# PHENOMENA EXHIBITED BY FUNGI WHEN GROWN IN CLOSE PROXIMITY.

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When a flask of contaminated culture media is examined an interesting and instructive picture presents itself. There is noted a variety of forms that are quite different as to character and method of growth. Some of the forms occupy a definite area resisting the encroachment of the surrounding forms, while other residents of such an heterogeneous colony intermingle and overgrow each other apparently without the means or the inclination to remain exclusive.

Similar conditions exist in forest growths where some species keep to themselves and form pure stands while others intermingle on lines of pure social equality. The analogy to the ecological relations of the higher plants is borne out likewise in the continued and continuous change which takes place in mixed cultures. In such circumstances we may observe a succession of forms arising, some gaining a dominance which checks the others and which may cause their eventual elimination or total submergence.

The literature relating to mixed cultures is becoming increasingly voluminous. It is realized by those engaged in studying fungi and their ways that mixed cultures and not pure cultures are common in nature. Through the better understanding of the effects which one fungus produces on another lies the possibility of more satisfactory explanations of such phenomena as epiphytotics, disappearance, and alleviation of symptoms. Such knowledge may lead to better ideas concerning control.

The problem, while of great interest, is exceedingly complex and has many angles. There are many paths to follow, any one of which may lead to interesting and important results. In my own work it seemed that the most promising approach lay in studying microscopically the zone existing between two approaching cultures. As the threads of the mycelium grow through this "no man's land" toward each other they soon begin to show by morphological changes whether or not they are to be affected by each other. Most of these changes have been listed and analyzed in a recent paper.[1]

For making such morphological observations I formerly used cultures growing on agar on glass slides. I have discovered recently, however, that mica strips serve my purpose better. They may be cut to any shape or size desired, they are easily cleaned, do not break and may be sterilized to red heat in the flame of the Bunsen burner and be ready for use within a moment following sterilization. These mica strips are placed on match sticks in Petri plates. Melted agar is poured on the mica strips and when the agar is hardened the strips are inoculated. The agar is kept from drying by placing moistened filter paper in the

[1] Porter, C. L. Amer. Jour. Bot. 11:168-188. 1923.

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bottom of the plate. As soon as growth is well started the cultures are kept under constant observation.

In this manner recently a new, and hitherto unreported morphological change was noted. G. C. Bormuth, a student of mine working with mixed cultures discovered a fungus which came into his cultures as a contamination which had a peculiar dissolving effect on the mycelial hyphae with which it came in contact. This peculiar phenomenon is often apparent before the fibres are in actual contact or it may not be observed until after there is some intermingling. The hyphae of other fungi when grown in close proximity become first filled with bubble-like structures. Eventually the mycelial wall disappears but the bubbles remain marking the former position of the hypha. These bubbles gradually become smaller, more scattered and finally they disappear. In Petri dish cultures a clear zone gradually forms and is clearly evident to the unaided eye preceding the advance of the dissolving fungus. This effect has been noted with a considerable number of species including several isolated from corn stalks, probably Fusaria; also *Fusarium cubense*, *F. conglutinans*, *F. lini*, *Sclerotium rolfsii* and a Penicillium isolated from gladiolus bulbs. *F. cubense* reacted more strongly with the dissolving fungus than any of the others tried. The effect was sufficiently striking with *F. conglutinans* to justify the attempt to check it in the soil with the dissolving fungus.