

THE WILDFOWL TRUST

THE report* of the Wildfowl Trust for 1957-58 describes the administrative activities of the staff, the state of the accounts (satisfactory), the growth in membership (from 5,094 in 1957 to 5,320 in 1958), the work of scientific members of staff during the year, as well as investigations and observations of wildfowl by many well-known correspondents throughout the world. One of the latter is an interesting account by Eric Fabricius, of the University of Stockholm, of the mechanisms which make plumage waterproof. Fabricius found that ducklings of several species lost their waterproofing on a diet consisting of raw crushed fish, and regained it on a diet of insects; even in specimens that had lost their waterproofing there were indications that the oil gland was functioning.

The oil gland was removed from fourteen young tufted ducks just after hatching, while their down feathers were still enclosed in their isolating horny sheaths. After bursting of these sheaths and the full development of the down, the plumage was as repellent to water as that of the normal control birds, indicating that it is not the secretion of the oil gland which makes the plumage waterproof.

Operated and normal control birds alike lost their waterproofing when subjected to contact with smearing substances. In this condition the barbules of the down feathers were disarranged, sticking together in groups, between which were irregular spaces. The normal waterproofing was gradually restored if the birds were allowed to preen. Plumage remains water-repellent when birds feed on insects because insects are dry and clean. Plumage even remains water-repellent on a diet of fish, provided that the pieces of fish are only given to the birds while these are swimming in clean water. The preening consists of a number of stereotyped movements. The nibbling type of preening movements, in particular, aid in maintaining the barbules in a state which makes the plumage repellent to water. These findings confirm the view of Marsden that the large amount of finely distributed air among the ramifications of the feathers is the principal factor in the water-repellency of plumage.

* Tenth Annual Report of the Wildfowl Trust, 1957-1958. Edited by Peter Scott and Hugh Boyd. Pp. 134+32 plates. (Slimbridge, Glos.: The Wildfowl Trust, 1959.) 10s. net.

The causes of death of birds at Slimbridge during 1955-57 have been analysed by A. R. Jennings, of the University of Cambridge. Of the 680 birds examined, the largest number of deaths were due to the high incidence of acute pulmonary congestion and pneumonia among very young birds. Sudden lowering of the air temperature often associated with heavy rainfall brings about this pulmonary syndrome, which is often referred to as 'chilling'. This type of acute respiratory disease is a common cause of high mortality in free-living species, and the same conditions seem to apply even under conditions of semi-captivity. The changes at post-mortem are quite typical and comprise acute congestion and oedema of the lungs, an enlarged gall bladder full of viscous bile and usually an unabsorbed yolk sac. In all, 138 birds died from various infections. Aspergillosis was the most frequent with 117 cases, the predilection sites for the fungus being the lungs and air sacs. The lesions were usually typical fungal granulomata, but in some birds there was an acute diffuse pneumonia. Tuberculosis was the next most common disease, and eight cases were seen.

One of the main objectives of the research programme at Slimbridge has been to obtain a better understanding of the taxonomy of the Anatidæ. All the work has now been surveyed by Dr. G. U. T. Matthews, the assistant director of the Trust, who shows that a whole variety of techniques are open to the modern taxonomist. Many of these techniques are incapable of assessing relationships below the family level and are of passing interest when concerned with relationships within a family. It is beginning to appear that the Anatidæ is an unusually homogeneous and closely knit family.

What makes the report outstanding, of course, is the revealed and hidden imprint of Peter Scott, the director. His sketches lose none of their attractiveness with the years; they may even excite more interest as they become more audacious. The many photographs are included only if they illustrate the work of the Trust and do so with adornment; not one of them is below standard. With a report of such high quality it is to be hoped that the activities of the Inland Revenue authorities may not, as is feared, lead to the production of future reports in an attenuated form.

DAIRY RESEARCH IN SCOTLAND

THE recent triennial report of the Hannah Dairy Research Institute* gives a clear picture of the expansion of the Institute's activities in the past three years. New laboratories have been built, and greatly increased facilities have been added to those formerly available for metabolic studies. The work reported continues to reflect the aims defined when the Institute was founded some thirty years ago.

Among several important additions to the Institute is a splendidly equipped climatic laboratory. This

* Hannah Dairy Research Institute. Report for the Three Years ended March 31, 1959. Pp. 52.

has been constructed, with capital provided by the Colonial Office, and is being used for studies on the effect of climate on the physiology of cattle. The laboratory includes a room in which a cow or steer can be maintained at any temperature from 0° to 60° C. within $\pm 0.1^\circ$ C., and at a relative humidity within ± 1 per cent over a wide range. A second room houses four cattle with slightly less critical control of environment. Metabolism houses have also been constructed for sheep and cattle. These contain six new closed-circuit respiration chambers for sheep and one for cattle, and provision is also made for

twenty-four sheep metabolism cages. With their unique equipment and instrumentation the climatic and metabolism buildings are a notable example of collaboration between biologists, physicists and engineers.

The Grass and Dairy Husbandry Department has continued its investigation of the intensive management of a largely grassland dairy farm. Purchases of fertilizer rather than concentrates continue to show a high return, and the Ayrshire herd averaged 800 gallons a year with one cow per 1.8 acre. The choice of forage species and strains, coupled with suitable management and fertilizer treatments, is being studied in extensive plot and feeding experiments. In the Biochemistry Department fundamental studies are in progress concerning the chemistry of milk protein and the vitamins and enzymes of milk. Attention has been given to factors influencing the important riboflavin and vitamin A components of milk, to the synthesis of lysine in the rumen and to the effect of thyrotropin and growth hormone on milk yield.

The construction of new equipment has not prevented the Nutrition Department from continuing its important studies on energy metabolism. These have shown that above the maintenance-level the utilization of mixtures of volatile fatty acids by sheep decreases with decreasing chain-length, being as low as 30 per cent with some mixtures rich in acetic acid. In ruminants almost all dietary carbohydrate is absorbed as these short-chain acids, and world-wide interest has been aroused by this first step in the reconciliation of classical energy studies with recent developments in ruminant nutrition.

Other work with sheep has been concerned with the effects of environmental temperature and clipped fleeces on energy metabolism, the influence of the physical state of roughages on their net energy and the role of vitamin E in muscular disease. Cow-feeding experiments suggested that the allowance of concentrates per gallon of milk should increase at higher yields.

The Physiology Department is concerned with the physiological responses of cattle to climatic stress. While aimed at the improvement of cattle productivity in hot countries, this work must also pro-

vide fundamental information of value in studies on housing in Britain. Two small chambers have been used for investigating the physiology of panting; the thermal stimulus to panting was found to be effective, in calves, only on the skin or upper respiratory tract. The ability to reduce tidal volume with increasing thermal stress appeared to be associated with high heat-tolerance as indicated by rectal temperature.

The validity of rectal as a measure of deep body temperature, the effects of heat stress on the blood and the role of the skin in loss of heat were also investigated. Important studies on the rate of acclimatization of calves to heat are now being extended to cows.

The Department of Veterinary Pathology studies both practical and applied aspects of mastitis. Histological examination of udders from infected cows, the incidence on farms of different types of mastitis and the relationship between the Whiteside test and cell counts have all been considered.

The Bacteriology Department has been largely concerned with the important *coli-aerogenes* bacteria of milk and with the application of the coliform test. Demand for sterilized milk in cities has prompted investigation of the spore-forming bacteria of such milk and of tests for effective 'sterilization'.

Many practical aspects are also dealt with by the Department of Technical Chemistry. Welcome collaborative studies are reported on the accuracy of various analytical methods for milk, and these have led to revision of the formula for the calculation of solids-not-fat content by means of the lactometer. Feeding trials indicated that with spring grazing the usual increase in milk protein is probably due more to an improved plane of nutrition than to an increase in any particular component of grass. Long-term studies have dealt with factors influencing the coagulation of casein, a problem in the manufacture of dairy products, and with the production, preservation and storage of dried milk. A new system was developed for the fractionation of the carbohydrates of roughages.

Readers of this report are provided with a ready reference to more detailed information by the liberal inclusion of relevant reprint numbers.

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CORRELATION OF AUDIO-FREQUENCY ELECTROMAGNETIC RADIATION WITH AURORAL ZONE MICROPULSATIONS

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DURING three periods of approximately one month each, continuous recordings were taken of the electromagnetic energy in the spectrum region of 10 c.p.s. to 10 kc.p.s. The detection equipment was a 10-m. vertical antenna, a swept frequency battery-operated spectrum analyser and a recording milliammeter. The frequency analyser had two ranges; it first swept through its lower range of 10-1,000 c.p.s.,

with a 1 c.p.s. band-width. A second sweep was then initiated to go from 500 c.p.s. to 10 kc.p.s. with a 40-c.p.s. band-width. A total time for a complete recording of both of the sweeps was 32.8 min. The equipment was housed at an isolated area about 2 km. from the nearest 50 c.p.s. power line. An example of the registration of the higher-frequency range is given in Fig. 1.