

STRIDULATION IN SOME AFRICAN
SPIDERS.¹

THE spiders which form the subject-matter of this paper, are probably best known by the comprehensive title "Mygale." They are also sometimes called crab-spiders, presumably from the great size to which most of the species attain; sometimes bird-eating spiders, from their alleged propensity for capturing and devouring small birds, a propensity which suggested to Lamarck the generic term *Avicularia*, still in use for one of the South American genera. But during the last fifty years our knowledge of this group has increased by leaps and bounds; the genus has expanded into a family, represented by numbers of genera which are rapidly becoming more and more accurately defined and classified.

Apart from their large size and usually heavy build, these spiders, referred to a family variously termed *Mygalide*, *Theraphoside* and *Aviculariide*, may be recognised from the vast majority of other spiders by possessing two pairs of lungsacs, and by the circumstance that the mandibles or jaws project horizontally forwards; while the fang closes almost longitudinally backwards.

So far as habits are concerned, it may be added that none of the species spread nets for the capture of prey. Most of them live on the ground beneath stones, or in deep burrows which they excavate in the soil, and line with a layer of tough silk to prevent the infall of loose particles of earth or sand. At nightfall the spiders may be seen watching at the entrance of their burrows for passing insects, and during the breeding season the females are to be found at its further extremity mounting guard over their egg-cocoon. Other species again live in trees, and spin a silken domicile either between forked branches or in the hollow trunk, or in large leaves rolled up for the purpose. There is no doubt that their food consists almost wholly of insects of various kinds. Nevertheless cases are on record of the destruction of small reptiles, mammals, and birds by these monstrous spiders.

The discovery of stridulatory organs in the members of this family dates back to the year 1876, when Prof. Wood-Mason came across one in an Assamese species now known as *Musagetes stridulans*. Since that year organs like that which he described have been found, not merely in the solitary species as he and most of his successors appear to have thought would be the case, but in a great number of genera ranging from India to Queensland.

In some of the African *Theraphoside* Mr. Pocock has had the good fortune to discover two stridulating organs, which are not only quite different from each other, but also quite different from those possessed by the genera inhabiting Tropical Asia. One of these organs occurs in the genus *Harpactira*, the common "Mygale" of Cape Colony. It occupies the same position as the analogous organs existing in the Oriental species, being situated between the mandible and the maxilla. The other, on the contrary, found in *Phoneyusa* and its allies, is placed between the maxilla and the basal segment of the first leg.

What is to be said respecting the function of these organs, and what evidence, it may be asked, can be adduced in support of the view that they subserve stridulation? To this question the answer must be that so far as the African species are concerned there is no direct evidence based upon observation of the living animal to show what part they play in the spider's economy. But that their true and probably sole function is the emission of sound, is so strongly supported as to reach practical certainty from what is known of the function of the analogous organ detected by Wood-Mason in the Assamese genus *Musagetes*.

Observations have shown that the function of the instrument in spiders of this genus is to emit sound, so it may be concluded that organs constructed upon the same principle, and occupying the same or similar positions, will in all probability be found to perform the same office; and no further basis need be sought for the belief that the African spiders, *Harpactira* and *Phoneyusa*, and their allies, can stridulate as well as their Oriental relations.

What now is the use to the spider of the sounds that these organs give forth? It has been suggested that, like the call of the cicada and the chirrup of the cricket, they have a sexual significance, and serve to inform one sex of the whereabouts of the other. This belief, however, has no foundation in fact; for,

¹ Abridged from an article by Mr. R. I. Pocock in the *Zoologist*, January 15.

in the first place, there is not a particle of evidence that these spiders possess an auditory sense; and, in the second place, these stridulatory organs are equally well developed in the males and females, and are not, like the sexual stridulating organs known in other groups, confined to the male, or at all events better developed in that sex than in the female. Moreover, they appear in the young at an early age, and become functionally perfected long before the attainment of sexual maturity. So the supposition that they act as a sexual signal may be regarded as unsupported by evidence.

As a matter of fact, the true key to their function is supplied by the behaviour of the living spiders. From observations by Mr. Peal and Mr. E. W. Pickard-Cambridge, it appears that the spiders emit the sound when on their defence and acting under the stimulus of fear or anger, in exactly the same way as the rattlesnake makes use of its rattle. Mr. Pocock points out that the only explanation that has been suggested touching the function of the snake's rattle is that it serves as an advertisement of the whereabouts of the poisonous reptile, so that it may be avoided by enemies which might otherwise inadvertently injure it. Similarly poisonous and noxious insects are decked with warning colours, so that they may be readily recognised and not slain in mistake for harmless or edible species. If this be the true explanation of the so-called warning coloration of the insects in question, and of the whirring noise made by the rattlesnake, there seems to be no reason to doubt that the same significance is to be attached to the stridulation emitted by the peculiar organs recently discovered in the great African spiders.

UNIVERSITY AND EDUCATIONAL
INTELLIGENCE.

OXFORD.—The Professor of Mineralogy has been granted the sum of 50*l.* a year for five years, from January 1, to assist in the purchase of specimens and apparatus for his department.

Sir Archibald Geikie, F.R.S., will deliver the Romanes Lecture at the Sheldonian Theatre on Wednesday, June 1. His subject will be "Types of Scenery, and their Influence on Literature."

The Junior Scientific Club held its first meeting for this term on Wednesday, February 2. Mr. A. W. Brown exhibited and described some life specimens of *Aphrodite* and two specimens of the unsegmented Cestode, *Amphiliina*. Mr. G. W. S. Farmer read a paper on "Training." Mr. A. E. Boycott (Oriol) is President this term.

CAMBRIDGE.—The Special Board for Biology have re-elected Dr. Arthur Willey to the Balfour Studentship for one year. The same Board have nominated Mr. K. R. Menon to occupy the University's table at the Naples Zoological Station.

Mr. W. W. Skeat, District Magistrate of Larut, Perak, has offered to the Ethnological Museum a collection of exceptional interest and scope, illustrative of the fast-disappearing indigenous crafts of Selangor and its neighbourhood.

Dr. G. Elliot Smith, advanced student of St. John's College, has been approved for the Certificate of Research. His original dissertations relate to the origin of the Corpus Callosum and to cerebral anatomy.

Mr. H. E. Durham, M.A., M.B., has been appointed one of the representatives of the University at the Madrid Congress of Hygiene, to be held in April next.

Sir E. Frankland has been appointed an Elector to the chair of Chemistry, Sir W. Turner an Elector to the chair of Anatomy, Prof. D. Oliver to the chair of Botany, Sir A. Geikie to the Woodwardian Professorship, Dr. Hugo Müller to the Jacksonian Professorship, Mr. L. Fletcher to the chair of Mineralogy, Lord Walsingham to the chair of Zoology, Lord Kelvin to the Cavendish Professorship, Sir W. H. White to the chair of Mechanism, Prof. Schäfer to the chair of Physiology, Lord Lister to the chair of Surgery, and Dr. J. F. Payne to the chair of Pathology.

IN the last paragraph of the Speech from the Throne, read at the opening of the new Session of Parliament, on Tuesday, it was announced that measures for the constitution of a teaching University for London, and for dealing in part with the subject of secondary education, would be brought forward "in case the time at your disposal should permit you to proceed with them." As several other measures are in the same case, the outlook is not

very hopeful for either of the educational measures referred to, and unless the Government seriously pushes them forward another Session will pass without the much-needed legislation. The measures are urgently pressing for consideration, and they ought not to be permitted again to lapse, as they have done before.

THE *Lancet* announces that the Senate of Glasgow University have appointed Prof. Michael Foster to be Gifford Lecturer in the Glasgow University for the sessions 1898-99 and 1899-1900, in succession to Prof. Bruce, whose term of office expires with the current session.

THE students of Finsbury Technical College will hold their annual conversazione at the College on February 18. Prof. S. P. Thompson has promised to lecture on "Wireless Telegraphy." Mr. Ives will give an exhibition of colour photography, and glow-lamp making will be demonstrated by Mr. Robertson.

AN illustrated article on technical education in the United States, together with some other statistics relating to the occupations of students who have passed through certain representative American institutions, appears in the January *Record of Technical and Secondary Education*. Among other articles we notice one on technical instruction given to fishermen in Aberdeenshire and Essex.

THE following item of information from the tenth annual report (1897) of the Clerkenwell Public Library, London, is worth recording:—"Scientific works are very largely circulated. Biology, including evolution and methods of scientific research, is a very popular subject, the sixty-eight works which the library contains on this topic having been issued over 2800 times within recent years. In this subject two copies of Darwin's 'Descent of Man' have been issued nearly 200 times, a record which is exceeded only by the most popular novels."

DR. W. B. BENHAM, M.A., New College, Oxford, has been elected to the chair of Biology in the University of Otago, and will leave England at the end of March. Dr. Benham has for the past seven years held the post of "Aldrichian Demonstrator in Comparative Anatomy" at Oxford, and as such has acted as assistant to Prof. Lankester, to whom he was previously assistant in University College, London. For ten years Dr. Benham has been Lecturer in Animal Biology at Bedford College for Women, London; and was appointed Examiner in Zoology in the University of London last year. His original researches are embodied in some thirty papers: these are mainly concerned with the anatomy and classification of the Oligochaete Annelids; he has also contributed the article "Polychaeta" to the Cambridge Natural History, and published an account of the Brain of the Chimpanzee "Sally," the Blood of *Magelina*, the Anatomy of *Phoronis*, &c.

At the annual congress of the South-eastern Union of Scientific Societies, held at Tunbridge Wells last May, Mr. S. Atwood, of New Brompton Natural History Society, drew attention to the difficulty of securing rooms for meetings in some of the smaller towns, even where suitable rooms belonging to Technical Institutes existed, which the Societies would be willing to hire. On the proposition of Mr. Pankhurst, of Brighton, the following resolution was passed unanimously:—"That it be an instruction to the Council of this Union to consider the question of how far buildings erected under or used for the purposes of the Technical Institution Acts may be made available for the use of local scientific societies." Since then the Council have had the matter under consideration, and have communicated with Colonel Holland, of the Kent County Council, who has replied to the effect that the Technical Education Committee have no control over Technical Institutes, and the local authority must be applied to for the permission desired. Colonel Holland adds: "If that authority wishes to help, it can do so without any permission from the Technical Education Committee." It appears, therefore, that no legal obstacle exists to the use of rooms belonging to or used for the purposes of technical instruction when such rooms are not needed for their special objects.

In a paper on the teaching of science in secondary schools, read on January 12, in Birmingham, before the Friends Guild of Teachers, Dr. Bevan Lean deprecated children beginning systematic work in science or entering the laboratory before the age of thirteen or fourteen, and urged that before boys (and girls) were allowed to learn chemistry or physics they should possess at least a sound knowledge of arithmetic. It was emphasised that the teaching of science in schools should not be in any

sense commercial, nor should its aim be the mere awakening of interest or even the gain of knowledge: it was valuable solely as a means of mental culture, because through it could best be stimulated the power of accurately ascertaining facts and drawing correct inferences. It was urged that this educational value could best be obtained through chemistry, because chemistry admitted of quantitative experiment within the time of a short class and of an infinite variety of experiment; and, moreover, it so frequently touched matters and operations that were familiar to children in every-day life. The scientific method of investigating nature must be illustrated, and that necessitated placing the children in the attitude of discoverers, so that they could proceed from the known to the unknown, and not from the simple to the complex. Experience showed, too, that the problems on which great investigators were engaged 100 years ago were suitable for the modern schoolboy. This did not mean that we could build up the whole of our science for ourselves. The time for books and lectures would come, but at school it was far more important that boys and girls should be placed in direct contact with facts in the attitude of inquirers. It was a necessary corollary that the teacher ought to have a knowledge of the history of his science, and that it would be a great advantage if he had himself carried on original research: at the least, he ought to have an inveterate habit of inquiry.

SCIENTIFIC SERIALS.

Bulletin of the American Mathematical Society, January.—On the commutator groups, by Dr. G. A. Miller. This is a collection of eleven theorems, some of which are proved in the present paper. For proofs of the remaining theorems reference is made to the writings of Frobenius and Dedekind. Dr. G. A. Miller has also a paper, read before the Society at its December meeting, entitled "On the limit of transitivity of the multiply transitive substitution groups that do not contain the alternating group." This is a paper which contains three theorems and four lemmas bearing upon results recently given by Jordan and Bochert in *Liouville's Journal* and the *Mathematische Annalen* respectively.—Geometry of some differential expressions in hexaspherical coordinates, by Dr. V. Snyder, read at the Toronto meeting, is an appendix to the author's dissertation "Ueber die linearen Complexe der Lie'schen Kugelgeometrie" (Göttingen, 1895). It gives an outline of differential geometry, and shows the application of it to the quadratic complex. Some results are, among the ∞^3 spheres which touch a given surface, there are ∞^2 which also cut a fixed sphere at a constant angle. These spheres either envelope another surface or are arranged in ∞^1 pencils, touching the surface along the curve of intersection with the sphere, which is then a line of curvature of the given surface (*cf.* Darboux, "Théorie des surfaces," vol. i. p. 257, who does not mention the exceptional case). The locus of the point-sphere in a spherical complex of degree n is a surface of degree $2n$, and contains the circle at infinity as an n -fold line. The surface of singularities of a quadratic spherical complex is a cyclide. The Dupin cyclide is the only surface that can be the complete envelope of a non-reducible special quadratic spherical complex. Numerous references are given to writers on the subject.—Dr. E. O. Lovett gives a useful abstract of some lectures by Sophus Lie, viz. "Vorlesungen über Differentialgleichungen mit bekannten infinitesimalen Transformationen" (edited by Dr. G. Scheffers, Leipzig, 1891).—Dr. Charlotte A. Scott, in a short note, commends a translation of Prof. Klein's "Vorträge über ausgewählte Fragen der Elementargeometrie," by Messrs. W. W. Beman and D. E. Smith.—The "Notes" and "New Publications" give their usual useful information.

Bulletins of the St. Petersburg Society of Naturalists, 1897 (xviii.), Nos. 2 and 3, February and March.—No. 2.—Geological excursion in North Russia, by Amalitzkiy.—Age of clay slates on the Upper Ulba, Altai, by von Petz.—Excursion to Crimea (botany), by Levandoskiy.—On the part played by iron on the motions and the degeneration of cells when they are submitted to the bactericidal action of the immunised serum, by Sakharoff.—On fertilisation in *Fugians regia* and *F. nigra*, by Navashin.

No. 3.—On the relations between the Upper Tertiary in Russia, Rumania, and Austro-Hungary, by Andrusoff.—Journey to East Persia (geo-botany), by Korovyakoff.—All these communications are fully summed up in French or German.