreamed courses from which this essence could be obtained. The essentialist programme won't do. In a similar way it could be claimed that some whole called human biology emerges greater than the sum of its parts—but of course holism won't do either. It is just a collective noun, and, since both the essence and the whole are such delightfully abstract entities, time and again talk of them has been adopted as a subterfuge. One is quite safe because there is no possibility of concrete consequence. This subterfuge is easier to grasp than the underlying thorn, but I would suggest the following solution.

Every kind of knowledge, including science, is valuable. But all kinds of knowledge are not valuable in the same way or for the same reason. There is one kind of knowledge with which we control our physical environment: knowledge about things. But there is also another kind of knowledge about man, and about the spiritual and ethical explorations which make him peculiarly man. There are of course criticisms that can be levelled at this simple distinction—I believe it perpetuates the body-mind fallacy. However, it is apt enough in the face of the behaviourist's assertion that Freud and Shakespeare are useless because their work is unamenable to operational definition.

The new school of human sciences at Oxford came into being on the recommendation of an inter-faculty committee representing the Boards of Biology and Agricultural Sciences, Medicine, Social Studies, Anthropology and Geography and Psychology. These sciences have come in recent years to deal, quite deliberately, with man as thing. And yet I think one student betrayed what it was he really wanted when he (erroneously) described the Oxford experiment as a union of arts and science.

It is a curiosity about man that cannot be pursued within the axioms of the biological sciences. Science, like a waggish boy, can be brought into the study of man—indeed, the study of man would be quite incomplete without this. But I cannot take at all seriously attempts at the reverse, and such an attempt is not particularly well concealed in any advocacy of human biology. It is of course common to attempt neither—which results, even at its best, in an unsatisfactory dualism. The hobbies of scientists listed in *Who's Who* are always entertaining and frequently surprising.

Yours faithfully,
ANTONY COURTICE

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University of Sydney.

University News

Dr J. O. L. King, faculty of veterinary science, has been awarded the status and title of professor at the **University of Liverpool**.

The title of professor of urology has been conferred on **Mr J. P. Blandy**, in respect of his post at the **London Hospital Medical College**, University of London.

Dr E. L. Blair has been appointed to a personal chair in physiology at the **University of Newcastle upon Tyne**.

Dr C. Ellenby has been appointed to a personal chair of zoology at the **University of Newcastle upon Tyne**.

Mr T. G. Miller, formerly University College of Rhodesia, has been appointed visiting professor in the department of geography at the **University of Reading**.