This author found that in twenty-six out of thirty-one cases when the cercariæ from a single snail were used in infesting experimental animals all the individuals developed were of the same sex. Dr. S. Yokogawa has given me permission to use in this connection the results of some of his experiments along this line, which were performed several years ago. He found that when a cat, dog, or rabbit was infested with the cercariæ from a single snail that worms of only one sex would develop. He also found that in these cases the worms would not develop to maturity. These two workers have developed independently the same hypothesis to explain the results of these experiments.

According to this hypothesis sex in the schistosomes is determined in the fertilized egg and all the cercariæ coming from a single miracidium are of the same sex. When all the individuals derived from the cercariæ from a single snail were of the same sex it would follow that the infestation in this snail was from a single miracidium or two or more miracidia of the same sex. In those cases where both sexes came from the same snail, this snail must have been originally infested with two or more miracidia representing both sexes. Now my findings recorded above in regard to dimorphism in a species of schistosome cercaria, and the presence in one snail of only one of these types, lends further support to this hypothesis. Further, since in the life cycle of *S. japonicum,* the miracidium and the mother sporocyst are the only stages derived from a fertilized egg, it is in these stages that sex differentiation would theoretically be expected. Up to the present time, however, no one has examined these stages to determine whether they show a sexual dimorphism. My purpose in discussing the data given above and the hypothesis derived from them in this preliminary way is to call the attention of zoologists interested in the problems of sex to the interesting condition found in this trematode family.

William W. Cort

knowledge of the morphology and development of *Schistosoma japonicum*'' (Japanese). An abstract of a paper given before the Japanese Pathological Society. *Igaku Chuo-Zashi,* Vol. 17, No. 6.

ORIGIN OF POTATO RUST[1]

A year ago the writer called attention to the threatened introduction into the United States of two more crop pests, the potato rust, *Puccinia Pittieriana,* and the peanut rust, *Puccinia Arachidis.*[2] Since then the latter fungus has been found in one field in Florida, where all vestige of it was at once destroyed. The other fungus has not yet appeared in the United States.

During 1918 the potato rust was very abundant and harmful in the experiment station grounds at Ambato, Ecuador, not only upon potatoes but even more so on tomatoes. This was the first report of the rust in South America, having previously been known only from the high lands of Costa Rica on the potato alone. In Ecuador it showed decided preference for North American varieties of the tomato. An excellent illustrated account of the rust and its behavior, with conjectures on its origin, was published in the bulletin of the Ambato station for January, 1920, by the station botanist, Abelardo Pachano.[3] I take the liberty to quote a few disconnected sentences from this article, after changing them from the Spanish into an English garb.

The rust of the tomato and potato is a wholly new disease, not only in our fields [in Ecuador], but also elsewhere. Not simply the fact of its novelty should interest us, but more particularly its virulence, its ease of propagation, and the enormous injuries that it occasions; these considerations would seem to place it among the most serious maladies of cultivated crops.

The history of this rust [in this region] may be easily sketched. The year 1918 is demonstrated as the date of its first appearance. In fact in the spring of that year we had occasion to observe very grave disturbances, by our horticulturists given the general name of plague, in the tomato plots from seed of North American origin. The varieties most attacked were those by the names Acme, Golden Queen and Black-eyed State. Nearly at the same time we noted similar lesions

[1] Presented to the Mycological Section of the Botanical Society of America at the Chicago meeting, December 29, 1920.

[2] Science, 51: 246–247, March 5, 1920.

[3] *Boletin de Agricultura Quinta Normal,* 1: 7–12, Figs. 1, 2, January, 1920.

in the parcels of potatoes of the variety Calvache. But although the malady has increased very rapidly and is abundant in the tomato plots, it has not flourished in those of the potato.

Where did this new parasite come from? We have not met with it up to the present on any of our wild Solanaceæ, so as to enable us to infer that it has been transferred from them to the potato and tomato; neither has seed been received from Costa Rica so we could believe that it has come from that locality. The trouble, as it has manifested itself, has appeared on plots grown from North American seed, in a way to make us think that this new plague is to be referred to the United States.

Mr. Pachano informs me by letter that the disease was not so prominent during 1919 as it was in 1918, but had the same relative predominance on the tomato, especially on the North American varieties. He has also modified his views regarding its origin. We may assume, I think, that the susceptibility of North American varieties has no special significance in connection with the question of the native host or habitat. The snapdragon rust has been known since 1897, and has spread throughout the United States, but only recently has it been traced to its native Californian hosts. In fact I think we can safely assume that the appearance of the potato rust in the gardens of central Ecuador indicates that the rust can be found on uncultivated native plants in that same region. The Solanum rusts of tropical and semi-tropical America are numerous, but have been little studied, and those of Ecuador almost not at all.

There is a rust described from Colombia on *Sarache edulis,* a close relative of Solanum, which much resembles the potato rust except that it has slightly larger spores. This same rust on another species of Sarache was found in the vicinity of potato rust on Mt. Irazú in Costa Rica by E. W. D. Holway, who tells me that the plant is common in gardens there, going by the name "yerba mora." There is also a very similar rust known on the wild *Solanum triquetrum,* a vine ranging southward from central Texas into the adjacent region of Mexico, but this form has slightly smaller spores than the potato rust. Only actual trial can show if these forms can be transferred from one host to another, and if the size of the spores is in anywise dependent upon the host.

A variation in spore-size apparently dependent on the host is found to occur in the case of the snapdragon rust, and cases of such size variation are known for other species, some of them authenticated by pedigree cultures. The spores from the potato and tomato are remarkably uniform in size. Whether the three forms of Solanaceous rusts here referred to are the same or not, it is fairly safe to predict that the potato rust has originated somewhere between Ecuador and Costa Rica on hosts native to the localities.

J. C. ARTHUR

PURDUE UNIVERSITY,
LAFAYETTE, INDIANA

SCIENTIFIC EVENTS

A WORLD ATLAS OF COMMERCIAL GEOLOGY

WITH the growth of American industries the known and the possible sources of our supplies of raw materials have become of greater and more pressing interest. Even the United States—most favored of nations in abundance and variety of raw materials—can not be self-sufficient; it must look beyond its shores for supplies as well as for markets. The study of the distribution of mineral raw materials and their relations to the promotion of trade and the control of industry is a branch of geology and may best be termed commercial geology. Under the complex requirements of present-day life no continent, not even North America, can be self-sustaining. It is no longer enough for us to make an inventory of the mineral wealth of the United States; we must supplement that inventory by a broad understanding of world demand and supply. To set forth graphically and to describe concisely the basic facts concerning both the present and the future sources of the useful minerals is the purpose of a World Atlas of Commercial Geology just