

and are free to follow the bent of this or that special study. In the long run, their united work is immensely profitable. Here is commercial rivalry, and more; here is a better understanding of the right conditions of "applied science."

Lord Cromer, president of the society, took as a signal instance of the necessity for experiments on animals the recent discovery of a serum treatment in cases of epidemic cerebro-spinal meningitis, that ghastly disease which goes by the foolish name of "spotted fever." It is an acute septic inflammation of the membranes of the brain and the spinal cord. By experiments on animals it was proved to be due to special germs of the order of diplococci. Flexner and Jobling, working at the Rockefeller Institute, discovered a way of preparing, from immunised horses, a serum containing a direct antidote, and this serum was first used in the spring of 1907. Before that time there was no special treatment of the disease, and the mortality ranged from 68.4 per cent. to 80.5 per cent. The children—it was mostly children—suffered terribly, and died in a few days; and of those who survived many were left, from the intensity of the inflammation, imbecile, paralysed, or blind. By the use of the serum the mortality has been reduced to 36.7 per cent. In Belfast, of 275 cases treated before the use of the serum, 72.3 per cent. died, and of ninety-eight cases treated with the serum 29.6 per cent. died.

The Research Defence Society exists to keep the public informed of such facts as these, and we hope that it will have a long record of such victories over disease.

IS THE ASSOCIATION OF ANTS WITH TREES A TRUE SYMBIOSIS?

THE fact has long been known that some species of ants occur in constant association with certain kinds of trees. Thus members of the dolichoderid genus *Azteca* are often found inhabiting the interior of the stems of *Cecropia peltata*, and among the Pseudomyrmini *P. bicolor* forms its nests within the spines of the "bull's-horn" acacia. The view has been held by many naturalists, amongst others by Fritz Müller and Bates, that in these cases the benefit is mutual, the tree affording both shelter and sustenance to its occupants, and receiving in return protection from the attacks of the formidable leaf-cutting ants of the genus *Atta* and of other enemies. Doubts on this point have been expressed by several authorities, among them by Dr. David Sharp, in whose opinion "there is reason to suppose that a critical view of the subject will not support the idea of the association being of supreme importance to the trees."

A careful investigation of the relations subsisting between the arboreal species of *Azteca* and *Pseudomyrma* and the trees which they inhabit has lately been conducted in Paraguay by Karl Fiebrig, who has published his results, illustrated by numerous photographic reproductions, in the current volume of the *Biologisches Centralblatt*.¹ His conclusions may be summarised as follows:—

Azteca not only makes use of internodal cavities already existing in the stem of *Cecropia peltata*, but excavates fresh spaces or enlarges existing ones at the expense of living tissues of the tree. Fritz Müller described certain pits in the stem of *Cecropia* where the wall is much thinner. These spots, he says, are selected by the female ant for the purpose of gaining access to the interior of the stem. But, according to Fiebrig, the ants effect their entrance into new internodal spaces by perforating the partitions in the stem before they have gnawed through the thin bottoms of the pits; moreover, openings to the exterior are often made irrespective of the situation of the pits, and when the latter are perforated the boring is, in certain cases, effected from within, and not from without. Neither the internodal spaces nor the pits can therefore reasonably be considered as myrmecophilous adaptations. Again, the alleged protection against leaf-cutting ants must often be superfluous, since the *Cecropia*, with its

inmates, is apt to be found in marshy situations where these enemies cannot reach it. Most of the trees in Paraguay are subject to the attacks of the leaf-cutting *Atta*, but, nevertheless, though unprotected by the presence of *Azteca*, they continue to maintain their existence, even if belonging to introduced, and not native, species. *Cecropia* itself is not tenanted by ants until it is some years old. The presence of colonies of *Azteca* does not prevent *Cecropia* from receiving much damage from the attacks of other insect enemies, and Fiebrig is of opinion that the constant loss suffered by the tree from the depredations of *Azteca* itself involves a more serious drain upon its vitality than the occasional raids of the leaf-cutters. Finally, the occupation of *Cecropia* by these ants not only fails to afford protection against enemies other than the leaf-cutters, but even encourages the assaults of such formidable foes as woodpeckers and internally feeding lepidopterous larvæ.

With regard to the association between *Acacia cavana* and *Pseudomyrma fiebrigi*, the author points out that this tree, in common with other species of *Acacia*, is protected against the ground-haunting *Atta* by the fact that it grows only in situations which are constantly liable to inundation. The thorns in which the ants take up their abode have frequently been already hollowed out and furnished with apertures of access by lepidopterous larvæ; moreover, the spaces tenanted by the ants are not confined to the thorns, but extend also to the stem. In neither situation do they occur naturally, but in both they are excavated, as in *Cecropia*, whether by ants or caterpillars, at the expense of the living tissues of the tree.

On these grounds Fiebrig concludes that, at any rate so far as the species observed by him are concerned, the benefits of the association between trees and ants are not mutual, but are enjoyed by the ants alone. There is no doubt that the reasons for his view adduced by Fiebrig are of great weight. At the same time, it cannot be said that these observations are sufficient of themselves to disprove altogether the existence of ant-plant symbiosis.

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UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following is the text of the speech delivered by Prof. Love in presenting Dr. G. E. Hale for the degree of D.Sc., *honoris causa*, at the Encænica on June 24:—

Inter Astronomos qui ea quæ in æthere solem circum-fuso geruntur investigant nemini cedit Georgius Ellery Hale. Qui vir duodeviginti abhinc annos primus omnium fabricatus est instrumentum illud, ad lucis e solis puncto quovis emissæ naturam cognoscendam aptissimum, quo hodie utuntur omnes fere solis observatores. Hoc subsidio fretus potuit flammæ illas excurrentes, quæ solis defectu plerumque cernuntur, sole pleno quasi in pictura exprimere: mox plagas lucidissimo candore fulgentes, quas faculas vocant, eodem modo repræsentare. Idem nuper docuit procellis hunc æthera vexantibus tenuissimas materiæ particulas quasi turbine quodam agitatas vim magneticam miro modo gignere: quæ omnia nemo demonstrare potuit nisi excogitandi peritissimus, in observando patientissimus, in causis cognoscendis sagacissimus. Neque ei satis erat Naturæ arcana reserare, sed Observatoria duo in orbe terræ maxima fere et instructissima condidit atque ornavit: idem Ephemeridem, in qua recentissima de siderum natura ubique reperta pervulgantur, conscribendam curavit. Sodalitium denique maximum instituit quo omnes omnibus ex terris huius militiæ cælestis contubernales congregantur.

ST. ANDREWS.—Dr. William Nicoll, who has for some years carried out important researches on the parasites of birds, fishes, and other forms at the Gatty Marine Laboratory, has just been elected to the Ernest Hart memorial scholarship.

DR. J. C. IRVINE, lecturer on organic chemistry in the University, has been appointed by the University court to the chair of chemistry in St. Andrews, vacant by the resignation of Prof. Purdie.

¹ "*Cecropia peltata* und ihr Verhältnis zu *Azteca Alfari*, zu *Atta* sexdens und anderen Insekten. Ein kritischer Beitrag zur Ameisenpflanzen-Hypothese." By Karl Fiebrig (San Bernardino, Paraguay).