

features. Often, too, the repetition of an experiment is necessary before any conclusion can be drawn with confidence. On the other hand, it is occasionally necessary to go into some detail in order to show the scope and purpose of an investigation, and the significance of the problems that have arisen.

Breeding Experiments.—In the 1929 breeding experiments 221 ewes, nearly all two-tooths, were mated and 199 lambs were tailed. In eight small flocks, representing different fleece-types, like was mated with like. The fleeces of the lambs are now about half-grown. The wool has been examined from time to time on the lambs and in samples, and tentative conclusions have been formed. The results are likely to be of the most interest from the point of view of thickened tip and of harshness, even in flocks selected primarily for some other purpose. It may be explained that the term "thickened tip" is used to include all cases where a thicker apical end is followed by a finer region. Frequently it is necessary to distinguish between hairy thickened tip, containing coarse medulla, and non-hairy thickened tip. In the fine-woolled flock the results prove to have bearing on thickened tip because the ram, while strikingly fine, shows tips that are thickened but not hairy.

The great majority of the offspring of parents both with thickened tip show thickened tip. Whether all these lambs have thickened tip cannot yet be stated. Whether thickened tip mated with thickened tip always produces lambs possessing this character is a fundamental question in genetic analysis. In matings between thickened-tip animals, both too fine to be called hairy, some offspring with coarser wool have been born, and these are being watched with interest; some of these lambs do show hairy tip. There is also further evidence that points to thickened tip being inherited as recessive to evenness, and the matter is being tested by further matings.

If it should be established that thickened tip breeds true, while at the same time of even-fibred animals some breed true and some throw some thickened-tip offspring, then simple practical conclusions would follow. The case would be parallel to that of the inheritance of black and red in cattle. Red breeds true; while some blacks can have red calves, some have only black calves. Should the two cases prove similar thickened tip could then be avoided by the choice of the right even-fibred ram, while thickened tip, though non-hairy, would be likely to lead to hairy thickened tip in stronger-woolled descendants.

With regard to harshness, attributed to small irregularities in individual fibres, the majority of the lambs from parents both harsh appear to be harsh, but a few not. After the receipt, some twelve months ago, of a memorandum by Dr. S. G. Barker upon the shape of cross-section of certain New Zealand wools, some attention was paid to small irregularities in wools of a wide range of breeds and crosses. The evidence suggested that the presence of small irregularities showed a considerable measure of dominance over the even cylindrical form of fibre, just as, taking examples again of well-known characters in cattle, black is dominant to red, polled to horn, and the white face of the Hereford to plain colour. While the conclusion is only tentative, the Romney breeding results also suggest the dominance of small irregularities. Should this be true, it would be important to choose both parents free from these irregularities; simply choosing for each generation a ram desirable in this regard would bring about improvement only slowly.

Breeding experiments on similar lines to those of last season are now in progress, being planned to have rather more direct bearing on thickened tip. The importance of this breeding-work lies in the possibility that the inheritance of major wool-characters—as distinct from fine distinctions—may turn out to be comparatively simple, just as it long ago proved possible to understand the main features in colour-inheritance in horses and cattle. At the outset Romney wool characters appeared a thorough jumble, and, while their inheritance is far from elucidated after only one season's work, genetic analysis of major features does seem a feasible project. It may be emphasized that the wool-character figuring in our experiments, like lustre and those dealt with more particularly in this report, can all be recognized on the sheep's back in the pen.

NUMERICAL MEASURE OF THICKENED TIP AND HAIRINESS.

During the long vacation Miss A. B. Hefford spent three months at the College in work on wool, and was mainly occupied in fibre counts and measurements designed to provide a basis for the numerical expression of the degree of thickened tip or hairiness of a sample. Such numerical expression is of obvious importance in order to measure accurately the results of any experiment on thickened tip or hairiness. We may wish, for example, to correlate parent and offspring, or to measure the influence of feed, weather conditions, or age. A system of judging by eye or hand leaves too much scope for error.

It proved convenient to sort fibres into groups by eye, count the numbers in each group, and then to measure the diameter at selected positions near both the coarse and the fine end where the fibre was appreciably coarser at one end. Brief mention may be made of two of the points that came out in this study.

(1) Thickened-tip fibres were divided into those with the apical end chalky in appearance because strongly medullated, and those sparkling in that region became relatively free from medulla. For each of those groups the ratio

$$\frac{\text{Average diameter of coarse end}}{\text{Average diameter of fine end}}$$

was calculated. This ratio was higher rather than lower in the "sparkling" group than in the "chalky" group. This serves to emphasize that it is difference of diameter in different parts of the fibre that constitutes the primary problem rather than the presence of coarse medulla.

(2) Frequency curves of fibre-diameters for the coarse ends of all the fibre groups combined were plotted. In general, those curves show two peaks—one peak in the region of the coarser thickened-tip fibres, the other peak in the region of the fine even fibres. The first-mentioned peak was well marked