## Elastic Constituent of Rubber

IN a recent paper[1] K. C. ROBERTS has described the isolation from dried fresh *Hevea* latex of small quantities of a highly elastic substance which he has named caoutchol and to which he has ascribed the formula $C_{80}H_{130}(OH)_2$. This substance has been shown to possess the high degree of elasticity hitherto regarded as characteristic of rubber; the rubber hydrocarbon purified by its removal is comparatively non-elastic.

The X-ray photograph of freshly prepared caoutchol, unstretched, at room temperature (35° C.), shows certain sharply defined rings identical with those reported by W. H. Barnes[2] for 'frozen' rubber. Other rings, however, exhibit significant differences. At 700 per cent extension, caoutchol gives an X-ray photograph almost identical with that obtained from stretched, air-dried, fresh latex, the transition from the rings of the Debye-Scherrer diagram to the sharply defined spots of the fibre pattern being clearly visible.

The purified rubber hydrocarbon, to which Dr. Roberts has given the name caoutchene, does not show the sharply defined rings characteristic of caoutchol nor can it be extended sufficiently to give the fibre characteristic of stretched rubber. The X-ray evidence therefore supports the theory that the minor constituent caoutchol is the primary factor in the elasticity of rubber.

The detailed results of this work, together with further X-ray observations on derivatives of caoutchene and caoutchol, will be published elsewhere.

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[1] Roberts, K. C., *J. Chem. Soc.* (Feb. 1938).
[2] Barnes, W. H., *Canadian J. Research*, B, **15**, 156 (1937).

## Food of the Partridge

JUST a quarter of a century ago I concluded an investigation on the food and feeding habits of the partridge, and my results were set forth in the *Journal of the Land Agents' Society* (June 1917), and in further detail in *Science Progress* (Oct. 1918). I found an examination of crop, intestine and stomach contents over a period of five years to "show that of the total bulk of food consumed 59·5 per cent. is vegetable matter and 40·5 per cent. animal matter. Of the former 53·5 per cent. consists of leaves, fruits, and seeds of weeds, 3·5 per cent. of grain, and 2·5 per cent. of miscellaneous vegetable matter. Of the animal matter, 23 per cent. consists of injurious insects, 3 per cent. of beneficial species, 4 per cent. of neutral species, 6·5 per cent. of earthworms, and 4 per cent. of slugs complete the summary." These facts were repeated in my work on "The Food of Some British Wild Birds" (1924–27).

In November last, Mr. A. D. Middleton and Miss H. Chitty published an interesting paper on this subject in the *Journal of Animal Ecology* (which I have only just seen), in which they state "Perhaps the most striking are the large quantities of green food eaten during the winter and spring months and the very low percentage of animal food. For some reason, partly due to the publications of Collinge, insects have for a long time been regarded as an important and even essential part of the food of partridges."

With all respect, as one who has devoted more than thirty years of his life to such investigations, I think I may say that Mr. Middleton and Miss Chitty have failed to realize one of the most important results of their work, namely, that since I carried out my investigation on the nature of the food of the partridge, in 1912 and 1913, this bird has changed its food habits, just as the rook and the starling have in that period. Like these authors, I chronicled exactly what I found in the stomach and intestines, they in the crops, and the two records show conclusively the change that has taken place. There can be little doubt that this change has not been beneficial to the partridge as a species, for, for some years past, the mortality due to strongylosis and coccidiosis and other causes have been enormous.

It is clear to me that here we have a very striking case of reduced vitality due to a change in diet, and it shows how important it is, as I have previously advocated, that from time to time all such investigations should be repeated, in order that the true economic status of any particular species of wild bird should be ascertained.

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## Cytology of Metamorphosis in the Culicinæ

A NUMBER of investigators[1] have distinguished two main types of larval insect tissue with respect to growth and metamorphosis. Many tissues grow by increase in cell size and undergo disintegration at metamorphosis, the corresponding adult tissue being formed from imaginal disks that were not functional parts of the larval tissue. The second class of tissues grow by cell division and multiplication, and are carried over, with or without modification, into the adult.

The epithelium of the larval ileum of *Culex pipiens* behaves in a manner intermediate to the two methods described above. Larval growth is accomplished solely by increase in cell size, and at metamorphosis the adult tissue is formed by the simultaneous division, reduction in size and increase in number of these same larval cells. In this case great increase in cell size is not accompanied by inability to divide or to undergo further differentiation.

These phenomena, first observed in *Culex pipiens*[2], have during the past year been found in the following other species collected in Maryland: *Culex apicalis* Adams, *C. territans* Walker, *Aedes canadensis* Theobald, *A. triseriatus* Say, *Orthopodomyia signifer* Coquillett, and *Anopheles punctipennis* Say. Metamorphosis of this type is probably present throughout the sub-family Culicinæ.

All seven species have a diploid number of six chromosomes. The following cytological peculiarities, first studied in *Culex pipiens*, have since been found in the other six species of mosquito: (*a*) increase in the chromosome number of larval cells, accompanying increase in size and apparently taking place within the resting nucleus; (*b*) multiple chromosome complexes of 192, 96, 48, 24 and 12 chromosomes appearing during the mitoses effecting metamorphosis, and showing a direct correlation between chromosome number and cell size; (*c*) prophase synapsis of high