A full account of this work will be published elsewhere.

J. M. Mitchison

Zoological Laboratory,
Cambridge.
April 26.

[1] Schmitt, F. O., Bear, R. S., and Ponder, E., *J. Cell. and Comp. Physiol.*, **9**, 89 (1936).
[2] Reviewed in Ponder, E., "Hæmolysis and Related Phenomena" (Grune and Stratton, New York, 1948).
[3] Rudall, K. M., Proc. Symp. on Fibrous Proteins, 15 (Soc. Dyers and Colourists, 1946).
[4] Perutz, M. F., *Proc. Roy. Soc.*, A, **195**, 474 (1949).
[5] Mitchison, J. M., *Nature*, **166**, 313 (1950).
[6] Mitchison, J. M., and Swann, M. M., unpublished observations.

Unusual Phosphatic Material in the Sutton Hoo Ship Burial

In the course of an investigation to determine whether there was a body in the Sutton Hoo ship burial[1], chemical analysis has revealed some unusual phosphatic material derived from calcined bone. That this phosphatic material should have persisted after some 1,300 years is of the utmost importance when one considers that the acidic nature of the soil at Sutton Hoo[2] (subsoil sand, *p*H 4·5) does not favour the preservation of skeletal remains. In the whole of the burial deposit, the excavators thought they recognized only one small fragment of bone which they described as unburnt[3]. This piece, cancellous and brown in colour, was found on top of the largest of the silver dishes in close association with many fragments of wood, bark and iron. From visual examination only, a distinguished anatomist agreed with the excavators; but the opinion of others, based on more detailed examination, was that the fragment was not bone.

With its true nature still in doubt, the material came back to the British Museum Laboratory for chemical analysis. This showed it to be essentially a hydrated ferric phosphate containing only traces of calcium. When treated with dilute hydrochloric or nitric acids, minute carbon particles remained, and there was no trace of the collagenous structure that forms the residue when unburnt bone is so treated. The mode of distribution of these carbon particles throughout the material was seen, under the microscope, to be closely similar to that of the carbon particles in calcined bone, and there seems little doubt, therefore, that this phosphatic material was derived from this source.

A probable mechanism for its formation is suggested by the conditions under which it was found; while the acidity of the soil would favour the dissolution of calcined bone, the diffusion of corrosion products from the adjacent iron fragments into the bone structure would, by the deposition of insoluble ferric phosphate *in situ*, tend to form a 'cast' of the shape of the original material. This process of cast formation would be most likely to occur in those fragments of calcined bone actually in contact with metallic iron. In fragments remote from iron, it is probable that dissolution of the inorganic portion would proceed to finality with consequent loss of structure, thus releasing phosphate ions into the surrounding area. Where these met with iron corrosion products, amorphous ferric phosphate would be formed. Examination of all the material collected from the top of the silver dish supports this view. Besides other fragmentary examples of casts derived from calcined bone, a high proportion of which are 'cemented' to iron or its corrosion products, many pieces of wood were recognized to be heavily impregnated with amorphous ferric phosphate.

The formation of an insoluble product from burnt bone by contact with corroding iron under soil conditions that are unfavourable to the survival of bone (burnt or otherwise) is of considerable importance to the archæologist. The fact that this secondary material may be mistaken for unburnt bone (as, indeed, it was) will serve to emphasize the necessity of a very careful chemical examination of all fragments even remotely resembling bone, found in similar circumstances, particularly when questions of cremation or inhumation are involved.

A full report of the investigation will appear elsewhere.

H. Barker

Research Laboratory,
British Museum,
London, W.C.1.
May 20.

[1] Bruce-Mitford, R. L. S., *Nature*, **165**, 339 (1950).
[2] Phillips, C. W., *Antiq. J.*, **20**, 201 (1940).
[3] Phillips, C. W., *Antiq. J.*, **20**, 175 (1940).

Effect of Posture on Involuntary Eye Movements

Lord and Wright, and afterwards Lord[1], have published records of involuntary movements made by the eye during fixation, showing excursions as great as twenty minutes of arc, whereas Hartridge and Thomson[2] only found movements of about one-tenth of this amount. The former workers had their subject in the prone position and looking upwards, in the interests of head fixation, while the latter had their subject erect and used a technique designed to discount the effects of head movements.

It seemed likely to me that these very different results were probably due to the loss of the support that the eye gets from Lockwood's ligament[3] when the subject is prone, rather than to any differences in the recording technique of these two sets of workers. It also seemed probable that if the difference in the size of the involuntary movements in these two positions was real, there should be an accompanying change in visual acuity.

The test object used to verify this assumption was a set of Landolt's broken rings, black circles of stroke thickness t and overall diameter $5t$ with a gap of width t at some point in their circumference. These were drawn in a symmetrical pattern on a square card. When in the prone position, the subject saw the card lying beside him on the floor, through a mirror fastened to the ceiling at an optical distance of 5·5 metres. The same mirror and the same optical distance were used for the erect position. The actual illumination on the card could not be recorded; but it was of the order of thirty foot-candles. In each case the same bulb was used at the same distance, and the equality of illumination was checked with a photo-electric exposure meter. Three sizes of ring were used, in which the element t subtended approximately 65″, 50″ and 40″ at the subject's eye, so that the diameter of the largest subtended about 5·5′.

In the prone position, subject A resolved all ten 50″-rings without error with each eye separately. Subject B made one error with his right eye and two