every drop of water is needed for general irrigation. In sections of our country not adapted to farming and where land is scarce, the purification of sewage by intermittent filtration, which requires only about one twentieth the land, has been resorted to, and we are indebted to the splendid experiments made by the Massachusetts State Board of Health, at Lawrence, for much valuable information concerning the efficiency of this system, and which indeed has been adopted by a large number of municipalities both at home and abroad. In communities where land is so scarce that even intermittent filtration is impracticable, a number of processes for the purification of sewage before its discharge into the rivers have been proposed, such as chemical precipitation, sterilization, sedimentation, etc. These processes, however, are now considered as wrong in principle and aiming at the unattainable, and wherever irrigation or intermittent filtration cannot be advantageously carried out, preference should be given to the 'septic or bacterial tank.' This system was devised by Mr. Cameron, of Exeter, England, and is really an elaboration of the old cesspool; the tanks are built of concrete, brick or masonry walls, tightly covered to exclude both light and air, and large enough to contain the flow of sewage from 1,500 to 2,000 persons for from twelve to twenty-four hours. The raw sewage without screening or any preliminary treatment enters by two inlets which are carried down five feet below the surface in order that the entry may be quiet, so as not to disturb the bacterial layers, also that air may not be carried in or any gases escape back to the sewer. After passing through a 'grit chamber' 10 feet deep by 7 feet long and 18 feet wide, the sewage flows over a wall submerged one foot below the surface into the main portion of the tank, which is 65 feet in length, 7 feet 6 inches in depth and 18 feet wide, its capacity being 53,800 gallons, or approximately a day's supply; hence the transit of the sewage is ordinarily very gradual, averaging about 24 hours in the tank, so as to give ample time and quiet for the putrefactive changes which are brought about by the anaerobic bacteria, and which result in the digestion of the suspended organic matter, or its conversion into simpler, soluble forms and gases. The effluent from the tank, brownish-yellow in color and offensive in odor, after being aerated by being run over a weir and cascade arrangement, is next passed over the 'Dibdin bacteria beds' filled with coke breeze and clinkers, where the nitrifying organisms perform their share of the work, until the filtrate is fit to be discharged into the water courses, although whenever practicable it should be previously passed through well-drained land or over water meadows.

The advantage of the tank lies in the reduction in the amount of suspended matter; the accumulation of sludge from the sewage and excreta of 1,500 persons amounted to but four feet at the end of three years' trial; the operating expenses are also very slight and so far the bacterial or septic tank has given the most satisfactory results from a sanitary and economic standpoint, where broad irrigation or sewage farming cannot be applied. Chapter 12 deals with the agricultural value of bacterial effluents and conservation of the valuable constituents of sewage, the classification of trade effluents and the recovery of waste products.

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SCIENTIFIC JOURNALS AND ARTICLES.

THE third (July) number of Volume 3 of the *Transactions of the American Mathematical Society* contains the following papers: 'On the Group defined for any given Field by the Multiplication Table of any given Finite Group,' by L. E. Dickson; "Nachtrag zum Artikel: 'Zur Erklärung der Bogenlänge, u. s. w.,'" by O. Stolz; 'Proof of the Sufficiency of Jacobi's Condition for a Permanent Sign of the Second Variation in the so-called Isoperimetric Problems,' by O. Bolza; 'On Hypercomplex Number Systems,' by H. E. Hawkes; 'On Metabelian Groups,' by W. B. Fite; 'Conjugate Rectilinear Congruences,' by L. P. Eisenhart; 'Constructive Theory of the Unicursal Cubic by Synthetic Methods,' by D. N. Lehmer; 'The Groups of Steiner in Problems of Contact (second paper),' by L. E. Dickson.

The editorial staff of the *Transactions* has been increased by the appointment as assistant editors of Professor James Harkness, Professor E. B. Van Vleck, Professor H. S. White, Dr. C. L. Bouton, Professor L. E. Dickson, Dr. J. I. Hutchinson, and Professor M. B. Porter.

The July number (Vol. 8, No. 10) of the *Bulletin of the American Mathematical Society* contains: 'The First Meeting of the San Francisco Section of the American Mathematical Society,' by E. J. Wilczynski; 'Mathematical Problems, Lecture by D. Hilbert before the Paris Congress of Mathematicians, 1900,' translated by M. W. Newson; 'Reply to Mr. J. L. Coolidge's Review of Hill's Euclid,' by M. J. M. Hill; 'Notes'; 'New Publications'; 'Eleventh Annual List of Papers read before the Society and Subsequently Published'; and a nineteen-page Index of the volume.

The Botanical Gazette for August contains the following articles: J. C. Arthur describes the Uredinæ occurring upon *Phragmites, Spartina* and *Arundinaria* in America, giving full synonymy and specimens examined, describing two new species, and presenting a key; Aven Nelson continues his 'Contributions from the Rocky Mountain Herbarium,' describing numerous new species; George F. Atkinson describes and illustrates three new genera of the higher fungi, the names proposed being *Eomycenella, Eoterfezia* and *Dictybole. Eoterfezia* is taken as representing a new family, which is named Eoterfeziaceæ. Edward W. Berry presents a paper 'On the Phylogeny of *Liriodendron*,' tracing the development of the type through fossil forms to the present *L. Tulipifera.* Mel. T. Cook reports polyembryony in *Ginkgo;* Hermann von Schrenk describes a root rot of apple trees, and E. M. Wilcox shows that *Stipa Hassei* is not a good species.

The Popular Science Monthly for August has for its article Charles S. Minot's address before the American Association on 'The Problem of Consciousness in its Biological Aspects.' Consciousness is considered as the most important factor in the evolution of animals, without which the author thinks evolution could not have taken place as it has done. The following hypothesis is advanced near the close of the paper: Consciousness has the power to change the form of energy, and is neither a form of energy nor a state of protoplasm. William H. Burr concludes his paper on 'The Panama Route for a Ship Canal,' this seeming to be preferable to the Nicaragua route in the more important particulars. Edward Atkinson considers 'Social Bacteria and Economic Microbes, Wholesome and Noxious,' this being a review of the money expended or received for the leading staple products of our country. Edward L. Thorndike discusses 'Marriage among Eminent Men,' concluding that they marry at about the same age and in the same proportion as other men, and David Starr Jordan treats of the problem of 'University Building.' Two of the most important desiderata are shown to be sufficiently long course of training and the conducting of original research in the best sense of the word. Minnie Marie Enteman in a paper 'On the Behavior of the Social Wasps' presents a good study of the psychology of these insects. 'Field Notes of a Geologist in Martinique and St. Vincent,' by Thomas A. Jaggar, gives one of the best accounts of the recent eruptions, and what actually did take place, that has been published. The final article, by Frederick Adams Woods, on 'Mental and Moral Heredity in Royalty,' is an inquiry into the problem which is the more important, environment or heredity, or is there still another factor to be taken into consideration?

The American Naturalist for August, opens with an article by Freeland Howe, Jr., on 'A Case of Abnormality in Cats' Paws,' being apparently the intercalation of an extra digit. It is refreshing to see that it is not considered as a case of reversion. Helen Dean King describes in some detail 'The Gastrulation of the Egg of *Bufo Lentiginosus,*' and Charles W. Hargitt presents some 'Notes on the Cœlenterate Fauna of Woods Hole,' which includes descriptions of several new species. William A. Hilton has a very careful study of 'The Body Sense Hairs of Lepidopterous Larvæ,' concluding among other things that in most species all body hairs are sensory and supplied by the bipolar cells. Hannah Teresa Rowley notes the 'Histological Changes in

Hydra viridis during Regeneration' stating that it seems probable that the new cells are formed by division of the old cells throughout the entire piece. There are numerous good reviews of recent biological literature.

The Plant World for June contains 'How Shall our Wild Flowers be Preserved?' by A. J. Grout, being the third of the prize essays on that subject; 'The Yellow Water Lily of Florida,' by A. H. Curtiss who notes that this rare species is likely to be extirpated by the water hyacinth; and 'Habits of the Deep-set Bulbs of *Erythronium*' by Grace Stoddard Niles. Among the briefer articles is the report of the Secretary of the Wild Flower Preservation Society. The Supplement on the Families of Flowering Plants concludes the treatment of the order Gentianales and commences that of the Polemoniales.

The Wilson Bulletin for June contains a good article by Lynds Jones on the winter birds of Lorain Co., Ohio, and the same writer notes *Mareca penelope,* taken on the Licking Reservoir in March as 'A Bird New to Ohio.' Besides other articles the number contains a 'List of the Birds of Yokima County, Washington,' by Wm. Leon Dawson.

DISCUSSION AND CORRESPONDENCE.

SO-CALLED SPECIES AND SUBSPECIES.*

PERHAPS no discussions in zoology are as uninteresting and apparently profitless, to persons not engaged directly in them, as are those concerning the status of so-called species and subspecies. But a discussion may be uninteresting and apparently unprofitable, and still involve questions of great import, and these two ornithological papers which have just appeared from the Government press, cannot fail to raise serious questions in the mind of the average reader. Both papers deal with diversities of size and color in some of our common birds, and ten new trinomial names are added to our already overburdened nomenclature. For what do these names stand? Do they represent anything real and tangible? Is the phase of systematic ornithology exploited by these authors contributing anything of value to science, or is it simply making 'confusion worse confounded'?

Mr. Oberholser's pamphlet represents a very large amount of painstaking work, as 2,150 specimens of horned larks were carefully examined and compared in the attempt to make as complete and satisfactory a revision of the genus *Otocoris* as possible. The results are worth examination, but not so much for their intrinsic value, as for the revelation to an unusual degree of a zoological tendency, characteristic of the present day, and especially marked among ornithologists, the worth of which demands careful estimation. The author divides the horned larks into six species, although he admits that possibly two of these may be reduced to subspecific rank, ultimately. Of these six species, one well-marked form, of which little is known, comes from South Africa, while the others are confined to the northern hemisphere. Only one of the five species occurs in North America, but as 2,122 of the specimens examined represented that species, it will not be unfair to confine our attention to it, *Otocoris alpestris.* Although originally described by Catesby from the coast of the Carolinas, it is found not only throughout North America (except the extreme southeast) and southward into Colombia, but also in northern Europe and Asia. It therefore inhabits a wide range of greatly diversified country, and would naturally be expected to exhibit considerable variety in color and size. The important question which this monograph raises is how far is it desirable to recognize these varieties by name? Or better, are the diversities of size and color in a specified geographical area, sufficiently constant to warrant recognition as subspecies?

* 'A Review of the Larks of the Genus *Otocoris.*' By Harry C. Oberholser, Assistant Ornithologist, Department of Agriculture. From the Proceedings of the United States National Museum, Vol. XXIV., pp. 801–884 (with Plates XLIII.–XLIX.) [No. 1271]. Washington, Government Printing Office. 1902.

'Descriptions of Three New Birds from the Southern United States.' By Edgar A. Mearns, Major and Surgeon, U. S. Army. From the Proceedings of the United States National Museum, Vol. XXIV., pp. 915–926 [No. 1274]. Washington, Government Printing Office. 1902.