PENICILLIUM AS A WOOD-DESTROYING FUNGUS.—Spores from pure cultures of *Penicillium* were sown on sterilized blocks of spruce-wood, cut in March, and were found to grow freely and develop large crops of spores on normal conidiophores. Sections of the infected wood showed that the hyphae of the mould entered the starch-bearing cells of the medullary rays of the sap-wood and consumed the whole of the starch. The resin was untouched. In culture three months old the hyphae were to be seen deep in the substance of the wood passing from tracheide to tracheide *viâ* the bordered pits. Control sections, not infected and kept side by side with the above, contained abundance of starch, and no trace of hyphae could be detected in them.

The observation appears of interest in several connexions. *Penicillium* is one of our commonest moulds, and undoubtedly plays a part in the reduction of plant *débris* to soil-constituents; how far it can itself initiate the destruction of true wood, or how far it merely follows on the ravages of other fungi, bacteria, &c., is unknown. There are strong grounds for believing that it destroys the oak of casks, &c., but since these are impregnated with food-materials this is not very surprising. Trabut[1] has shown that *Penicillium* will grow in solutions containing 2–9·5 per cent. of $CuSO_4$, and other evidence exists showing how remarkably resistant this mould is, and how little organic matter it needs for life.

Dubois[2] showed that *Penicillium*, or a closely-allied form, not only lives in strong solutions of copper, neutralized with ammonia, but will erode metallic copper and bronze if transplanted thereon.

Jönssen[3] found *Penicillium* living in one-tenth normal sulphuric acid solution, and gives some interesting facts regarding the sulphur-containing oil-drops in its protoplasm, and other statements concerning oil in this fungus occur in the works of De Bary, Brefeld, Pfeffer, &c.

Gerard[4] gives proof that *Penicillium* can liberate butyric acid from mono-butyrine, and evidence that this is due to its power of forming a *lipase* or fat-splitting enzyme.

Lesage[5] gives striking instances of the resistance to externa

[1] Bull. de la Soc. Bot. de Fr., xlii, 1895, 1.
[2] Comp. Rend., 1890, cxi, p. 655.
[3] Bot. Centr., xxxvii, 1889, p. 201.
[4] Bull. de la Soc. Mycol. de Fr., xiii, 1897, p. 182.
[5] Ann. des Sc. Nat., Sér. 8, T. i, 1895, p. 309.

influences shown by the spores on germination. Not only will they germinate and live for some time in water, and under almost anaërobic conditions, but he found them germinating in 26·5 per cent. solutions of common salt; 30 per cent. solutions were too much for them, however. He states also that the vapours of cedar-oil, iodoform, napthalin, camphor, and patchouli do not prevent germination; though those of clove-oil, ether, alcohol, chloroform, and acetic acid prevent it. The maximum for alcohol was somewhere between 4·2 and 6·2 per cent. In acetic acid they germinated in twenty-four days in solutions of 1 : 256, but failed to do so in solutions of 1 : 64, whereas in HCl they germinated in two days in 1 : 4 solutions.

As regards temperatures, it is well known how resistant the spores are. A striking instance of the hardships the mycelium can undergo is given by Woronin[1]: he found *Penicillium* vegetating on the melting snow, where the temperature at night fell below 0° C.

Bourquelot[2] found invertase, maltase, trehalase, emulsin, inulase, diastase, and trypsin in the allied *Aspergillus*, and pointed out how suggestive this is in explaining the ubiquity of this mould. Probably *Penicillium* is equally rich in capacity for enzyme-production.

Miyoshi[3] showed that *Penicillium* can bore through cellulose membranes, and no doubt similar chemotactic phenomena are concerned in the piercing of wood-elements by the hyphae.

It certainly looks as if *Penicillium* may be a much more active organism in initiating and carrying on the destruction of wood than has hitherto been supposed, and that it is not merely a hanger-on or follower of more powerful wood-destroying fungi. It is also, doubtless, very independent of antiseptics.

H. MARSHALL WARD, Cambridge.

A METHOD OF OBTAINING MATERIAL FOR ILLUSTRATING SMUT IN BARLEY.—By sowing soaked, skinned barley that had been plentifully covered with *Ustilago* spores a supply of smutted barley may be ensured, and in such material it is easy to trace out the spore formation.

Hand-sections of the ear when about $\frac{3}{8}$ inch long showed the

[1] Arb. d. St. Petersb. Naturf.-Ver., B. xx, p. 31.
[2] Bull. Soc. Mycol., 1893, p. 231.
[3] Bot. Zeit., 1894, H. 1.