

Hubbard and Kropf's explanation of my results is based on the statement that the experiments were "performed in circumstances in which photochemical and thermal processes take place side by side". The implication here is that irradiation converted the parent visual pigment to an orange photoproduct, and that this photoproduct was unstable and decayed to indicator yellow. This is not so. It was explicitly stated that the orange photoproduct produced by irradiating frog rhodopsin at  $-5^{\circ}\text{C}$ . was thermally stable.

Thus irradiation for 1 hr. of frog rhodopsin at  $-5^{\circ}\text{C}$ . "generates a mixture of indicator yellow and a stable product with  $\lambda_{\text{max}}$ . displaced about 20  $\text{m}\mu$ . towards the blue. . . . At this temperature the photoproduct is stable (measurements at 20  $\text{m}\mu$  intervals from 380 to 620  $\text{m}\mu$  interlacing with return measurements from 610 to 390  $\text{m}\mu$  give a check of stability)"<sup>1</sup>. The whole spectrum was measured over the course of 1 hr., that is, the same period of time as for the bleaching operation. In the experiments carried out with conger eel and rhesus rhodopsins, the return measurements were actually slightly higher than the outward ones; far from decaying thermally to indicator yellow, the orange photoproduct was being regenerated from this substance.

It was shown experimentally that the rhesus photoproduct was photosensitive, yielding indicator yellow or retinene by a photochemical reaction. As was stated, the probable explanation for the presence of indicator yellow together with thermally stable orange photoproducts in the frog and conger eel experiments is that it was the product of photochemically bleaching these substances.

The use of light of long wave-length in the experiments reported (dominant wave-lengths of 550 and 580  $\text{m}\mu$  obtained from a Hilger-Barfit monochromator) makes it unlikely that regeneration from photoisomerized indicator yellow was involved in the thermal regeneration of rhodopsin. Even in the acid solutions used, indicator yellow has  $\lambda_{\text{max}}$ . no higher than 440  $\text{m}\mu$ , and later experiments at  $\text{pH}$  9.0, where indicator yellow has  $\lambda_{\text{max}}$ . at 380  $\text{m}\mu$ , have yielded identical results.

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<sup>1</sup> Dartnall, H. J. A., *J. Physiol.*, **116**, 257 (1952).

## BIOPHYSICS

### Plasticity of Wool

THE quality of a wool is not determined solely by the dimensional characteristics of the fibres, such as fineness, length and crimp. Differences in the nature of the substance govern the selection of wools for particular purposes, and it has been shown that these differences can be measured by determining the plasticity of the fibres<sup>1</sup>. The measurements are made by observing the rate of creep of the fibres in distilled water at  $22.2^{\circ}\text{C}$ ., usually under a constant load of 6  $\text{kgm./mm.}^2$ . When  $\log(E - E_t)$  is graphed against  $t$ , where  $E_t$  is the percentage extension at time  $t$  (min.), and  $E$  is an arbitrarily chosen limiting extension, a linear relationship is obtained in the later stages of extension; the slope ( $k$ ) of this line gives a simple measure of plasticity.

Because plasticity measurements are tedious, there have been several attempts to devise more rapid methods of characterizing the substance of different wools, and le Roux<sup>2</sup> has suggested that there is a simple direct relationship between the plasticity of a wool and its urea-bisulphite solubility<sup>3</sup>. This possibility had been examined in these laboratories before the publication of le Roux's note, and as the two sets of results were found to be contradictory, further experiments have since been carried out. Most of the wools in the new group were from South Africa, because le Roux's work was confined to such wools. Plasticity measurements were made under the conditions defined above, and the rigidly defined conditions of Dusenbury were adopted for determinations of urea-bisulphite solubility<sup>4</sup>. Both sets of results are given in Table 1.

Table 1

Wool	Plasticity ( $k$ )	Urea-bisulphite solubility (%)
64s Port Elizabeth Grassveld	91.4	55.0
60s Port Elizabeth Grassveld	86.2	41.2
66s East London	77.6	63.0
70s Cape Town	70.3	48.0
64s Cape Town	75.8	57.6
Cape Town	95.3	53.4
Queensland	42.6	47.3
70s Durban	92.6	60.3
64s Durban	73.1	56.2
60s Durban	112.8	57.9

These results, like the earlier ones, indicate that there is no simple relationship between the plasticity of wool and its urea-bisulphite solubility.

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<sup>1</sup> Whiteley, K. J., and Speakman, J. B., *Text. Res. J.*, **30**, 46 (1960).

<sup>2</sup> le Roux, P. L., *Nature*, **184**, 917 (1959).

<sup>3</sup> Lees, K., and Elsworth, F. F., *J. Soc. Dyers and Colourists*, **70**, 354 (1954).

<sup>4</sup> Dusenbury, J. H., Proc. Second Intern. Wool Textile Res. Conf., Harrogate, 223 (1960).

### Orientation of Cockchafers

A PAPER by Dr. F. Schneider published in 1957<sup>1</sup> suggested that cockchafers can orientate themselves in the magnetic field of the Earth. I have therefore carried out some experiments to detect the possible existence of permanent magnetic material in the body of cockchafers.

Two methods were used. First, I suspended parts of dead cockchafers at the end of a thin glass wire (length 1 metre, diameter  $25\mu$ ) and in a magnetic field up to 20 gauss. It was found that no magnet could be present of such strength that in a field of 0.2 gauss it would experience a torque of more than  $2 \times 10^{-6}$  dyne cm. In the second method I used very sensitive magnetometers of the Royal Netherlands Meteorological Institute, De Bilt, which enabled me to make measurements on living animals. These measurements showed that in a field of 0.2 gauss the torque exerted on the supposed magnet must be smaller than  $2 \times 10^{-7}$  dyne cm.

If the supposed magnet were 0.01 cm. long, the mechanical force exerted by one pole of the magnet would have to be  $2 \times 10^{-5}$  dyne to produce a torque