against which especially the recent investigations of W. Manchot might be cited.

The fine reproduction of 100 plates of beautiful microphotographs of hemoglobin crystals of various species of animals is especially noteworthy.

Leo Loeb

A Monograph of the Culicidæ or Mosquitoes. Volume 5. By Fred V. Theobald. British Museum (Natural History). London. 1910. Pp. xvi + 646. 261 text figures, 6 plates.

The author has assembled in this volume descriptions of many recently erected genera and species, characterized thirteen genera and eighty species as new, supplied keys for the separation of the genera and a very large proportion of the described species and, in addition, gives observations or references to practically all other genera and species. This latter makes the fifth volume practically a systematic index to the preceding four volumes and will greatly facilitate future studies in this group.

The modified classification proposed by Lutz and outlined in volume four has been closely followed. We regret to note that the tables for the recognition of the genera are based largely upon scale structure, a method of separation which has found comparatively slight favor in America, though we can not ignore the author's statement, especially in view of his wide experience with these insects from all parts of the world, that separation in this manner is comparatively easy, as evidenced by the number of correctly named collections received at the British Museum. The monograph, as a whole, is weak from a structural and biological standpoint, and necessarily so in many instances, especially in the case of forms received from distant countries where methods of collection and preservation are far from ideal. The study of the imago must, as a rule, precede biological investigations, and it is therefore not surprising that the immature stages have received comparatively little attention in this work. We sympathize strongly with the author in his declining to recognize genera and species based solely upon larval characters, despite the fact that such procedure is not sanctioned by the International Code of Zoological Nomenclature. It is true that good characters are found in the larvæ of this group, and that in some instances species are more readily separated in the larval than in the adult form. Nevertheless, our classification of the family is based upon the imago, and confusion is bound to result from the employment of a double standard; though technically allowable, it is in this group questionable procedure.

There are important problems in synonymy which should be settled in the near future for the purpose of avoiding confusion if for no other reason. The author declines to accept the broad delimitation of Aedes, recently proposed in this country, and, as a consequence, the nomenclature used by a number of American workers differs widely from that employed in the volume under consideration. Personally, without having made special study of the problems involved, we question the wisdom of attempting to unite under one name such diversified forms. On the other hand, a number of generic names have been allowed to stand as valid in this work which will probably fall as synonyms because of the absence of satisfactory characters. These and similar questions can be settled only by an exhaustive comparative study of the characters presented by the immature stages as well as those of the adult. The key to the solution of many of these problems will be found in the unrivaled collections from all parts of the world, now assembled in the British Museum of Natural History.

The diversity and size of this group is indicated by the eight subfamilies recognized (excluding the Corethridæ), comprising some 146 genera and 899 species, a large majority of these being valid. The world owes Professor Theobald a debt of gratitude for assembling, carefully describing and arranging this immense amount of material, among which are included some of the most dangerous insect enemies of man. Prior to this study, our knowledge of the Culicidæ was

little better than chaotic, many species being unknown or else grouped under a specific name mostly noteworthy because of its comprehensiveness. We think all will agree that Professor Theobald has done a large amount of valuable pioneer work, though we may not adopt all of his taxonomic views. The British Museum is to be congratulated upon having published such an admirable work, of which the volume under consideration forms only a part, consisting of five good-sized volumes, illustrated by a large series of figures, there being over 1,200 text illustrations and 88 magnificent plates, and characterizing practically all the known species in this important family. It is perhaps needless to add that this monograph on the Culicidæ, possibly not even yet completed, must be the major foundation for all subsequent studies in this group and therefore nearly indispensable to the systematist.

E. P. FELT

SPECIAL ARTICLES

NEW PHENOMENA OF ELECTRICAL DISCHARGE

AT a meeting of the Academy of Science of St. Louis on December 5, the writer gave further results of work on electrical discharge. It had been previously shown that oscillations of widely varying frequency, attended by musical tones, could be brought about, by means of small spark gaps of variable length, in the lines leading from the terminals of an influence machine to the main gap across which the discharge is to pass. In a former paper it had been suggested that the striæ in a vacuum tube were in the nature of waves in an organ pipe.

These results suggested the idea of imposing resonance vibrations in a column of air contained in a glass tube, which also contained terminals from the influence machine. The air vibrations were produced by means of a blast of air from a pressure tank, which was directed across the mouth of another tube. It has been found that with very careful adjustments, the electric discharge across a small gap in the glass tube could be affected in a marked way by the impressed sound waves. A luminous discharge was apparently converted into a dark discharge.

The line within the tube containing this gap was in multiple with another line containing an adjustable gap. This system was in the positive side of a circuit which contained a long discharge gap. Placed transversely in this gap was an insulated sheet of copper, which served to prevent disruptive discharges. Attempts are now being made to cause an organ pipe to sound a musical tone by means of periodically varying electrical stresses within the air-column. The response of the air-column is not as marked as when the vibrations are produced in the ordinary way. Some effects have however been secured, and there is every reason to believe that the attempt will meet with success. These results can only be considered as preliminary.

Several friends have suggested that the term drainage column as applied to the positive or luminous end of a discharge, was another name for an ionized mass of air. If we say that air is ionized by X-rays passing through it, this term does not represent the conditions at either terminal of an influence machine.

In a mass of air ionized by X-rays, the average charge of a molecule is the normal charge. Those which have a greater than normal charge mingle with those which have a less than normal charge. Such a mass of air will respond to the demands of an electrometer placed within it, whether its leaves have a greater or a less than normal charge. The supercharged molecules will deliver the excess to those whom they have robbed, or to any others which may be in a like condition. A similar statement may be made concerning the molecules which have less than the normal charge. But such a mass of air is not a drainage column. It is in a condition which promotes the formation of a drainage column, if the terminals of some "source" of electricity like an influence machine are placed within the ionized mass of air. This mass of air is then made a part of the conducting circuit, by the starting of the machine into action. The fact that it behaves differently from the rest of the circuit is incidental to the fact