

they would fall easy victims to enemies much weaker and slower than themselves.

On the other hand, we learn from Dufour that the species found in Algeria are exempt from the attacks of the Mason wasps, which, as is well known, in that and in all countries fearlessly attack and destroy numbers of the largest spiders, and could, without difficulty, catch the fleetest *Solpuga* in the world. The reason for this freedom from persecution is not quite clear, unless it is to be explained by the fact that the *Solpuga* is too formidable a foe for the wasp to tackle. That this may well be the case is rendered intelligible by the reflection that the large lycosiform and mygaloid spiders fall easy victims because, owing to feebleness of vision and lack of activity, they are not quick enough to elude the final swoop of the wasp. The *Solpugas*, on the other hand, as compared with the spiders, are exceedingly agile and keen-sighted. Moreover, when on the defence, they have a habit, as described by Dr. Walter, of turning up the abdomen, so as to protect that vulnerable part, and extending the legs forwards and upwards in such a way as to present to the foe a pair of gaping jaws surmounted by five pairs of strong limbs armed with long bristles, stout spines and sharp claws. Small wonder if under the circumstances the wasps think discretion the better part of valour.

The last peculiarity to be mentioned is the presence on the inner surface of the jaws of some strong horny ridges, which by mutual friction emit a harsh grating noise. In some genera these ridges are scarcely at all developed: in others they are very pronounced. That the sound is produced in the way described under the stimulus of sudden fear or irritation was long ago pointed out by Hutton, and even before him by Pallas; and, touching its function, one can only suppose that, like analogous organs found in the rattlesnake and in some of the largest spiders and scorpions, it acts as an advertisement of the whereabouts of the *Solpuga*, and as a warning to enemies to keep a respectful distance.

R. I. Pocock.

#### THE LABOULBENIACEÆ: A NEW FIELD OF STUDY AMONG FUNGI.

THE knowledge of most botanists of the group of Fungi here under treatment is probably confined to the brief description given of them by De Bary, under the head of "Doubtful Ascomycetes," where Peyritsch's figures of *Stigmatomyces Baeri* are reproduced.

Since 1884, when De Bary's "Fungi" appeared, the investigation of the group has, however, proceeded apace; and whereas at that time hardly more than a dozen species had been distinguished, Dr. Thaxter considers that no fewer than 150 species belonging to 30 genera are now known. Almost all of these additions are due to Dr. Thaxter's investigations, and have already been announced, from time to time, in a series of papers emanating from the Cryptogamic Laboratory of Harvard University.

The first to observe one of these Fungi was probably the entomologist Laboulbène, in whose honour *Laboulbenia rougetii* was named by Montagne and C. Robin. The earliest description came from Robin in the "Histoire Naturelle des Végétaux Parasites" in 1853. H. Karsten (1869) and Peyritsch (1871-75) followed with a more detailed treatment of the morphological characters of the group, and still later Berlese, Giard, Istvanffi, and Thaxter, have in turn added to our knowledge of the family.

The Laboulbeniaceæ are, without exception, entomogenous, and occur upon species of beetles and flies almost exclusively. They are attached to the chitin of the insect by only a minute foot, by means of which, however, they absorb all the nutriment they require for their development. Upon examination with a hand-lens, they have the appearance of hairs or bristles of a dark colour, standing out vertically from the substratum. As they seldom exceed half a millimetre in length, it is not surprising that they easily escape the notice of entomologist and mycologist alike.

Their morphological characters present features of unusual interest, inasmuch as they seem to exhibit a marked sexuality, and that of a peculiar type. The male cells are non-motile spermatia, arising for the most part endogenously, but in

certain genera abstracted exogenously, as in the case of the Floridææ. These spermatia become attached to trichogynes, whose cell-wall appears to have the same gelatinous consistence as have those of the Floridææ. In some genera, these trichogynes become branched and multicellular; in a few cases they bend over to come into contact with spermatia *in situ*, and then straighten again, carrying off a detached spermatium. Bearing the trichogyne is a "trichophore," itself resting on a "carpogenous" cell. From this latter there are ultimately budded off four or eight asci, each containing, when mature, four or eight usually septate ascospores, the whole being enclosed in a fusiform fructification, recalling the perithecium of a Pyrenomycete. It seems impossible to resist the impression that the asci arise as the result of an act of fertilisation, though the details of the process have not been observed. That the Laboulbeniaceæ are to be included among Ascomycetes can no longer be doubtful, and their morphology, when considered in connection with the observations of De Bary, Janczewski, Stahl, and more recently Harper, lend support to the view that sexuality persists in this class of Fungi. It is difficult to imagine how otherwise Brefeld can account for the structure of Laboulbeniaceæ, when his researches have extended thus far.

The similarity in the method of fertilisation with that existing in Floridææ is very marked. For the occurrence of a receptive trichogyne and detached non-motile spermatia among Fungi, Stahl's observations had already prepared us, though it has been denied that the structures called by these names in Collemaceæ, have the sexual significance they have been shown to have in Floridææ. The analogy of the similar organs in Laboulbeniaceæ with those of Floridææ would seem to be beyond doubt. A further startling analogy with Floridææ is found in the occurrence of a single conspicuous pit in the walls separating successive cells of the hyphæ; and, as in Floridææ, these have already been utilised in tracing the genetic connection of the cells of the thallus. Although Thaxter, on account of these similarities, does not regard the derivation of Laboulbeniaceæ from Floridææ, as unworthy of consideration, it is improbable that they indicate anything more than similarities of adaptation, which often occur in widely separated groups.

Of the 250 different species of insects on which these Fungi have been found parasitic, 241 are Coleoptera, and of these the majority are aquatic or riparian in habit. Of the 7 dipterous host-species one is the common house-fly, which is frequently infested with *Stigmatomyces Baeri* in the neighbourhood of Vienna. The single termite affected came from Africa, and the single acarid from Paraguay. Though most of the Laboulbeniaceæ yet described are exclusively North American, 19 European species are known, and some accompany their hosts into two or three continents. It is probable that the family will be found to be numerous in species, and widely distributed in range. No British locality for a single species is given in Dr. Thaxter's work, and no British writer seems to have yet made any contribution to the literature of the group. In Dr. Cooke's "Vegetable Wasps and Plant Worms," published in 1892, the species then described by Thaxter and others are enumerated, but no discovery of any of these in Britain seems to have been known to the author. It is highly improbable, however, that none of the parasites occur on any of the more than 3000 British species of Coleoptera.

Though these plants do not at present appear likely to become of any economic importance, yet it is clear that they are of exceptional morphological and physiological interest; and Prof. Thaxter has earned our gratitude for the persistence with which he has pursued their study, and for the ability and skill with which he has described and portrayed them. The work forms a worthy successor to the author's monograph on "The Entomophthoræ of the United States."

R. W. P.

#### THE BOLOMETER.<sup>1</sup>

IN the number of the *American Journal of Science* for March 1881, there appeared an article descriptive of the actinic balance (since called the Bolometer), an instrument which has gained acceptance among physicists as a useful aid in the study of radiant heat. It was, it may be remembered, originally devised by the writer to discriminate the heat in any small portion of the grating spectrum, but it has since found wider applications.

<sup>1</sup> Reprinted from the *American Journal of Science*, April. (Communicated by the Author.)

<sup>1</sup> "Contributions toward a Monograph of the Laboulbeniaceæ." By Roland Thaxter. (*Memoirs of the American Academy of Arts and Sciences*, vol. xii. No. 3, December 1896. Pp. 242, pls. 26.)