as the most satisfactory working hypothesis of the origin of the phenomena.

C. B. ALLSOPP

Guy's Hospital Medical School,
London, S.E.1.

D. G. CATCHESIDE

Botany School,
Cambridge.
March 8.

¹ Darlington, C. D., and Koller, P. C., *Heredity*, **1**, 187 (1947).

² Lea, D. E., "Actions of Radiations on Living Cells" (Camb. Univ. Press, 1946).

³ Sax, K., *Genetics*, **32**, 75 (1947).

⁴ Darlington, C. D., and La Cour, L. F., *J. Genet.*, **46**, 180 (1945).

⁵ Giles, N. H., *Genetics*, **28**, 398 (1943).

⁶ Crowther, J. A., *Brit. J. Rad.*, **11**, 144 (1938).

⁷ Allsopp, C. B., *Brit. J. Rad.*, **21**, 72 (1948).

⁸ Lea, D. E., *Brit. J. Rad.*, Supp. No. 1, 75 (1947).

⁹ Weiss, J., *Brit. J. Rad.*, Supp. No. 1, 56 (1947); *Trans. Farad. Soc.*, **43**, 814 (1947).

¹⁰ Lea, D. E., *Brit. J. Rad.*, Supp. No. 1, 59 (1947).

Electron Microscopy of the Sarcolemma

STRIATED muscle fibres are surrounded by a delicate membrane or sheath, the sarcolemma. It has frequently been stated^{1,2,3} that this sheath is composed of a network of collagenous or reticular fibrils, arranged like a knitted sock. One of us (R. B.) in an investigation to be described elsewhere has failed to find any evidence of fibrillar structure using various methods of microscopy, including phase contrast and dark-ground illumination. We have, therefore, investigated the structure of the sarcolemma by means of the electron microscope (R.C.A. console model).

Frog's thigh muscles were teased roughly and allowed to soak for periods of up to a few hours in Ringer's solution. This produces numerous retraction clots in the fibres, leaving clear areas of empty sarcolemma. The fibres were then fixed or treated with various chemical reagents and dried in a desiccator. Unfixed fibres were also examined. After drying, the fibres were mounted on the usual 200-mesh specimen grid of the electron microscope. The accompanying photograph shows a strip of sarcolemma (formalin fixed) $\times 11,000$ (initial magnification in microscope 5,000 times). No fibrils were

seen at magnifications up to 25,000. The main feature is the presence of numerous small spots, of the order of $0.04-0.1 \mu$ in diameter. In places where the membrane has become folded it appears that the spots lie on the membrane rather than in it. In some cases the spots seemed to form a more or less regular pattern, but this may not always appear to be the case owing to distortion of the membrane. The spots were seen in unfixed material, but were clearer after formalin fixation. Sheets of membrane were often observed to split under the action of the beam; the membrane tears linearly and cleanly without leaving fibrous strands, in marked contrast to high-polymer membranes which have frequently been studied by the electron microscope.

The nature of the spots is at present unknown. They are not seen in specimens which have been treated for some hours with dilute citric acid. It is possible that they might be points of attachment of either connective tissue fibrils or myofibrils. They are usually about 0.5μ (or less) apart, a distance which does not correspond to any known periodicity within the myofibril; but it is possible that the sarcolemma has become shrunk or distorted by drying. The thickness of the sarcolemma is usually given as 1μ . Electron microscopy suggests that it may be less than 0.1μ , though a tenfold shrinkage is not ruled out.

These experiments are still in an early stage. The work is being continued with improved technique and a more detailed account will appear elsewhere.

We wish to thank the Ministry of Supply for the facilities which enabled us to carry out the investigation.

W. M. JONES

Atomic Energy Research Establishment,
Harwell.

ROBERT BARER

Department of Human Anatomy,
Oxford.
March 9.

¹ Bairata, A., *Z. Zellforsch.*, **27**, 100 (1937).

² Nagel, A., *Z. Zellforsch.*, **22**, 694 (1935).

³ Fenn, W. O., Contractility in Höber's "Physical Chemistry of Cells and Tissues" (Churchill, 1945).

Capillary Distribution in Cow Skin

In studies on the nature and distribution of the 'sweat' glands of Ayrshire cows, shortly to be published in detail elsewhere, a close relationship has been found between the distribution of blood capillaries and hair follicles.

Other workers¹⁻³ have been concerned with all or some of the following structures, (1) the hair follicle, (2) the sebaceous gland located near the middle of the hair follicle and opening into it, (3) the arrector pili muscle and (4) the 'sweat' gland lying at the base of the hair follicle and with independent duct opening on the surface of the skin close to the point of emergence of the hair. The number of hairs has been used as an index of the number of 'sweat' glands in different regions of the skins of buffaloes, Zebu, Formosan and Freisian cattle¹.

These structures appear to form a unit, and in our observations on twenty-one different skin regions of each of five four-year-old Ayrshire cows, we have been unable to find any one of these structures not associated with the others. This also applies to