The key to the families of Diptera is written by an eminent authority in that group and will doubtless prove one of the most valuable parts of the book. Unfortunately some of the smaller families are omitted. The most serious drawback, so far as the present work is concerned, is the fact that the old and complicated Schinerian system of wing venation nomenclature is used, but nowhere explained, the explanatory figures of wings of Diptera, as in the other orders, being lettered by the Comstock-Needham system. The wing of *Blepharocera* is figured, although the Blepharoceridæ are omitted from the keys and the text does not explain that the intricate maze of intersecting lines are not veins, but folds in the wing membrane. They will surely puzzle any one who does not appreciate that fact. "Second boscal" cell (bottom of p. 323) is probably a misprint.

The wings of Hemerobiidæ are not ordinarily opaque, as stated in the table on page 307. Only one family of Trichoptera is recognized, although all authorities to-day would agree in recognizing more. Only one family of Thysanoptera is recognized, despite the fact that modern authorities recognize two suborders and several families.

In the key to families of Hemiptera the first category is "wingless insects with fleshy unjointed beak," its alternative is "winged or wingless insects, with a jointed beak," but under the latter is a subheading which provides for wingless insects with the beak wanting! Further, the beginner would often experience difficulty in recognizing the jointed character of many Coccid beaks.

The Aphidæ are differentiated from Aleyrodidæ and Coccidæ by having "long and slender legs and transparent wings," while the two latter are said to have "legs short, wings usually opaque." It is hardly necessary to mention the many legless Coccidæ, as well as the long-legged forms (*Orthezia,* etc.).

In the table to Coleoptera the majority of families are omitted altogether, and so are very many in the Lepidoptera. In the discussion of the latter order no mention is made of a division into two suborders Jugatæ and Frenatæ, but the *butterflies* and *moths* are said to form two main divisions of the order. The wing of *Hepialus,* however, is figured and the jugum noted in the legend. Such an insufficient statement as "subcosta and radius of hind wing connected by a cross-bar" is noted in the characterization of Sphingidæ.

The work closes with chapters on collecting and preserving insects, which will be of great value to the student.

The book is well printed on good paper and the illustrations, as a rule, come out well; when properly revised, it will make a welcome addition to the rapidly growing list of entomological texts, from which the teacher can choose the one best suited to the needs of his students.

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Dynamic Meteorology and Hydrography. Part I., Statics. By V. BJERKNES and J. W. SANDSTRÖM. Quarto. Pp. 234. Part II., Kinematics. By V. BJERKNES, TH. HESSELBERG and O. DEVIK. Quarto. Pp. 175 (with atlas of 60 charts). Carnegie Institution, 1911.

The object of this treatise is to develop practical methods for the systematic study of the pressure, temperature, humidity, density and velocity of the atmosphere. On account of the difficulty of solving the differential equations of a viscous gas the methods are almost entirely graphical, elaborate tables being given that obviate the necessity of even ordinary integration. In Part I. it is assumed that the conditions of equilibrium are fulfilled along every vertical line. From the records of a balloon sent up with self-registering instruments for pressure, temperature and humidity, it is therefore possible to calculate the pressure and density at different heights. For facility of calculation the authors divide the atmosphere into sheets each about 1,000 meters thick, beginning at sea level, and find the average density and temperature of each sheet. To allow for the humidity and still use Boyle's law, as for dry air, a virtual temperature is used that is derived from the

humidity and the actual temperature. In some cases the authors prefer to use, instead of the sheets, the heights of the surfaces of equal pressure drawn at intervals of one tenth of an atmosphere. Less accurate results can also be found from observations at the earth's surface, assuming average values for the changes as one ascends vertically. By these two methods it is possible to draw level surfaces and vertical sections that show the pressure and density at different parts of the atmosphere. If the equilibrium were exact the surfaces of equal pressure, of equal density and the level surfaces would coincide. The more these surfaces differ from each other the greater the tendency to motion. Similar considerations are discussed for the oceans, but these do not at present appear to have the same importance as the atmosphere. The second part takes up the representation of velocity. From observations of small balloons the horizontal velocity in different localities and at different heights can be found. These results are averaged with respect to height for the sheets of the atmosphere that were used in the first part of the work. The lines of flow can now be drawn for each sheet and also the curves of equal velocity. In some cases the authors use "isogonal" curves, namely, curves of equal direction of velocity. The use of these curves to solve differential equations is credited to Sandström. It appears, however,[1] to be due to Massau, who called them "isoclines." Towards the end of the volume these diagrams are used to deduce the vertical motion of the atmosphere under the assumption that momentum is a solenoidal vector, a downward velocity indicating precipitation. A supplement of 60 excellent maps comprises conical projections of the earth's surface showing the contour lines, in 24 sheets, and examples of the preceding methods applied to actual cases. The middle of Part II. contains an elegant study of two dimensional vector fields and of the graphical treatment of the operations which occurs in the differential equations of hydrodynamics.

[1] See D'Ocagne, "Calcul Graphique."

It is to be hoped that the authors will complete their work by a third part, on the dynamics of the atmosphere, as distinct from the kinematics, including Professor Bjerknes's own work on this part of the subject, and also extend the period of six hours, which is the limit of their prognostications, at present. A fuller treatment of the thermodynamics of the atmosphere would also be desirable.

F. R. Sharpe

The Theory of Experimental Electricity. By W. C. D. Whetham, F.R.S. Second edition. Cambridge, The University Press; New York, G. P. Putnam's Sons. Pp. xi + 340. $2.50 net.

It gives us great pleasure to welcome a new edition of Mr. Whetham's text-book. This work presents the subject of electricity as a living science and is characterized by a wonderful freshness of treatment. It is thoroughly up to date and includes such matters as the thermodynamic theory of electrolytic cells, conduction through gases, radioactivity and the electron theory. Although of necessity brief, the treatment of these subjects is quite accurate. Excellent judgment has been shown in the choice of material and the newer branches of the science are exhibited in their proper relationship to the old. One of the striking features of the book is the combination of simplicity and accuracy in the proofs used in establishing the important principles of the science.

We regret to observe that two blemishes which we noticed in the first edition have not been removed. The treatment on pp. 35 et seq. of the force due to a charged plane as though the charge resided on both sides of the plane is cumbersome if not actually misleading. The proof on page 105, of the mechanical force on a current due to a magnetic field, is fallacious as it stands; although it is made to give the right result. This matter could easily be rectified without changing the method. We also think that it is high time that Franklin's proof that the charge resides in the dielectric were dropped from the text-