

Medical Research Council in Great Britain, between the Chinese Ministry of Economics and Natural Resources and the Department of Scientific and Industrial Research, etc.

A fund has been set up in India for the maintenance of a Scientific Supply Service, so that the essential needs of Chinese research institutions, etc., many of which are engaged on war work, may be met. Six copies of current issues of some seventy-five British scientific journals are regularly sent to China for distribution by the Cultural Scientific Office, and it is hoped to arrange for a Chinese edition of *Monthly Science News* to be published in Chungking. *Monthly Science Abstracts and Reviews* and copies of *Endeavour* are distributed through Academia Sinica. Six positive micro-film copies of each of these seventy-five scientific journals are being sent regularly to China for distribution by the International Committee for the Supply of Scientific and Cultural Reference Materials, and this organization also handles all American supplies of micro-films. British scientific films are being supplied to the Department of Educational Cinematography of Nanking University, and a number of offprints of scientific papers from British journals have been transmitted to China at the author's wish or on request from Chinese workers. The number of text-books and monographs on scientific subjects which have reached China in response to requests passed on by the Council's Office runs into hundreds. Thirty manuscript papers in English by Chinese workers have been submitted for publication through the Chungking Office to editors of British scientific journals, and a panel of translators from Chinese to English has been assembled so that scientific papers of special interest can be translated or abstracted. A grant has been made for the preparation of abstracts in English of Chinese publications on chemical matters, and at least four hundred current Chinese scientific publications have been distributed through the Council to British scientific workers and science libraries. A science news letter, *Acta Brevia Sinensia*, giving an account of current Chinese scientific activities, is duplicated and distributed by the British Council in Great Britain. Prof. E. R. Dodds returned from China in the summer of 1943 after a successful tour of the university centres, Mr. E. Hughes has been in China since May 1942 and was remaining until the end of September 1944. Prof. W. L. Renwick, who reached China more recently, has already submitted a report on the fine arts in China.

## WORK OF THE ROYAL ARMY VETERINARY CORPS

MAJOR A. V. FRANKLIN, writing in the *Veterinary Record* (447, Nov. 18, 1944), tells one of the most interesting and humane stories of this war. As a result of the progressive mechanization of our armed forces before the War, the Royal Army Veterinary Corps was very considerably reduced, and some prophets decided that it would never be revived. How wrong they were they will learn from Major Franklin's article. When a cavalry division was formed for service in Palestine, veterinary units of the Royal Army Veterinary Corps were organized to attend to its animals. Mobile units were also serving, at the outbreak of the War, the two cavalry

regiments stationed in Palestine. Other veterinary units were attached to Indian and Cypriot mule pack transport companies operating in France. This was the extent of the British Army veterinary services until the end of 1940.

In 1941, however, a striking change occurred. The duties of the Army Remount Service were transferred to the Royal Army Veterinary Corps, which thus undertook the purchase, training and maintenance of animal reinforcements, as well as the care of the animal sick and injured. In the difficult country of Eritrea and Greece, where pack animals played such an important part, the Royal Army Veterinary Corps had ample opportunity to prove its efficiency. In Greece many veterinarians were taken prisoner and some heavy casualties were incurred. One of the saddest tasks was the rescue, by the mobile section stationed at Alexandria, in veterinary charge of the Polish Carpathian Brigade, of hundreds of mules in the North African desert. The Italians fleeing before Lord Wavell had left them there without food, water or attendance and their condition was deplorable; but they were soon restored by proper veterinary care. In Syria, several regiments of yeomanry operated with their own veterinary officers and also two mobile veterinary sections. It was here that the Royal Army Veterinary Corps showed the efficiency of its remount organization. Horses of all kinds were taken over from the Vichy French, classified, examined for disease, branded, shod and generally conditioned before they were re-issued for service with the Allies. Here also many horses and mules were found deserted by their attendants without food or water and often in a pitiable condition. While this task was being completed, yeomanry and cavalry regiments were being mechanized and their horses were taken over and trained for transport work.

In 1942, the Royal Army Veterinary Corps was given the task of meat inspection and administration of the livestock depots from which the Army's meat supply was derived. The stock were inspected both before and after slaughtering, and this service was so beneficial that it was extended throughout the Middle East. The existing slaughter-houses were often so insanitary that the Royal Army Veterinary Corps designed and built new ones with adequate rail and road facilities. The serious danger of transmission to man of certain animal parasites which are very prevalent in bovines was removed. Later, the Corps undertook the actual selection of the beasts provided by local contractors, who soon learnt that inferior stock would not be accepted. Often, indeed, they could not supply beasts of sufficiently high quality, and the Royal Army Veterinary Corps established its own livestock depots, first in Syria and later throughout the Middle East, in which cattle, sheep, goats and pigs were reared and supplied to the Forces. Patients in the hospitals received white meat in the form of rabbits from the Corps' rabbitries. One of these depots, carrying a stock of 1,500, was able to produce 150 animals a week. The commanding officer of this depot has reported that, in Syria, parasitic disease in sheep and goats caused the deaths of one million animals in one winter alone, a loss which amounted to three million pounds sterling, or one quarter of the annual budget of the country.

In Italy, the Royal Army Veterinary Corps had perhaps its most difficult task. Many of us have heard about the mules used in this extraordinary campaign; but we have not all realized how much our men

owe to the R.A.V.C., which bought, conditioned, trained and issued these invaluable animals. This work called for high administrative and business skill. Mules had to be sought out in many countries, and the right types had to be selected and transported across land and sea. Many veterinarians were required for the pack transport companies and more for the remount depots, animal hospitals, mobile sections and laboratory services. Evacuation of animal casualties from the line and the supply of reinforcements was one of the most eagerly sought jobs in the veterinary service. The Corps is now considering the extensive use of dogs.

It is certainly true that, as Major Franklin says, the story of all this work, when it can be told in full, will bring great honour to the veterinary profession. Much of the veterinarian's work, in peace-time as well as in war, is unspectacular and done with a quiet efficiency which does not get into the news. It deserves the admiration and gratitude of all who care for animals.

G. LAPAGE.

## RELATIVITY OF TEMPERATURE RADIATION

**I**N his Halley Lecture<sup>1</sup>, Prof. H. Dingle gave an outline of an entirely new application of relativity principles to thermal radiation. He has now published a more detailed account<sup>2</sup> which shows how far the theory has been worked out. The fundamental idea is that "our theories should not imply the possibility of observing what is, in fact, unobservable". Thus in Einstein's theory of two bodies moving with uniform relative velocity, it is only this relative velocity and its limiting value which are of importance. Moreover, the equality of the inertial and gravitational mass is regarded not as a remarkable coincidence, but as establishing that these two masses are two aspects of the same property.

Guided by this analogy, Prof. Dingle deals with the radiation of a black body, of constant temperature, in terms of its effect upon a second black body. He regards the equality of the emissive and absorptive powers as establishing that these are two aspects of the same property. It should have been pointed out that this equality exists only when the powers are defined in a general way<sup>3</sup>. The conventional definitions<sup>4</sup>, which give absorptive power as a pure number, but emissive power as a quantity with dimensions, obscure this equality.

The most important part of Prof. Dingle's theory seems to be the analogy between the three kinematical variables, displacement, time and velocity, and three thermal variables, entropy received by a certain instrument, 'thermal time', and what I will venture to call 'radiocity', though he calls it 'radiation temperature', or simply 'temperature'. It is certainly not the usual absolute temperature, as it is approximately proportional to its fourth power. The 'thermal time' is measured by a 'thermal clock', which records what in ordinary terms would be called the total amount of radiant energy received from a black body radiating at a constant rate. In terms of these variables, Stefan's law of radiation takes the form 'radiocity is rate of change of entropy', exactly analogous to 'velocity is rate of change of displacement'. Moreover, if the zero of 'radiocity' is changed, the three thermal variables are transformed by formulæ that correspond

roughly (but not in detail) with the Lorentz transformation formulæ of Einstein's theory. Finally, there is an invariant thermal interval; but this involves an expression of the fourth degree in the differentials, whereas the kinematical interval of space-time involves only one of the second order.

Two applications of the theory are to the maximum efficiency of a heat engine working between fixed temperatures, and to the general equations of the thermo-electric circuit. It is difficult to find other applications, as there are few phenomena which depend only on temperature differences, do not appreciably alter the temperature, and are independent of the properties of particular substances. It is emphasized that the theory, at any rate in its present form, deals only with radiation; no claim is made that all thermal phenomena are independent of the zero of temperature.

Prof. Dingle concludes by indicating how the limitation of constant temperature might be removed. As in the extension of the special theory of relativity to the general theory, it would be necessary to deal with tensors, but in the thermal case the work would be much more difficult. Perhaps some enterprising young mathematician may care to tackle this. If Prof. Dingle's arguments are sound, they open up a new line of approach to the theoretical study of radiation and a new opportunity for the use of the tensor calculus.

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<sup>1</sup> *Nature*, 153, 731 (1944).

<sup>2</sup> *Phil. Mag.*, 35, 499 (1944).

<sup>3</sup> Preston, "Theory of Heat" (4th ed.), 494.

<sup>4</sup> Preston, "Theory of Heat" (4th ed.), 541-42.

## INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE

**T**HE annual report of the Indian Association for the Cultivation of Science for the year 1943 includes the presidential address, the report of the committee of management, including lists of papers published in the *Indian Journal of Physics*, vols. 16 and 17 and in the *Proceedings* of the Association, and appendixes on the scientific work of the Association. The membership increased from 157 to 213 during the year, and of the latter figure 133 are life-members.

The report on the scientific work of the Association refers to a study of primary extra reflexions in Laue photographs, in which the exact location of the absolute maximum of each extra spot at different orientations of a crystal, the spread of the intensities of the spots along different directions, the change of maximum intensity with variation in the angle of incidence, and the deviation of the direction of maximum intensity from the planes of incidence are being studied. A closer study of the extra reflexions in Laue photographs of phloroglucinol crystals indicated that these reflexions are also of the secondary type and originate from the lattice degradations along the trigonal and the diagonal axes, and further investigations of this effect in benzil are in progress. Attempts are also being made to obtain accurate values of the atomic parameters in benzil crystals by a two-dimensional Fourier analysis.

Investigation of the magnetic behaviour of rare earth ions in crystals at low temperatures led to the conclusion that the paramagnetic units do not change with temperature, but the angle between the various paramagnetic units and the unit cells in these crystals