hypha sends out toward the spore a special branch or fusion peg. Soon after a fusion has taken place (3–6 hours after mixing the nectar), the main protoplasmic contents move out of the pycnidiospore and out of that part of the flexuous hypha which has fused with the spore, thus leaving behind a large vacuole. Presumably the nucleus of the pycnidiospore passes down the flexuous hypha toward the fundaments of the æcidia. This passage is made easier by the fact that the flexuous hyphæ have no septa.

The fundaments of the æcidia or 'rudimentary æcidia' which, after the nectar of (+) and (−) pustules has been mixed, become diploidized and produce æcidiospores, are well-defined haploid organs. They require a special name, and I therefore propose that they should be called *proto-æcidia*[3].

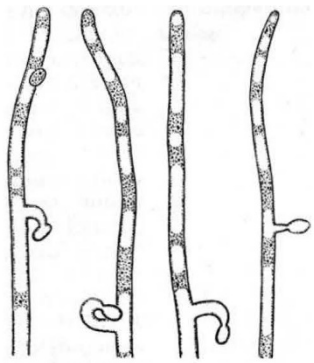

Fig. 3.

FOUR FLEXUOUS HYPHÆ WHICH HAVE EACH SENT OUT A SHORT BRANCH OR PEG WHICH HAS FUSED WITH A PYCNIDIOSPORE. × ABOUT 500.

The experiments here recorded were made early this year at Winnipeg in the Dominion Rust Research Laboratory, and I here wish to acknowledge my indebtedness to Dr. J. H. Craigie for placing the resources of the laboratory at my disposal and to Dr. T. Johnson for supplying me with a series of inoculated barberry bushes.

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Kew. Nov. 30.

[1] Craigie, J. H., NATURE, **131**, 25 (1933).
[2] Pierson, R. K., NATURE, **131**, 728–9 (1933).
[3] A more detailed account of the sexual process in *Puccinia graminis* and other rust fungi is in preparation for vol. 7 of my "Researches on Fungi".

Nature of the Outer Surface of the Cell Walls of the Mesophyll of the Leaf

IN a recent communication[1], it was recorded that a number of hydrocarbons, including pure paraffin, readily entered the air-spaces of a leaf strip placed vertically in contact with the surface of these liquids, and could also be observed to flow readily over the surface of the exposed mesophyll and cascade down and fill the interspaces. Water, on the contrary, will neither flow over the surface nor fill the interspaces under any conditions, without a pressure gradient.

Since then, working independently, I have found that certain dyes such as janus green, which are also sensitizers of protein monolayers, are strongly adsorbed on the surface of the cells when the leaf is infiltrated under pressure. Under these conditions, it was found that ready infiltration of the air-space could be obtained, but the dye was entirely adsorbed on the cell walls near the point of entry, while the leaf lamina although completely infiltrated by water was entirely free from dye. The dye so adsorbed cannot be liberated by water on exposure of the mesophyll, although it can be extracted by acetone as was described by Ponder[2] for red corpuscles sensitized with brilliant green. The dye cannot be extracted in water by a rise of 15° as recorded by this author for the protein layers of red corpuscles. This possibly may be due to the fact that adsorption took place at a laboratory temperature of 33° instead of 15° as in Ponder's observations on red corpuscles.

Dyes such as methylene blue, neutral red, diamantfuchsin, jodgrun, indigo carmine all give the same results. Other dyes such as orange G, congo red, nigrosin, corallin and magdala red enter the interspaces with the water and show no adsorption.

On using a mixed solution of non-adsorbed and adsorbed dye in approximately equal concentration, the protein adsorbed dye is entirely adsorbed near the point of entry while the other dye enters and fills the interspaces and shows no adsorption. These results are obtained equally well whether the leaf is infiltrated by dye drawn in from the cut edges of the lamina, or whether it is drawn into a complete leaf from the petiole.

If one of the fatty acids such as sodium taurocholate in slight bulk concentration in water be placed on the exposed mesophyll, it begins to spread, and after an interval of one or two minutes the bubbles of air in the interspaces below are displaced and the liquid spreads out and gradually fills the interspaces of the mesophyll. The action is exactly similar to that observed with pure paraffin but the rate is very much slower. Leaf strips placed vertically with the edge in contact with the fatty acid solution are slowly infiltrated, but the process is arrested about 5 mm. from the point of entry, when a brown band of discolouration appears at the limit of infiltration.

The action of the fatty acid on the exposed mesophyll is sensitive to *p*H reactions, as was found by Schulman and Rideal[3] in their observations of the lytic action of fatty acids on protein monolayers in red cells. In this case, the action proceeds readily at a *p*H of 6·2 but very slowly if at all on the alkaline side, while the reverse was recorded for red cells.

The unwettability of these cell walls by water and their great adhesion for hydrocarbons shows that the surface is not covered by liquid water. The strong adsorption of protein sensitizing dyes in general and the non-adsorption shown by other dyes strongly suggest that the outer cell wall–air interface is not a cellulose surface.

The fact that fatty acids which have the power of entering and dispersing protein monolayers cause complete wettability of the walls by water only within certain *p*H values, suggests that the interface may be protein in nature and of molecular thickness.

It is hoped to publish the results shortly.

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[1] Bangham, D. H., and Lewis, F. J., NATURE, **139**, 1107 (1937).
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[3] Schulman, J. H., and Rideal, E. K., *Proc. Roy. Soc.*, B, **122**, 46 (1937).