

periods of autoclaving rather than after one longer one. The varieties of potato tested which make 100 per cent good slopes after all treatments are Majestic, Epicure, Red King and King Edward; those which are definitely bad are Katriona, Sharpe's Express and King George; while Arran Banner, Duke of York, Dunbar Cavalier, British Queen, Arran Comrade and Great Scot are variable. It is possible that the degree of ripeness of the potato may be one factor which determines the character of the slope in these variable cases.

The bacterial growth obtained on the varieties used is also variable, especially in the case of pigmented species. There is no question in these experiments that Majestic promotes the greatest and most typical growth, while Epicure, British Queen and Arran Comrade are also good. Among the other varieties there is little to choose from the point of view of amount of growth, but the type of growth may be different. The following descriptions of cultures of a soil species of *Flavobacterium* when grown on potato slopes emphasize this point:

- Dunbar Cavalier. Scanty, pale yellow streak, just raised, smooth, glistening, dry.
Great Scot. Moderate, cream to yellow, raised, slightly nodular, glistening, slightly moist.
Arran Banner. Moderate, pinkish, raised, slightly nodular, glistening, moist.
Sharpe's Express. Moderate, canary yellow, slightly raised, smooth, glistening, dry.

It seems that for comparative work it is essential to use the same variety of potato, and from all points of view Majestic is a very satisfactory variety.

D. WARD CUTLER.
MABEL DUNKLEY.

Department of General Microbiology,
Rothamsted Experimental Station,
Harpenden, Herts.
Nov. 4.

Axial Spin and Weapons of the Ancients

As one interested primarily in linguistic studies, I should like to suggest two points, one in confirmation and to amplify, the other a query, arising from Sir Gilbert Walker's article on "Mechanics of Sport" in NATURE of October 2.

That the ancients were aware, at least empirically, of the steadying influence of a movement of rotation about its longitudinal axis on an object also endowed with the motion of translation, is beyond doubt. This spin can be communicated by the thumb and fingers (as in throwing the assegai); or by a cord (the 'becket') which unwinds and is left in the hand. The becket corresponds to the Roman *amentum* and the Greek ἀγκύλη, which are often mentioned in connexion with the throwing of spears. Sir Gilbert cites becket and *amentum*; but one can go further. In Latin it is curious how constantly the verb *torqueo* ('twist') and its derivatives are used of throwing a spear. Virgil alone employs *torqueo* and its compounds about sixty times of hurling projectiles. This was pointed out by R. F. T. Crook¹, who convincingly deduced that the choice of the verb *torqueo* implied the imparting of an axial spin. The imposing array of evidence which he adduces makes this view much more likely than the older interpretation, that

torqueo referred to a preliminary 'flourish' or brandishing. Last year² I attempted to develop this idea, showing that πάλλω was used in Greek of communicating precisely the same twirl to a spear; an explanation which, if true, incidentally provides a very simple etymology for πάλλω.

The flight of the arrow raises the question to which I should be glad to receive an authoritative answer. Did the ancients, by feathering their arrows with truncated wing feathers, arranged in cyclic regularity of bias, impart a slight rotary spin to the arrow? Illustrations on vase paintings suggest this arrangement. So, too, the modern practice, apparently. "The fletcher selects feathers from either one wing or other of the bird."³ There is also in Duff's practical manual a diagram of a transverse section of a feathered arrow, showing the screw-like relation of the tips of the feathers (p. 128). A correspondent to *The Times* (Feb. 17, 1936) writes: "It is essential that the feathers should curve the same way, to impart a slight rotary motion to the arrow in flight, and therefore, since the feathers curve differently on each wing, all three (feathers) should be from the same one." On the other hand, I have often heard it stated that the feathered arrow flies steadily—on an even keel, so to speak—like a miniature aeroplane. Sir Gilbert Walker writes of the function of the feathers as merely providing resistance at the rear end (to prevent the arrow slewing round to fly with its length at right angles to its path). This, too, is, I think, the popular idea of an arrow's flight—compare "as straight and steady as an arrow". Does an arrow rotate?

Department of Latin,
University College,
Cardiff.
Nov. 3.

L. J. D. RICHARDSON.

¹ *Classical Rev.*, 30, 46-8 (1916).

² *Trans. Philolog. Soc.*, 101-5 (1936).

³ Duff, J., "Bows and Arrows".

Boron in Agriculture

THE importance of boron in agriculture is now well recognized, and in the recently published monograph on the subject, R. W. G. Dennis and D. G. O'Brien¹ have made an excellent survey of the information available up to the present time. The rapidity with which knowledge on the subject has accumulated may be judged by the fact that only six years have elapsed since the matter was of purely scientific interest, whereas now it has become one of economic importance. New plants for which boron is essential are constantly being discovered, and this year it has been established at Rothamsted that carrots should be added to the list. According to Bertrand and de Waal², carrot contained 25 mgm. boron per kgm. dry matter compared with 2.3-5 mgm. in cereals and 75.6 mgm. in beet, all plants being grown in the same soil. This relatively low boron content of carrot possibly indicates that its need for the element is not great, and that in consequence, disease due to its deficiency is not likely to be widespread.

K. WARINGTON.

Rothamsted Experimental Station,
Harpenden, Herts.

¹ *West of Scot. Agric. Coll. Res. Bull.*, No. 5 (1937).

² *Ann. Agron.*, 6, 537-541 (1936).