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THE WORK OF THE DEPARTMENT OF ANIMAL  
GENETICS OF THE UNIVERSITY OF  
EDINBURGH\*

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In 1913 the Development Commission invited the cooperation of the University of Edinburgh in formulating plans for an Animal Breeding Institute and a committee to consider ways and means soon began to function. War necessitated the postponement of the project but the echoes of the last shot had hardly died when, on a very humble scale, the Animal Breeding Research Department came into being in 1920 with Dr. F. A. E. Crew, then an assistant in the Department of Natural History, as director and complete staff.

The original cramped quarters in High School Yards were soon outgrown and in 1924 the Department moved to seven rooms in the new chemistry building at the foot of Blackford Hill, where adjacent land and outbuildings permitted a more extensive programme of work than had previously been possible. Here the institute was rapidly outgrowing its accommodations when, in 1927, the International Education Board of the Rockefeller Foundation came to its aid with a conditional offer of \$150,000 for the endowment of a Chair of Genetics at the University and the construction of a building to house the department, together with equipment therefor. Thanks to the generosity of Lord Woolavington and various public bodies the required like amount was eventually raised.

The net result of this decade of activity was that the visitor to Edinburgh in 1930 found the Department housed in a fine new three-story building all its own, with a permanent staff of twelve persons and a list of thirteen students and scientific guests. Dr. Crew was appointed to the new Chair of Genetics in addition to his duties as director of the rechristened Department of Animal Genetics. In 1929 the institute was substantially aided by Mr. T. B. Macaulay, president of the Sun Life Assurance Company of Canada, who endowed a lectureship in Genetics with accessory assistantships, and provided

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funds to purchase a farm at Balerno for more extensive work with domestic animals.

For convenience the research activities of the Department will be considered here under the headings of the several different animals with which they are concerned.

### **Cattle, Swine and Horses**

Work with these animals is in the hands of Mr. A. D. Buchanan Smith, with Dr. Alex. Calder as first assistant. Extensive studies have been made of the rôle of inbreeding in the development of Shorthorns and Jerseys and of the extent to which prize winners were inbred in comparison with the average for the breed. In the past two years, however, the studies with cattle have been concentrated upon statistical analysis of herd book data which seem to show that some of the hereditary factors affecting milk yield in Jerseys and Ayrshires are sex-linked.

With swine the major project is a Pig Testing Station, planned to evolve an adequate method of evaluating various types, strains and individuals from the standpoint of economical production of bacon. The inheritance of colour, hernia and other characters of swine is also being studied and data on fertility, litter size and other aspects of the physiology of reproduction are being compiled for future analysis.

Studies with horses have included the rôle of inbreeding in the evolution of the Clydesdale, the frequency of hereditary defects in certain families and the inheritance of white markings.

### **Sheep**

Since its inception the Department has fostered a series of investigations with sheep, which have included the study of (1) characteristics of the fleeces of different breeds, (2) colour inheritance, (3) fertility and (4) ecological factors affecting the fleece, reproduction and distribution of breeds. The work is now directed by Mr. W. C. Miller, who had gone with Dr. Crew to Algeria in 1927 to investigate Voronoff's claim that he could induce greater growth of body and of fleece by testicular grafting. Tests of this theory at Edinburgh indicate that there is induced by the operation a temporary stimulus which is subsequently counteracted by a compensatory slow-

ing down of growth. The influence of the thyroid upon growth of the fleece is being studied, as is also the possibility of using anterior pituitary to induce oestrus at a period other than that at which it normally occurs. Colour inheritance studies are being continued in cooperation with Mr. J. A. Fraser Roberts of Leeds, and the mechanism of transmission from ram to ewe of the little understood disease, scrapie, is being investigated jointly with the Animal Diseases Research Association at Moredun. A genetic study of the inheritance of kemp and of the possibility of eliminating it is also under way.

### Fowls

In this section Dr. A. W. Greenwood and Dr. J. S. S. Blythe have for several years been investigating the functions of the gonads and other endocrine glands, with special reference to their effects upon the secondary sex characters, pigmentation and reproduction in Brown Leghorns. More recently they have been interested in the influence of testicular grafts in young pullets upon sexual maturity and upon the shape of the eggs subsequently laid.

By way of more formal genetics Professor Crew finds time, in addition to his multifarious duties as Director, to study the inheritance of plumage colour in the turkey, the duck and the Old English Game Bantam. He is also investigating the supposedly sex-linked nature of spangling and the sex dimorphism in the plumage coloration of Mallard and Rouen ducks. The relationship of the thyroid and the pituitary to the phenomenon of broodiness is also being studied.

### Rats, Mice and Rabbits

Using the rat as his experiment animal, Dr. B. P. Wiesner is leading investigations in mammalian sex physiology with special emphasis upon the study of two hormones of the anterior pituitary found to be present also in the human placenta. This work led to the establishment of a Pregnancy Diagnosis Station (using the urine test) available to physicians and hospitals in Great Britain and Northern Ireland.

The effects of certain endocrinal extracts upon the metabolism and the sex-ratio are also being studied. An interesting experiment aims to find the effects of density of population upon reproduction, growth rates and longevity in the mouse.

The effects of various factors upon the growth of tumours and, in turn, the influence of the tumour upon the metabolism of the host are being studied.

Investigations are under way to determine the effects on wool growth in Angora rabbits of heredity, age, size, season, nutrition and other factors. A correlation between the presence of ear tufts and high yield of wool has been discovered as well as a genetic basis for both characters. Dr. J. N. Pickard, in charge of rabbit investigations, is also studying the length of the gestation period, litter size, sex-ratio, infertile matings and other phases of the physiology of reproduction.

The Department gives courses of lectures to students in pure science, in agriculture and in veterinary science. A series of ten lectures on the physiology of sex and of reproduction is given by its staff in the Physiology Department of the University and short courses in animal genetics are also given at the University of Aberdeen and at the Veterinary College in Glasgow.

There is located at the Department the Imperial Bureau of Animal Genetics, with Professor Crew as its director. This is one of eight similar Bureaux placed at various research institutes in the British Isles, each designed for the dissemination to agricultural research workers in the British Dominions and Colonies of information in a specific field, such as Animal Nutrition, Entomology, Plant Pathology and others.

To some readers certain of the problems studied may seem to be in the field of straight physiology rather than of genetics. To them I should say that the physiological aspect of these researches is the direct expression of Professor Crew's firm belief that genetics and physiology are inseparable and in many cases so closely interwoven that none can say where genetics leaves off and physiology begins. It is not enough that we should discover how a certain gene is inherited and what effect it produces. Physiological studies are essential if we are ever to discover in what ways the visible characters are produced from their invisible genes, and in doing this we shall bridge what is at present one of the greatest gaps in biological science.