

scales of these few species of Coal Measures Amphibia are sufficiently fish-like to be of service in the derivation of the Amphibia from the fishes. One would think that they might be, and it is the intention of the writer to describe and illustrate these structures fully; clearly distinguishing between scales, osseous scutes and ventral scutellæ. These latter may be scale-like, but are always confined to the myomeres of the abdomen, thorax and throat. That some of the ventral scutellæ have a scale-like arrangement is certain, but this arrangement can be accounted for on other grounds. The writer is confident that the ventral scutellæ have an entirely different origin, ontogenetically and phylogenetically, from true scales.

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THE COTTON WORM MOTH IN 1912

AN enormous migratory flight of the cotton worm moth, *Alabama argillacea* Hubn., was recently reported by Dr. A. P. Saunders¹ as occurring at Clinton, N. Y., on October 10, 1912, the moths swarming into town about 3 A.M. He states also that two or three days earlier a large invasion of the moths occurred at London, Ontario.

It is therefore of especial interest to note that another huge swarm, probably of the same wave of migration, appeared at Hanover, N. H., two days later than at Clinton, N. Y., viz., the early morning of October 12, 1912. Windows and doors of business houses that had been brightly illuminated during the night were literally covered in the morning with these handsome brown moths.

The facts, so far as they go, seem to warrant the conclusion, or at least the hypothesis, that a great wave of these insects from the cotton growing Gulf States was moving in a northeasterly direction at the rate of about 80-100 miles per night. This would require an average rate of flight of only 8-10 miles per hour. Continuing on the same course at the same rate the wave would have reached Augusta,

and perhaps Bangor, Me., on October 14, though it is quite possible that the rather heavy rain that fell in New Hampshire on the night of the 12th and 13th may have delayed the flight or changed the direction of its course. Records from that region will be awaited with much interest. Clinton, N. Y., is roughly 300 miles due east of London, Ont., lat. 43° N. Hanover, N. H., is about 160 miles northeast of Clinton, and 43° 42' N. The part of the wave front that passed through London, Ont., presumably passed considerably to the north of Clinton, if the moths were guided at all by the prevailing winds of October 9 in that vicinity, and traveled, as would be expected, in a northeasterly direction over the length of Lake Ontario.

In a case of this kind, in which winged creatures wander far from their native habitat, it is natural to suppose that the wind has played a prominent part in the dispersal, as when an occasional murre is driven inland by the storms of winter. So far as I have been able to learn, however, from a somewhat superficial examination of the records of the weather conditions of the time, I have found no evidence of any notable atmospheric disturbance sufficient to account for this apparently large and extensive migration. In Ontario and the northeastern states the moths would seem to have encountered only moderate southwest winds, followed on the 10th-12th by unsettled weather and variable winds of no great velocity.

It is impossible at present to say whether light, which has such a powerful control over the movements of butterflies and, to a more limited extent, of moths, was or was not an important factor in this case, but it is a matter worth considering.

This migratory wave seems to have passed to the north of Massachusetts, if one may judge from the scanty data at hand, though Professor Fernald² has reported that earlier in the season (Sept. 21-25, 1912) a few of these moths were taken in that state. He mentions a large invasion in 1911, during the last week in September, and another on October 17, 1914,

¹ SCIENCE, January 8, 1915.

² SCIENCE, November 27, 1914.

around Worcester, Mass., and, about the same time, in Pittsfield.

These sporadic and easily traceable migrations of the cotton worm moth, in the opinion of the writer, afford a rare opportunity, with the cooperation of many observers, for a thorough investigation into the causes of insect dispersal. Such an investigation would be likely to bring to light some important facts, of common interest to students of evolution and of economic entomology.

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SCIENTIFIC BOOKS

Sugar Analysis: For Cane-sugar and Beet-sugar Houses, Refineries and Experiment Stations and as a Handbook of Instruction in Schools of Chemical Technology. By FERDINAND G. WIECHMANN, Ph.D. New York, Jno. Wiley & Sons. Third edition. 8vo. Pp. xiii + 307. 7 figs. Cloth, \$3.00.

The author "has endeavored to cast his material in a form in which it would prove most readily available in the several branches of the sugar industry," and has reduced repetition to a minimum. "The methods and means used in the analysis of sugar and in the analysis of materials used in sugar production, have first been fully discussed, and then specific analytical control of cane-sugar manufacture, of beet-sugar manufacture, and of refining, has been taken up for detailed consideration."

The first seven chapters are devoted to Properties of Sucrose; Instruments Used in Sugar Laboratories; Polariscopes and Accessories; Sucrose Determination by Optical Analysis; Sucrose Determination by Chemical Analysis; Sucrose Determination by Optical and Chemical Analysis; and, Constituents of Sugar Other Than Sucrose; the eighth chapter to Materials Used in the Sugar Industry, the ninth, tenth and eleventh chapters, respectively, to Analytical Control in Cane-sugar Manufacture; Analytical Control in Beet-sugar Manufacture; and, Analytical Control in Refineries. In the twelfth chapter, a Résumé of the Work of the International

Commission for Uniform Methods of Sugar Analysis is given. Twenty well-selected sugar tables and the index to the volume occupy the last 70 pages.

The portions dealing with the properties of sucrose, instruments, polariscope and accessories, sucrose determination by optical methods, by chemical methods, by optical and chemical methods, and the constituents of sugar other than sucrose, are clear in definition without being overburdened with detailed description to be found in references cited. In some instances, however, more detailed directions would add value to the volume when being used for instructional purposes. For example, on page 123, in the direction for the determination of woody fiber, no precaution, such as covering the beaker with washed muslin, etc., is directed to prevent loss of portions of fiber in decanting, other than: "The water . . . is decanted carefully, in order to avoid any loss of the weighed sample."

On pages 71 and 178-179, in giving the method of Clerget, the author states that the use of subacetate of lead as a clarifying agent is not permissible, recommending, on page 71, specially prepared blood-carbon, and on pages 178-179 specially prepared bone-black, "if a decolorant must be used."

Some of the methods given in chapter 8, for the analysis of materials used in the sugar industry, could be substituted by more modern and expedient ones. That given on page 146, for the determination of calcium sulphide, could be substituted by the more expedient evolution method used in the steel and iron industry. On page 151, seventh line from the top, in the method for the determination of total phosphoric acid in phosphate paste, the direction, after making alkaline with ammonia and clearing with nitric acid, is: "Add about 10 grams of ammonium nitrate." This is neither necessary nor advisable, when the method of solution is that recommended at the top of the same page, viz., by nitric and hydrochloric acids. The rest of the method, as outlined on this page, could be substituted by that of the Association of Official Agricultural Chemists as given in Bulletin 107, Bureau of Chemistry. On page 153,