the methods for designing and constructing sewers for each are presented in full detail. The combined system carries both the house sewage and the storm water, while the separate system carries only the former, with a small additional amount of water for flushing. The first system may be the more advantageous when the conditions require an underground system of conduits to dispose of the flood water, and the second may be better when the storm water can be easily carried away through the street gutters. In general, the separate system has been found lower in cost than the combined one for small towns, and hence its extensive use during recent years.

The author's treatment of methods of flushing and cleaning sewers is full and thorough. With respect to ventilation he concludes that chimneys, fans and other devices have been unsuccessful and that no method better than allowing free egress and ingress of air through manholes, street basins and house-roof pipes, has yet been found. Analyses of sewer air have failed to show greater impurity than that in the air of a crowded city street, whether carbon dioxide or number of bacteria be taken as the basis of comparison, and hence no objection except that due to sentiment can be made to this method of ventilation. The methods of cleaning street basins and sewers and of removing obstructions are explained at length; for the small pipe sewers wooden balls called 'pills' are run through with the current, each successive one being greater in size than the preceding; for those larger than one foot in diameter a cylindrical carriage traveling on wheels is employed. The annual cost of cleaning such pipe sewers is said to range from $4 to $15 per mile.

The book is carefully written, well illustrated, and contains many tables for facilitating computations. It is the only American work which deals in detail with the construction of the sewers of both the combined and separate systems. This is the correct plan of treatment, for there is no inherent reason why one is preferable to the other, and the engineer, in each particular case, must determine from the local conditions the most economic and efficient system.

M. M.

Cuba and Porto Rico, with the other Islands of the West Indies: Their Topography, Climate, Flora, Products, Industries, Cities, People, Political Conditions, etc. By ROBERT T. HILL, of the United States Geological Survey. New York, The Century Company. 1898. 8vo. Pp. xxviii + 429. 2 maps. 79 plates.

Although popular in treatment, this book contains much information of value to specialists in geology and anthropology. Based primarily on personal observation during several extended journeys through the West Indies, it is enriched by large acquaintance with the literature of the West Indies covering the centuries since the discovery of the New World and the planting of the first European colony on the Island of Martinique. In his first chapter ('The Geographic Relations of the West Indies') the author emphasizes his own generalization as to the genetic independence of the three great regions of the western hemisphere, North America, Central America with its Antillean extension, and South America; in the next three chapters ('The West Indian Waters,' 'The Classification of the West Indian Islands,' and 'The Great Antilles') the subject is expanded and illustrated by details; while the thirty-sixth chapter ('Geological Features of the West Indies') is the most convenient summary extant of the geologic history, structure and mineral resources of this half-submerged portion of the mid-American continent. Additional facts concerning the geology of the islands are scattered through many of the chapters, with significant details concerning the flora, fauna and climate. In the eleventh chapter ('The People of Cuba'), the eighteenth chapter ('The People of Porto Rico'), the twenty-second chapter ('Cities and People of Jamaica') the description of the Republic of Haiti, and the thirty-seventh chapter ('Race Problems in the West Indies'), as well as in other portions of the book, the population is described in a notably appreciative way, the mythology and industries receiving especial attention. Throughout, the volume gives evidence of careful observation and mature thought, as well as a strong grasp of the scientific and social problems of the region; it gives promise of becoming not merely the most

useful current hand-book on the West Indies, but a contribution of permanent value to the literature of that part of the western hemisphere. It is admirably printed, artistically bound, amply illustrated, satisfactorily indexed, and well arranged for reference, as well as for consecutive reading.

W J M.

The Birds of Indiana. By Amos W. Butler. 22d Report of the Department of Geology and Natural Resources of Indiana. 1897. 8vo. Pp. 515–1187. 5 plates and numerous cuts in the text.

Commissions for the preparation of State Natural History Reports so often fall into incompetent hands that all ornithologists, and particularly those students of birds residing in the State of Indiana, may congratulate themselves that a person so well qualified as Mr. Butler was selected to write the work under consideration.

The matter relating to the birds known to occur in Indiana is preceded by sections on the 'Indiana Bird Law,' the physiography of the State (from Dryer's 'Studies in Indiana Geography'), 'Peculiarities affecting Bird Distribution,' 'Changes in Bird-Life,' 'Destruction of Birds,' 'Zoological Areas' and 'Bird Migration.' There is also a bibliography giving some 212 titles.

This is followed by keys to the orders, families, genera and species, and biographies of the 321 species recorded from Indiana, including descriptions of their plumages, general and local ranges, nests, eggs, times and manner of occurrences and habits. The report, in fact, is a complete ornithology of Indiana.

Mr. Butler has followed the excellent plan of securing the best available material, for the use of which he makes ample acknowledgment. Thus his keys are taken from Ridgway's and Jordan's 'Manuals,' his illustrations from the publications of the U. S. Biological Survey and Coues's 'Key,' while the number of local observers quoted assures us that the work contains all existing and desired information and that it will long remain the standard authority on Indiana birds. We trust, therefore, that a sufficiently large edition has been printed to prevent its early classification with other State lists, which become 'out-of-print' before those who could make the best use of them learn of their existence.

F. M. C.

The Butterfly Book. A Popular Guide to a Knowledge of the Butterflies of North America. By W. J. Holland. New York, Doubleday & McClure Co. 1898. Imp. 8vo. Pp. xx + 382. 48 colored plates. 183 figures in the text. Price, $3.00.

As the secondary title indicates, this work was prepared to meet a popular need. The preface says: "It is essentially popular in its character. Those who seek a more technical treatment must resort to the writings of others." Nevertheless, it will 'have utility also for the scientific student,' since 'the successful development in recent months of the process of reproducing in colors photographic representations of objects has been, to a certain degree, the argument for the publication' of the work. The forty-eight plates have been reproduced by the new process known popularly as 'three-color printing,' and this is its first application so far as we know—certainly on such a scale—to butterflies. It is, however, an unquestionable and surprising success, destined—if the extraordinarily low price at which the book is sold be any guide—to come into very general use. The representation of the colors as well as of the pattern outstrips all that can be done by chromolithography, and has the added value of an accuracy unattainable except at the high cost of the very best workmanship. As the photographic method employed requires the use of a screen, as in so-called 'half-tone' work, there is a certain loss of vividness, but it appears to be even less than is ordinarily the case with half-tones from a photographic print. This may be seen by an examination of the five plates of caterpillars and chrysalids copied from my 'Butterflies of the Eastern United States,' where direct comparison is available. There are, it is true, a few, but very few, unaccountable and generally very slight changes in tint (as in Pl. 2, Fig. 20; Pl. 3, Fig. 18, and Pl. 5, Fig. 3), and occasionally a blurring, or at least a loss of sharpness, due to imperfect registering, but such mishaps would