and might be helpful in increasing the water-repellency properties, and also in reducing the mobility of air within the feathers for heat insulation and during flight. In the same specimen were also found sheaths showing striations which gave the impression of a replica of bundles of microfibrils. This can be seen in Fig. 3, which is from a preparation containing only downy barbules. The thickness of the membranes from the phenolic treatment varied between 50 and 200 A. Similar results were obtained by dissolving the feather parts in dilute sodium sulphide.

Thicker sheaths, up to 0·1 micron in thickness, were obtained when feather barbs were dissolved in 50 per cent alcohol to which had been added some 0·1 per cent sodium bisulphite[4]. These membranes were mostly double (originating from both sides of the barbules), and in the optical microscope it could be seen that they still retained the contours of the original feather parts. In the electron microscope, marked striations and also compact ridges could be observed. These ridges might belong to cell walls (Fig. 4).

The treatment with phenol and enzyme or with alcohol and bisulphite leaves only the outer parts of the feather vane and down undissolved. From the different action of the reagents it can be concluded that the keratinous body is enveloped by a cuticular sheath approximately 0·1 micron thick, consisting of at least two layers. The external of these, practically unattacked by tryptic digestion, is the same as that freed by bromination. It is the most resistant one and is analogous to the epicuticle of wool. Beneath there is the second layer, which is digestible by trypsin but unattacked by alcohol and bisulphite. This layer might correspond to the exocuticle of wool.

Further details of this investigation will be published elsewhere. These studies of the epicuticle have been aided by a research studentship to one of us (G. L.) from the International Wool Secretariat.

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Superconductivity of Tin Isotopes

Measurements have been made of the superconducting transition temperatures and critical fields of nearly pure tin isotopes separated by the electromagnetic method; the mean atomic weights provisionally determined by mass spectrograph were 116·2 ± 0·2, 120·0 ± 0·2 and 123·6 ± 0·4. Samples of about 15 mgm. in the form of cylinders 1 cm. long cast in silica tubes were used, and transitions were studied (*a*) by observing the magnetic moment in a constant small magnetic field (2 gauss) as the temperature was lowered, and (*b*) by measuring magnetization curves at constant temperatures. The magnetic moments were measured by a ballistic method[1], and to improve relative accuracy all three samples were studied together. The transitions were sharp (~ 0·01° K. width), and the transition temperatures (T_c), defined as the temperatures (extrapolated to zero field) at which the ratio of magnetic moment to field had half its superconducting value, could be determined with a precision of order 0·001° K. relative to each other. The values of T_c expressed on the 1949 scale[2] were:

M	116·2	120·0	123·6
T_c° K.	3·763	3·707	3·654

Maxwell's[3] value $T_c = 3·662$° K. for an enriched sample with $M = 123·1$ lies well on a graph of these results, and so too does the value $T_c = 3·726$° K. for natural tin[4] ($M = 118·7$). A log–log plot shows that our results are consistent with the relation $T_c \propto 1/M^{1/2}$, but until the atomic weights have been determined more precisely, a departure of the exponent by as much as 0·05 from ½ is not excluded. This relation was predicted by the theories of Fröhlich[5] and Bardeen[6], and has already been verified in experiments on mercury isotopes[7,8]. By direct measurements of differences (ΔH_c) of critical field (H_c) between two isotopes at the same temperature, it was established that the $H_c - T$ curves are geometrically similar; in particular, the value of $\Delta H_c/H_c$ extrapolated to 0° K. was found equal within 5 per cent to $\Delta T_c/T_c$, so that the relative change of electronic specific heat cannot exceed 5 per cent of the relative change of mass. The value of dH_c/dT at $T = T_c$ was 142 gauss/° K., and the value of H_c/T_c extrapolated to $T = 0$° K. was 81·5 gauss/° K. for all three isotopes.

Full details of these experiments will be published later.

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The superconductivity of three samples of separated tin isotopes (identical with those mentioned in the preceding communication) has been investigated with two different methods. In addition to some experiments on the magnetic susceptibility, similar to those carried out by the American authors[1] and in Cambridge, detailed measurements of the dependence of the electrical resistance on temperature and magnetic field have been made. Thin rolled strips of the three isotopes and of natural tin, which had been annealed, were investigated simultaneously by the same method as employed previously[2]. The following results were obtained:

M	116·2	118·7	120·0	123·6
T_c ($H = 0$)	3·764	3·727	3·710	3·653° K.
$T_c M^{1/2}$	4057	4061	4064	4061
H_c (3·5° K.)	39	35	32	23 gauss
H_c (3·0° K.)	108	104	98	90 ,,
H_c (2·5° K.)	169	166	160	151 ,,
H_c (2·0° K.)	220	216	210	202 ,,
H_c (1·5° K.)	259	255	248	241 ,,
H_c (0° K.)	(308)	(305)	(299)	(291) ,,
H_c(0° K.)/T_c	81·8	81·9	80·5	79·9 gauss/deg.
dH_c/dT (T_c)	152	163	157	154 ,, ,,
$R_{4.2}/R_{90}$	5×10^{-3}	$2·5 \times 10^{-3}$	$1·5 \times 10^{-3}$	2×10^{-3}

M is atomic weight; T_c is transition temperature in zero field; H_c is critical field; R_x is resistance at x° K.