of drouth and moisture, and changing chemical and physical conditions.

This amœba was recovered by Wherry (1913) from the water-supply of the adjacent city of Oakland, California, but it is primarily, in our experience, a soil amœba, found in undisturbed alluvial soil along Strawberry Canon on our campus, in garden soils and appears to have its maximum abundance at a depth of about four inches, though it was also recovered on our campus from clay and rock talus *in situ* in the sides of the excavation for the Sather Campanile to a depth of over twenty feet. It has also been found in cultures from various ranch soils from the central valleys of California.

It is not distinguishable by any morphological characters from a species described by Schardinger (1889) as *Amœba Gruberi* from human feces in a case of dysentery at Vienna, Austria. There is evidence that this author used pure culture methods. It is possible, however, that the cysts might have taken in food or water and have passed intact through the digestive tract and then have been recovered from the feces in the culture, but contamination from dust or water are equally open as possibilities. All of these facts taken together lead to the inference that this amœba, *Nægleri gruberi* (Schardinger), may have a wide distribution in the soil and to be cosmopolitan in its occurrence. If this proves to be the case, or if other amœba of the soil have similar flagellated stages, it is obvious that future investigations of the relative distribution of amœbas and flagellates in the soil should be so conducted as to avoid the complications in interpretation and conclusions involved in the Jekyll-and-Hyde life history of this organism.

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The Native Habitat of Spongospora Subterranea

The discovery of *Spongospora subterranea*, the powdery scab organism, on recent importations of potatoes from Peru by the Department of Agriculture has furnished important evidence bearing on the question of the origin of this parasite. *Spongospora* is widely distributed in Europe and within the last three or four years has established itself in several widely separated localities in the United States and Canada, but the problem of its origin has remained unsolved.

Kunkel's[1] recent work on *Spongospora* has demonstrated that a very intimate relation exists between the host cells and the parasite.

[1] Kunkel, L. O., "A Contribution to the Life History of *Spongospora subterranea*," *Jour. of Agr. Research*, 4: 265–278, Pls. XXXIX.–XLIII., 1915.

The latter does not cause a rapid destruction of host tissue such as is seen in many cases of recently established parasitism, but rather produces a temporary conservation of the host cells followed by their gradual destruction, in short, the type of development to be expected in parasitism of long standing. Hence we may safely conclude that the association of *Spongospora* and the potato is an ancient one, and we should therefore naturally look for the original home of powdery scab in some very early habitat of the potato. In 1891 Lagerheim[2] collected *Spongospora* in Quito, Ecuador, and stated that the disease was well known in that region, but he gave no evidence bearing on the question as to whether it had long existed there or had been recently introduced, possibly from Europe, where it has been known to exist since 1841. Evidence on this question is now at hand.

Mr. O. F. Cook, of the Bureau of Plant Industry, recently returned from South America, bringing specimens of a large number of native varieties of potato from Peru. When these collections were examined by the undersigned pathological inspectors of the Federal Horticultural Board at Washington, about one third of the tubers were found to be affected with powdery scab. Their identification of the organism has been verified by Mr. C. W. Carpenter of the Bureau of Plant Industry. The diseased tubers came from the eastern slope of the Andes, all having been grown at altitudes of 10,000 feet or more in the regions about Cuzco and Ollantaytambo, Peru. Some of the infected tubers were obtained direct from the fields of the Indians near the upper limit of potato cultivation in the Panticalla Pass, between the Urubamba and Lucumayo valleys, at an altitude of over 12,000 feet. Mr. Cook states that potatoes are never imported in these localities, only the original native varieties being grown. Hence introduction of the disease from Europe or any other foreign locality into this region of primitive potato-growing seems most improbable. Both host and parasite are apparently indigenous.

[2] Lagerheim, G. de, "Remarks on the Fungus of a Potato Scab (*Spongospora solani* Brunch)," *Jour. of Mycology*, VII., 103–104, 1892.

Further evidence tending to show that the disease is native to Peru and not introduced is furnished by the character of the disease itself as it develops on the Peruvian potatoes. The sori are in general smaller and shallower than those usually produced on most varieties of European or North American tubers, and show less destruction of host tissue, indicating that the disease is not of a serious nature in Peru. This inference is strengthened by Mr. Cook's statement that the natives are not concerned over the disease, in fact do not consider it an injury. That the fungus is common and generally distributed is proved by the fact that about one third of the tubers collected in this region showed *Spongospora* sori. The slight importance of the disease in Peru as compared with its greater virulence in Europe and North America is easily understood if South America is the native habitat of the parasite. Ancient association of the host and its parasite would naturally have developed a high degree of resistance on the part of the potato and have produced the balanced relation of host and parasite so commonly seen in cases of long-established parasitism.

The evidence indicates, therefore, that South America, which is the native habitat of the potato, is also the home of *Spongospora*. If so, we may add one more organism to the already long list of parasites which are relatively unimportant in their native habitats, but which have developed greater virulence and destructive power when introduced into new regions, especially if in the new localities the host plants have been subjected to more intensive cultivation.

The discovery of powdery scab on these Peruvian potatoes shows the need of very careful inspection of all imported plants and emphasizes the great importance of obtaining healthy material for breeding or other experimental purposes. Such material should be entirely free from disease, even from diseases which are apparently of little importance in the native habitat of the host.

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