



Fig. 1. Oospore of *P. megasperma* after burial in soil for one week. Oospore among glass fibres in Petri solution and germinating by hyphae. ($\times 220$)

incubation for a month, the fungus hyphae had become interwoven with the glass fibres and had produced sexual and asexual reproductive structures. The tapes and threads were removed from the cultures without any adhering agar and kept damp while the ends of the tapes were turned back and sewn with glass thread to prevent unravelling. In other experiments agar from the culture plates was included in the loops sewn at the ends of the tapes. The glass material with its inoculum of *Phytophthora* was then buried, either in the upper six inches of non-sterile garden soil out-of-doors or in similar soil in flower-pots in a cold greenhouse. Subsequent location of the tapes and threads was facilitated by hanging them from lengths of wire just below the soil surface. They were extracted after periods of time varying from a day to a year. Soil was washed off under a slow stream of water and the material fixed and stained for immediate examination or left in water or Petri solution for sporangial production. If detailed observation or photography of a particular fungal structure was required, the relevant portion of glass was cut away and the constituent fibres teased apart. After immersion in liquid medium, small portions of the tapes or agar were inserted in surface-sterilized apples in order to recover the *Phytophthora* species.

After burial in the soil for only a week, oospores of *P. cactorum* and *P. megasperma* on glass threads were seen to germinate in Petri solution with the production of hyphae and rarely sporangia (Fig. 1). Oospores of the same two fungi were still present on tapes and in agar after burial for a year; they germinated to produce sporangia (Fig. 2) and pure cultures were obtained. The shells of oospores which presumably had germinated during burial were also observed in the agar. No evidence of the presence of *Phytophthora* was obtained from controls of glass



Fig. 2. Oospore of *P. cactorum* after burial in soil for one year. Oospore in agar in Petri solution and germinating by a hypha and a sporangium. Sporangium (on right) slightly plasmolysed. ($\times 660$)

material and agar utilized throughout all experiments. This investigation is not yet complete; but the method is reported here as it may be of use to other mycologists working with fungi in soil.

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Breeding Behaviour of the Emperor Penguin

MAN has very seldom had the opportunity of observing the breeding behaviour of *Aptenodytes forsteri*, the emperor penguin. Few rookeries have so far been discovered; all are around the coast of the Antarctic, and all are difficult of access from expedition bases, particularly during the winter months when breeding occurs.

The first rookery, discovered in 1901 at Cape Crozier, was visited on a number of occasions by members of Scott's two antarctic expeditions. Observation during the incubation period was limited to a few hours. The report by Dr. Edward Wilson (1907) is the most comprehensive account so far available of the natural history of these birds.

In 1948 a fourth rookery was discovered fifty miles from one of the bases of the Falkland Islands Dependencies Survey. During the following winter (June–August) I was able to spend ten weeks observing the rookery during the egg-laying, incubating and early post-hatching periods. As a result of these observations a considerable amount of new information has been obtained.

Observations indicate that immediately after the egg is laid, the female moves out across the sea ice to open water, leaving the male to hold the egg for the full incubating period of sixty days. During this time the male does not feed. Towards the end of the incubation period the female returns ready to take over the feeding of the chicks, and the males disperse to the open water after their long fast. Characteristic behaviour at all stages was observed, and a series of embryos was obtained. Work is at present in progress on the interpretation of the results under the following headings: (1) breeding and incubating habits; (2) morphology; (3) embryology, and growth of the chick.

It was not possible to observe courtship behaviour, or the dispersal of the rookery. It would, therefore, be of particular interest if future observers on any emperor penguin rookery could pay special attention to these points.

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