discussed. Occasionally there appears to be a slight looseness in wording, as, for example, where the author states that members of the other orders are "deliberately mimicked" (p. 397). Presumably this is hardly what the author intends. We regret the absence of any note upon the value of birds as checks upon insect life. Members of this class rank as most important agents in controlling injurious insects in the temperate regions, and it would seem as though there should be some discussion of the relations existing between them and insect life, even in a work treating of tropical species. The book is completed by a table of contents and an index. We much prefer the general index to separate indices for plants and insects.

This volume with its large series of illustrations, most of them excellent and some surprisingly accurate, must prove of great service to Indian entomologists and of value to others desiring to make comparisons between faunæ of different regions. It is particularly serviceable to the economic entomologist, since the authors have given most of their attention to applied entomology, and many of the colored plates illustrate insect pests. They are to be congratulated upon having prepared a work which will do much to advance the knowledge of Indian entomology.

E. P. FELT

The Fauna of British India. Dermaptera. By MALCOLM BURR, D.Sc., M.A., F.E.S., F.L.S., F.Z.S. Published under the authority of the Secretary of State for India in Council. London, Taylor & Francis. 1910. 8vo, pp. xviii + 217. One colored and nine plain plates. Numerous figures in the text.

The last volume of "The Fauna of British India" to appear from the press is the monographic work upon the Dermaptera of India, Ceylon, and Burma, from the pen of Dr. Malcolm Burr. It is the first volume of the series which has been published under the supervision of Dr. A. E. Shipley, who upon the death of Lieutenant-Colonel C. T. Bingham, the successor of Dr. Blandford, assumed the editorship of this important series of publications.

The Dermaptera, or earwigs, form a compact and well-defined group of insects, which originally were included by Linnæus among the Coleoptera, by De Geer were raised to the rank of an order, and by many later writers have been treated as a family of the Orthoptera. Dr. Burr treats them as a distinct order, and rejecting the amendments of the name suggested by Agassiz and Burmeister, and the half a dozen substitutes proposed by other writers, employs the name originally applied to the group by De Geer and sanctioned by extensive use.

The species of Dermaptera found in the more temperate regions of the world are not numerous, only two occurring in Great Britain, but in the tropics they are much more abundant, and in the volume before us the author enumerates over one hundred and thirty species.

Comparatively very little has hitherto been written upon this interesting order and the bulk of Dr. Burr's work is, as is pointed out by Dr. Shipley, the result of original investigation.

After a brief preface the author gives us a Systematic List of Species. These fall into five families, containing in all fifty-one genera. There are one hundred and thirty-three species definitely allocated and two *incertæ sedis*. The three largest genera are *Diplatys* Serville, *Forficula* Linnæus and *Labia* Leach, containing, respectively, twelve, eleven and eight species. Many of the genera contain but a single species in the faunal region covered by the work.

The next section of the work is styled the introduction, and presents a full and very satisfactory account of the structure, development, habits, and geographical distribution of the Dermaptera. The bulk of the volume is devoted to a detailed description of the various families, subfamilies, genera, and species. There are three appendices, one giving directions for collecting and preserving Dermaptera, the second containing a list of the authors cited, and the third furnishing a glossary

of terms employed. The plates appear to be carefully drawn and are artistically excellent. A careful examination of the book leaves a delightful impression upon the mind. It is in many respects a model of monographic treatment, and the editor, Dr. A. E. Shipley, is quite right in saying that whereas

> Dr. David Sharp in the Fifth Volume of the "Cambridge Natural History" states: "The classification of the earwigs is still in a rudimentary state." . . . Burr's work will cause the deletion of this sentence if a new edition of Dr. Sharp's volume be called for.

The author of the work intimates that he is engaged in preparing upon the same lines an account of the Dermaptera of the entire world. The appearance of such a work will certainly be welcomed, and the present reviewer hopes that the learned author may be spared in health to complete it at no distant day.

W. J. Holland

Carnegie Museum,
March 15, 1910

SPECIAL ARTICLES

CANAL-RAY EFFECTS IN OPEN AIR DISCHARGE

In a paper recently published[1] the writer has shown that the positive luminescence in a Geissler tube is due to a progressive ionization of the air column, and that this ionization begins at the anode wire. In a long tube like that used by J. J. Thomson, this ionization may extend over a distance of fifteen meters.

Since the publication of the paper, evidence has been secured on photographic plates, showing that a disruptive spark discharge in open air can not be produced, until such ionization, originating at the anode terminal, has reached the negative terminal.

Confirmation of this conclusion may be obtained in the manner now to be described. We have used a large eight-plate influence machine.

Small spark-knobs are so adjusted that a torrent of loud sparks passes between them. Hang midway between the knobs a sheet of copper. It is suspended on long silk threads, its plane being at right angles to the line joining the knobs. The sparks can not now be made to pass. A column of positive luminescence joins a positive terminal and a copper plate, but the cathode half of the gap is dark. A glass rod interposed in the positive luminescence casts a shadow on the side turned away from the anode. The shadow is not bounded by right lines, as is the case in rarefied air, where the mean free path is great. When the rod is held near the copper plate, a shadow is, however, cast on the plate. If the plate is moved to a parallel position near the negative terminal, a torrent of sparks passes through the plate. If moved in the opposite direction, until it makes contact with the positive knob, no sparks will pass in any position of the plate. A negative inflow to the edges and corners of the plate is now taking place, as is shown by brush "discharges," but the ionization effects are dispersed in such a way that the conducting channel or channels through the air do not lead to the negative terminal, and no spark can pass unless the spark gap is made shorter.

We have here a clear explanation of the reason why the spark length is greater, when the positive terminal is a small knob than when it is a large one.

A small windmill was placed in the positive luminescence, with its plane of rotation at right angles to the discharge. The vanes were of thin mica sheet. The diameter from tip to tip of the vanes was 8 cm. The vanes were mounted on a hub of hard rubber having a shaft of vulcanized fiber, and turning on pivots of fiber or glass, mounted in hard rubber. The vanes rotated in a direction which showed that the air was drifting away from the positive terminal. As nearly as could be estimated, the rotation was such as was produced by carrying the mill through still air with a velocity of 1.5 meters per second.

All of the results described are produced when the negative terminal is grounded.

These phenomena show that in all probability an X-ray tube will be much less likely to suffer puncture, if its cathode is grounded.

[1] *Trans. Acad. of Sc. of St. Louis*, Vol. XIX., No. 1.