These slits may be seen with the naked eye if examined closely. They arise in the following manner: The fungus having penetrated the outer skin (epidermis) of wheat-plants, then develops minute root-like fibres (hyphæ), which ramify amongst the inner tissues of the plant. These "roots" draw upon the plant-juices, increase in length and number, and finally burst through the outer skin of the stems, leaves, and bracts, forming slits therein. Here they produce abundantly those red globes which are the so-called summer spores (uredospores) of the fungus — that is, the reproductive bodies by which wheat-rust spreads in the summer from one wheat-plant to another and from one crop to another. Highly magnified, their appearance is similar to Fig. 1 (*a*). The name "wheat-rust" is given to the disease on account of the rusty-red appearance lent to affected crops by these spores, particularly in the summer months. Later on there arises from the same slits a black powder—the so-called winter spores (teleutospores) of the fungus. Fig. 1 (*b*) shows two winter spores highly magnified. The presence of this black-spore form in the slit-like ruptures was greatly in evidence at the time the investigation was made (end of March last).

Both the summer and the winter spores are the reproductive bodies of the same fungus — *Puccinia graminis*. The especial function of the summer spores is to propagate the fungus in the summer, while that of the winter spores is (1) to withstand severe winter conditions; (2) to germinate the following spring and themselves produce another special kind of spore known as the basidiospore (Fig. 1 (*b*)). The function of the basidiospore is to infect the barberry (*Berberis vulgaris*) as a host-plant. The fungus resulting from the basidiospore creates a fungus disease of the barberry, and ultimately produces a spore-form distinct from any of the three previously mentioned — namely, the acidiospore. The acidiospores are dispersed by the wind and infect wheat-plants with *Puccinia graminis*, which fungus then proceeds to produce the summer spores, and so on as before.

In New Zealand the occurrence of barberry is so rare in many parts that it would appear impossible for it to bear the fungus producing the acidiospores which originate the wheat-rust; moreover, so far the occurrence of affected barberry shrubs has not been recorded in New Zealand. The usual means by which wheat-rust survives during the winter is therefore apparently not resorted to in New Zealand, and the question as to how it winters here is still obscure. The summer spores, which are believed to perish in countries with hard winters, are, it is asserted, capable of maintaining their viability in certain countries with