without any drug and the other fed the diet containing succinyl sulphathiazole. The latter drug is absorbed to only a small degree, and therefore it can have little effect on tissues in general, although it is effective in inhibiting bacterial synthesis in the intestine.

Twelve female rats, aged 29 days, were divided into three groups, each containing one rat from each of four litters. Group 1 was fed the basal diet, Group 2 the basal diet with the addition of 0·5 per cent sulphadiazine, and Group 3 the basal diet with the addition of 0·5 per cent succinylsulphathiazole. The growth-rates of all three rats from each litter were kept the same by restricting the food intake where necessary. The food consumption was measured accurately. The weight was practically stationary from the twenty-third to the thirty-second day, when the experiment was terminated. The rats were killed by decapitation and the livers and kidneys weighed. The livers were digested with papain and takadiastase at *p*H 4·5. Aneurin was determined on the digest by the thiochrome method and riboflavin by the fluorometric method of Slater and Morell[3].

The results of these measurements are summarized in the accompanying table, which gives the statistical significance of the differences between the means for each group. Histological examination of the kidneys failed to show any evidence of kidney damage; this is confirmed by the fact that the kidneys of the rats in Group 2 weighed about 10 per cent less than those of the other rats. Kornberg *et al.*[4] found that kidneys damaged by sulphadiazine were abnormally heavy.

The livers of the rats fed sulphadiazine contained considerably more aneurin but no more riboflavin than those of rats fed no drug or fed succinylsulphathiazole. The concentration of aneurin in the livers of the rats in Group 2 was 64 per cent more than those in Group 3; the total amount of aneurin in the liver was 87 per cent more. There was no significant difference between Groups 1 and 3 in regard to any of the measurements made. This suggests that the effect of sulphadiazine on the aneurin metabolism is not related to the inhibition of bacterial synthesis in the intestine. The efficiency of food utilization of the rats fed the sulphadiazine was slightly but significantly greater than that of the other rats. This may possibly be related to the effect on aneurin metabolism.

An appreciation of the significance of these findings must await the results of further work which is in progress. When this is completed, it and the experiments described in this communication will be presented in detail in another publication.

I wish to acknowledge the assistance of Miss C. E. Francis, who analysed the urines for aneurin in the human experiment; of Mrs. H. M. Schroder and Mrs. D. Gilmour for the analysis of the diet used in this experiment, and of Miss J. E. McNae for the histological examination of the rat kidneys.

E. C. Slater

Australian Institute of Anatomy,
Canberra.
April 16.

[1] Fantl, P., *Aust. J. Exp. Biol. Med. Sci.*, **18**, 175 (1940).
[2] Hubbell, R. H., Mendel, L. B., and Wakeman, A. J., *J. Nutrition*, **14**, 273 (1937).
[3] Slater, E. C., and Morell, D. B., in the press.
[4] Kornberg, A., Endicott, K. M., Daft, F. S., and Sebrell, W. H., *U.S. Pub. Health Rep.*, **60**, 661 (1945).

Frictional Properties of Wool

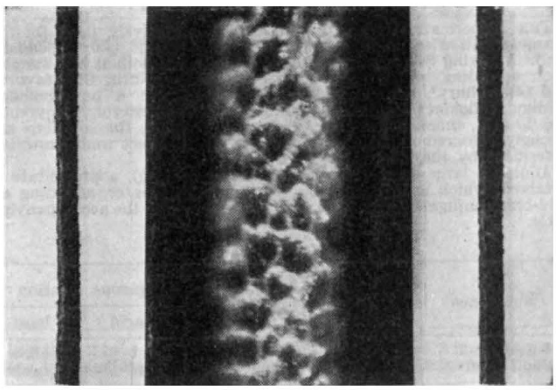
When wool fabrics are rubbed in presence of an aqueous solution of acid or alkali, shrinkage takes place because the fibres migrate in the direction of their root ends. This type of migration is usually referred to the imbricated scale structure of the fibres, but Martin[1] has rejected the ratchet theory and invoked "a particular kind of molecular structure" in the scales of wool to explain its peculiar frictional properties. In order to decide which of these views is correct, fibres were coated with thin films of silver and gold and their frictional properties examined.

The root ends of 80–90 purified Lincoln wool fibres were calibrated by determining their lengths, diameters and weights at 65 per cent relative humidity and 22·2° C. The fibres were then mounted in parallel across a light steel grid and exposed in high vacuum to the vapour from molten silver or gold[2]. To ensure uniform coating of the fibres, several brief exposures were given with the grid rotated into different positions by means of a magnet. Although the exposed fibres were completely coated with metal, their scale structure was well defined, as may be seen from the accompanying photomicrographs.

The thickness of the metal film was calculated in each case from the gain in weight of selected fibres during exposure, and confirmed by determining the loss in weight when the metal film was removed. Scaliness measurements were made on the remaining fibres by two methods[3,4]. The results are given in the accompanying table.

Although less than that of untreated fibres, the scaliness of fibres coated with the thinner film of silver (0·03 μ) is remarkably well defined. In addition, the fibres were found to creep on being rubbed between moistened glass plates. Since the metal film was intact after each of these determinations, it must be concluded that the peculiar frictional properties of wool are due to the ratchet effect of the scales.

Nature of fibre	Thickness of film (μ)	Scaliness	
		Violin bow method (%)	Lepidometer (gm.)
Untreated	—	38·8	2·90
Silver-coated	0·030	25·2	1·77
Untreated	—	39·2	—
Silver-coated	0·056	5·3	—
Untreated	—	39·2	—
Gold-coated	0·052	6·0	—



a *b* *c*

(*a*) Silver-coated fibre (× 100), diffuse light
(*b*) „ „ (× 250), reflected „
(*c*) Gold-coated „ (× 100), diffuse „

With thicker films of silver or gold, the differential frictional effect, as measured by the violin bow method, is almost entirely eliminated, although scales were clearly visible under the microscope. Lepidometer measurements were unreliable, owing to removal of metal, but creep between glass plates was found to be impossible. It seems probable, therefore, that the thicker film of metal increases the rigidity of the scales, or seals the small gap[5] between the scale edges and the body of the fibre, thus making unidirectional movement according to the Rudall model[6] impossible.

Helen M. S. Thomson
J. B. Speakman

Textile Chemistry Laboratory,
University, Leeds.
May 6.

[1] Martin, *J. Soc. Dyers and Col.*, **60**, 325 (1944).
[2] Pringsheim and Pohl, *Verh. deutsch. phys. Gesell.*, **14**, 506 (1912); Strong, "Modern Physical Laboratory Practice", 167 (1940).
[3] Speakman and Stott, *J. Text. Inst.*, **22**, T 339 (1931).
[4] Speakman, Chamberlain and Menkart, *J. Text. Inst.*, **36**, T 91 (1945).
[5] Mercer and Rees, *Nature*, **157**, 589 (1946).
[6] Rudall, see Speakman and Menkart, *Nature* **156**, 143 (1945).

A Bent Pebble

Another explanation may be offered of the origin of the 'bent pebble' described by Dr. J. S. Lee[1]. It may represent a worn-out fragment of silicified sandstone adjoining a right-angle joint junction in the rock. In many places along the Yorkshire coast and elsewhere I have seen somewhat similar angular pebbles obviously derived from septaria-skeletons ('melikaria'). These septaria-skeletons represent quartzose infillings of the cracks of the septarian nodules, and they are set free by the weathering of the surrounding nodule material. Joints in sandstone are often rimmed by zones of silicified rock which is usually much harder than the original sandstone. On weathering, the softer rock inside the joint blocks is removed first, with the result that the silicified rims are set free. A fragment taken from a knee portion of such a rim could easily have been detached and abraded into a shape resembling the 'bent pebble'. In this case the bending of the pebble would represent an original feature of the rock and would not be due to any subsequent tectonic deformation.

S. I. Tomkieff

King's College,
Newcastle-on-Tyne.
May 30.

[1] *Nature*, **157**, 590 (1946).

Mechanism of Colour Discrimination and a New Type of Colour Blindness

In a previous letter[1], it was suggested that differences in the luminosity curves are caused by varying numbers of receptors. In order to find new evidence for this, it seemed worth while to study the intensity discrimination and the visual acuity of the three sets of receptors, as these functions depend upon the number of elements. The blue apparatus was studied first. Two methods were used:

(*a*) The first method has been described already[2]. A constant small blue spot *P* was projected on a large field *F*, which could be illuminated by the same blue light *B* ($\lambda = 455$ mμ) and by green light *G*. First the intensity of *B* was adjusted to B_1 by the observer so that *P* vanished. Then an appropriate amount of *G* was added so that the blue apparatus alone could detect *P*. The new value B_2 was distinctly smaller than B_1. B_2/B_1 gives the ratio of the intensity discrimination of the blue apparatus compared to the red and green apparatus. For five observers we found the values 2·3, 4·1, 2·3, 3·0, 2·8.

A special series of measurements was carried out to prove that the three mechanisms were acting independently of each other. In the