rib meristem assumes a semi-circular form extending from almost one flank of the apex to the other (Fig. 3, *rm*).

Procambial strands differentiate acropetally in the apex before the leaves, which they are going to supply, arise. Similar cases have been recorded by several workers[1,4,6,10].

Variation in the number of tunica layers within the same species has been accounted for in *Garrya* by the stages of development of leaf primordia by Reeve[8,9]. I, however, failed to observe this in my materials, and so did Millington and Gunckel[6]. In mustard, the variation in the number of tunica layers appears to be related to the growth conditions of the shoot. During the vegetative phase there is scarcely any appreciable elongation of it. At the onset of the reproductive phase, the main axis grows in length very rapidly and its apex shows the maximum number of stratified layers (5–6). Majumdar[5] observes that, in shoot apices of *Heracleum*, there are 5–6 stratified layers on the flanks in contrast to only three at the apex. Here, too, the increased number on the flanks is related to the growth conditions of the plant, which possesses a "rapidly widening axis just below the apical cone without any vertical expansion". Similar positive correlation is observed in (1) *Liriodendron*[6], where there are more tunica layers in the active stage, and (2) *Tropœolum*[11], the young axillary shoot apices of which have only a uniseriate tunica in contrast to 2–3 in the main shoot.

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Regeneration of the Potato Shoot Apex

Mr. I. M. Sussex[1] propounds a problem of great importance and interest, but the main conclusion which he draws from his skilful experiments appears open to question. He has found that in shoots of potato lateral portions of the apical meristem which are separated by longitudinal cuts from the main part are often prevented from regenerating by the growing-point of that meristem, or if they do regenerate are soon inhibited by it in their growth. He concludes that since the inhibiting influence has travelled down to a level below the cut and up again to the separated piece of meristem, it must be based not on a transport of hormones but on a competition for nutriment. He supports this conclusion by mentioning some unpublished experiments which, he states, have shown that there is in these apices a transmission of some other kind of hormone-like stimulus which, after travelling in the morphologically downward direction, cannot travel up again.

These other results will be awaited eagerly; but it remains quite possible that the transmission of inhibition from the growing-points of these apices is based on a transport of hormones, since one kind of stimulus or influence may follow different rules of transmission from another, even if both are based on hormones. Thus in shoot systems the stimulus for cambial growth, which comes from developing buds and leaves, travels strictly in the morphologically downward direction only[2]. But correlative inhibition, coming from the same source, can travel down one shoot and up another orthotropic shoot, even when the transpiration stream in the latter has been artificially reversed[3]. Also, in many plants an influence coming from the main apical bud keeps the branches plagiotropic, and this must travel down the main stem and out along the branches to their tips. Yet all these transmissions are based on transport of hormone; and, indeed, the first stage is the same in all of them, being the formation of auxin by developing leaves near the apex and its transport down the stem[4–8]. If an explanation of the difference in further transmission be sought, it may be suggested that the cambium is stimulated to grow by the descending auxin itself, whereas the other two effects depend on other substances which can be transported upwards as well as downwards and are formed either from the descending auxin, by modification of its molecule, or as a result of its action[9]. Similarly, there may be different transmissions within the apical bud also.

It may also be remarked that although Mr. Sussex emphasizes the fact that the lateral pieces of meristem which he isolated by vertical cuts were either prevented by the growing-point from regenerating at all, or else were afterwards inhibited by it, it seems of equal interest that some of them did regenerate to form buds with two or three leaves, so that these pieces must have been partially released from inhibition. In this respect his results are rather similar to those of experiments on *Lupinus albus* in which, for another purpose, we isolated the youngest leaf or the presumptive area of the next leaf due to arise, or of the next but one, by similar vertical cuts[10]. For in many of these experiments, in which enough apical tissue was left on the isolated piece axillary to the isolated leaf, a bud was formed from this tissue, although neighbouring leaves of the same seedlings had no axillary buds. These buds grew quite strongly, so that they must have been released from inhibition nearly completely.

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While I agree that there is much justice in the comments on my communication[1], the main fact which needs emphasis at this stage is that we are still very much in the dark concerning the roles of hormones and general nutrients in growth and morphogenesis at the shoot apex.