

releases as a function of the season. In these well controlled conditions, homing performance (Fig. 1a) dropped to a minimum in February and March and reached a maximum in July (veterans) or July to September (naive birds). The absolute performance of the veterans and naive birds also differed greatly. Fluctuations of veterans' performance are statistically significant, though smaller than those of the naive birds. In contrast to previous findings^{1,4}, initial orientation (Fig. 1b) also shows a pronounced annual fluctuation, again more pronounced in naive birds than in veterans, and again the performance of veterans is clearly above that of naive birds. In winter, the initial orientation of naive birds was ill-directed rather than randomized. Comparable data from other release sites are being collected.

Obviously, some annual factor interferes with homing, and this fact is not entirely new^{1,2}; but experienced birds are much better at compensating for the action of this factor than are naive birds. Even very experienced birds, however, which at the end of this experiment had been released from this short distance release site up to twenty-eight times (among a grand total of over eighty releases), did not maintain an optimum level of performance either in initial orientation or in homing. These facts, among others, seem to imply that the birds do not depend on knowing such permanent local factors as, for example, landmarks. The basis for the fluctuations remains unknown, as does the way in which they interfere with the homing mechanism.

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State of the Pores in the Functioning Sieve Plate

RECENT work in this laboratory has confirmed that the pores in the sieve plates of functioning phloem are normally occluded, fairly densely, with slime fibrils. Stems of *Helianthus* seedlings and thin stolons of *Saxifraga sarmen-tosa* were plunged into briskly boiling water for 3 min before conventional fixation in glutaraldehyde and osmium, embedding and sectioning for electron microscopy. In almost all cases, the pores in the sieve plates appeared plugged with densely-staining material (Fig. 1a and b); where this was not obvious the micrographs strongly suggested that the section had passed between the shrunken plug and the pore wall. We regard these observations as evidence against the views often put forward that the plugging is an artefact of preparation caused either by longitudinal turgor release or by local enzyme action^{1,2}.

The view we take, namely that the pores are naturally occluded, is opposed on somewhat more positive grounds by Cronshaw and Esau³. They refer to the observation

that virus particles in infected beet may share the pores with the slime fibrils, and suggest that this precludes the present view. It is difficult to see the logic of their suggestion, unless it is presumed that the virus particles must be travelling at a rate comparable with that of the assimilate stream. For, *a priori*, it seems reasonable to believe that the forces (perhaps electrical) which introduce the slime fibrils into the pores would treat virus particles similarly; and a very slow working of the particles through the pores would be quite adequate to account for virus transport. The virus observation therefore to which they refer offers no real difficulty.

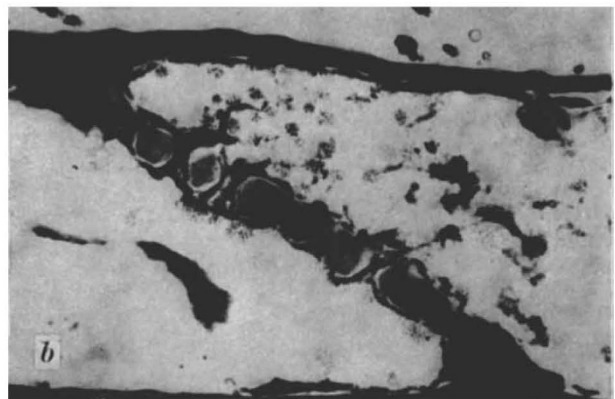
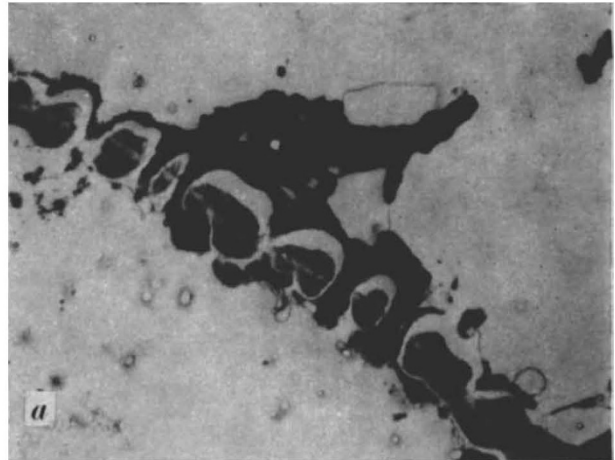


Fig. 1. Sieve plates of *Helianthus* (a) and *Saxifraga* (b) fixed after immersion in boiling water. $\times c. 9,000$. Note absence of callose.

We therefore conclude that the electron microscope evidence for sieve plate structure is virtually conclusive against the pressure-flow hypothesis of Münch. Furthermore, it offers no support for the transcellular strand theory. The only hypothesis which seems to be consistent with it is the electro-osmotic.

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