tigation of the sex-phenomena in the pea-crab, the female of which is known to be sedentary, spending its life imprisoned within bivalves such as mussels, cockles, and occasionally oysters. It was found that the female fulfils its mating functions probably once and for all (see NATURE, December 23, 1920, p. 533) when quite a tiny mite, and probably not more than a month or two old. It is unlikely afterwards that the female has any more need of a male. Now the same result—excepting for any advantage there may be in cross-fertilisation—might be obtained by the pea-crab being born as a male and changing into a female, and at the outset of the investigation such a change was suspected. It is, indeed, possible, that evolution in sex-characters in a similar species carried a stage further would end in cutting out the males of that species altogether—as has taken place in some Cirripedes—and leaving a hermaphrodite form which starts life as a male and changes into a female. In the case of the pea-crab, therefore, bisexuality is maintained by a very precocious association of the sexes, while the males still retain their active mode of life.

A similar dodge on the part of Nature has been applied in a large number of other cases, such as in some parasitic Copepods, some Echiuroids, some Cirripedes, some parasitic Isopods, and no doubt in many other cases. But in these cases the male is often minute and permanently attached to the female. It is clear, therefore, that it is necessary to be on the look-out for adaptations which retain in a species an appearance of bisexuality, but which bring about a close resemblance to the hermaphrodite state. The conditions which determine whether both sexual products shall ripen together in an individual or only successively are entirely unknown, but it is hoped that the suggestions put forward in this letter may help towards securing some information bearing on the problem.

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The Laboratory, The Hoe, Plymouth,
October 20.

## The Presence of Perennial Mycelium in Peronospora Schleideni, Unger.

SINCE *Peronospora Schleideni*, Unger, the onion mildew fungus, is known to produce its sexual organs in the leaves of the host-plant, the assumption has been made that the parasite is dependent on its oospores for perpetuation from year to year. It has now been proved, however, that the mycelium is capable of a perennial existence in onion bulbs, and that the shoots produced if such bulbs are planted are infected *ab initio*.

The presence of non-septate mycelium permeating the bulbs of the potato- and common onion, sent in from several parts of Ireland in the late spring of 1920, first directed attention to the subject. All attempts to induce this fungus to fruit on the bulb-scales, to infect other onions, or to grow on artificial media, met with failure. In some cases, however, where green leaves were present, the mycelium was traced from the bulb to the apical portion of a leaf on which conidiophores of *P. Schleideni* were being produced. All the infected bulbs shrivelled and died during the course of the autumn or winter, as did further infected specimens gathered in the autumn from badly diseased plots. Practically 66 per cent. of the smaller-sized onions from one particular plot which was badly mildewed in 1920 contained non-septate mycelium. Such infected bulbs sprouted prematurely, but although the mycelium grew up within some of the new shoots, it failed to develop conidiophores on the surface under winter conditions in the greenhouse.

Further material became available in the spring which proved the relationship of this fungus to *P. Schleideni*. Bulbs of the common onion (*Allium Cepa*) and of the shallot (*A. ascalonicum*) which contained the same non-septate mycelium were grown in the early spring under conditions which excluded the possibility of external infection, as proved by the fact that numerous control plants which were initially free from mycelium remained free from mildew, even when kept for a week under conditions favourable to the disease. The infected plants, on the other hand, when placed under a bell-jar for one night were found practically covered with mildew next day. In some cases the original infected leaves, which had not developed any mildew, were cut away. The new shoots which replaced them again came up permeated with mycelium and again became mildewed under favourable conditions, while similarly treated control plants remained healthy.

There is a time in the early spring, generally in the month of April, when the mildew is found only on onions the bulbs and leaves of which are permeated with mycelium. These plants appear to act as important centres of infection. For a long period no apparent harm results to the host, but the tips of the leaves ultimately turn yellow and droop. Under favourable weather conditions mildew then breaks out, at first just below the withered portion of the older leaves, and then on all the leaves except the youngest. There appears to be a nice balance between host and parasite, seeing that both can go on flourishing so long together, and that it is apparently only at a certain stage of maturity of the leaves that the internal mycelium breaks out into conidiophores. Even when this happens, the host-tissue is not killed for a considerable time.

Non-septate mycelium, apparently that of *P. Schleideni*, has been found in the bulbs of the common onion, in those of the potato- or underground-onion, and of the shallot. In the case of the common onion and shallot this mycelium has been definitely connected with the mildew fungus. It has also been proved that the mycelium survives when infected bulbs are left in the soil during the winter. This is possibly an important point in the case of Tripoli onions, which are sown in the autumn. The *rôle* of perennial mycelium in the shallot, potato-onion, and in onions grown from "sets" is obvious.

Plainly visible mycelium was observed in infected bulbs every time they were examined in spring, autumn, and winter. In these circumstances, it appears unnecessary to suggest the presence of mycoplasmic infection. It may be added that the mycelium is so obvious, the hyphæ being stout and well differentiated from the cells of the host-plant, into some of which large convoluted haustoria extend, that no better subject for demonstrating intercellular mycelium and haustoria is known to the present writer. No staining is required.

The effect of the fungus on the keeping qualities of infected bulbs requires further study, as do some other points in this strangely overlooked phase in the life-history of such a common and destructive parasite.

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Royal College of Science, Upper Merrion Street, Dublin, October 15.

## The Development of Optical Industries.

IN NATURE of October 20, p. 238, Messrs. Zeiss's publicity manager questions a particular period of British supremacy in the manufacture of optical glass,