

NOTES.

AUDIBILITY OF THE SPORE DISCHARGE IN *OTIDEA LEPORINA*.

On the visit of the Cryptogamic Society of Scotland to Perth, in September 1920, *Otidea leporina* was found in abundance, and I brought away half-a-dozen mature specimens to Glasgow. They were packed in a box, each one wrapped in paper, and they remained there twenty-four hours.

On opening the box the specimens were placed on the table, and I attended to something else. While thus engaged I heard every now and then a slight hissing sound, but, being busy, paid no attention to it, till looking by chance at the table I saw one of the *Otidea* puff, and immediately heard a hiss. The hiss was quite distinct, and required no effort to hear it, although I was fully six feet from the plants. Mr Stone's experience as recorded in the Transactions, vol. VI, p. 294, occurred to me, and placing my six specimens in a row I sat for some time watching my miniature field battery at work. First one fired (puffed), followed by the report (hiss), then another carried on, the others following in their turn at intervals of not more than two or three minutes. I noticed as the time passed that the intervals between the puffs increased in length.

What surprised me was the frequency with which they puffed, but as I was preparing for a journey to the south of England I had to put the specimens away without having noted the length of the intervals between the puffs, the length of time they retained the power of puffing, or the extreme distance at which the hiss could be heard. These points, however, will form material for future investigation.

R. B. JOHNSTONE.

CALIFORNIAN BEES.

During the past two years queries have been repeatedly received concerning the identity of what has been variously called "Californian Bees," "Palestine (or Jerusalem) Bees," "Macedonian (or Salonika) Bees," "Mesopotamian Bees," "Belgian Bees," "Egyptian Bees," "Wine Bees," "Water Bees," "Balm of Gilead," etc. This consists of solid, white, semi-translucent lumps usually about the size of peas and looks somewhat like pieces of soaked sago or tapioca. It is cultivated in sugar solution to which syrup is sometimes added and gives rise by fermentation to what is often called "Bee wine." The lumps move in the solution, the

buoyant dancing being due to the copious evolution of gas bubbles from their surfaces. It is probably this movement that has led to their being called "Bees."

The organism is the well-known Ginger-beer plant which was investigated by the late Professor Marshall Ward*. As the lumps move they shed yeast cells all round which increase and form a deposit at the bottom of the containing vessel: the liquid becomes viscous with slimy masses in it. Ward found that two organisms constitute the ginger-beer plant proper—a yeast, *Saccharomyces pyriformis* and a bacterium, *Bacterium vermiforme*: both are necessary for its formation and peculiar action. Other organisms can be grown out of both the lumps and the liquid but these are merely accessory or foreign organisms such as one would expect to find in a sugar solution exposed to the air. Ward reconstituted the ginger-beer plant by bringing together pure cultures of the yeast and the bacterium and showed that the specimens so produced acted like the original material. He regarded the relation between the two species as one of symbiosis. "The Schizomycete is favoured by obtaining some substance or substances directly they leave the sphere of metabolic activity of the yeast-cells; it can benefit by the presence of these substances even apart from the living yeast, though to a less extent.

The yeast, on the other hand, benefits by these substances being removed and destroyed, hence its renewed and continued activity—as evinced by the steady and copious evolution of carbon dioxide for weeks, and the corresponding increase of the yeast-cells by budding—when the symbiosis is established."

The origin of the plant is unknown. Ward obtained a certain amount of evidence showing that "the yeast (*Saccharomyces pyriformis*) is introduced from the grocers' shops attached to the ginger and brown sugar employed in ordinary practice, while the bacterium (*B. vermiforme*) is introduced with the ginger." That there was an "epidemic" similar to the present one about forty years ago is seen from the following note (*Gardeners' Chron.* XXI (1884), p. 542), by the late Mr Worthington G. Smith.

"The Editor of the *Gardeners' Chronicle* has several times been requisitioned by correspondents (mostly anonymous) for a scientific description of the 'Ginger Beer Plant.' The correspondents want to know its botanical name and native country. The writer of this note has also been tormented weekly, almost daily, on the same subject for two or three years. Every one has been asking 'him for the 'regular Latin or Greek name' of the 'Ginger Beer Plant.'

* The Ginger-Beer Plant, and the Organisms composing it: a Contribution to the Study of Fermentation-Yeasts and Bacteria. Phil. Trans. Roy. Soc. ser. B. CLXXXIII, pp. 125-197 (1893).

“Benevolent old ladies, clergymen and officers of the Blue Ribbon Army have called upon him, or written for a scientific explanation, hoping to make the ‘Ginger Beer Plant’ a boon for the poor. One person wished to feed paupers with it; another hoped by its means to knock all the publicans on the head; a third to send it in barrels for the army in the Soudan. When such persons have been told it is merely a form of German yeast they have turned away disappointed and disgusted. Something more must evidently be done for this rum shrub, of which I have recently had applications for slips, rooted cuttings, and seeds.... As all the correspondents insist on this ‘American plant’ being a new species I propose to humour them by calling it *Zingibeero-phora spumacephala*.”

Prof. Bayley Balfour exhibited the Ginger-beer plant at the Linnean Society in 1887. His statement—“it is said the Ginger-beer Plant was introduced into Britain by soldiers from the Crimea, in 1855”—is very interesting in connection with the modern names all excepting California being associated with our overseas armies, and many of the individual specimens having a story of a soldier connected with them in some way. From W. G. Smith’s note quoted above it is apparent that the plant has been known in America for a number of years. It may be that it has commercial possibilities in that country on account of its fermentative properties. One interesting point is that in no case that has come to my notice has the ginger been added to the solution as in former days.

The method usually employed by English villagers for the making of ginger-beer is as follows*: “They make a solution of sugar corresponding roughly to a 10–20 per cent. solution in tap water, in a large open vessel, a little cream of tartar and a few pieces of ginger are then added; some add lemon as well. The pieces of Ginger-beer plant are then placed in the mixture, and the whole allowed to stand for a day or two. Then the liquor is poured off into bottles and corked, and is drunk after two or three days more. Meanwhile more sugar solution is exposed in the original vessel containing the deposit, or ‘lees,’ and allowed to stand and bottled off as before.”

J. RAMSBOTTOM.

* H. M. Ward, *Loc. cit.* p. 129.