The elements of the theory of surfaces are introduced in the eighth chapter and applied to ruled surfaces and envelopes. The theory of curvature is elaborated in detail, including the notions of mean curvature due to Germain, total curvature conceived by Gauss, and quadratic curvature of Casorati. The chapter concludes with the determination and properties of the remarkable lines of a surface.

The ninth chapter begins the study of the inverse problems by presenting the fundamental concepts and rules of simple and multiple integration. The tenth chapter evaluates the well-known forms of rational, irrational and transcendental indefinite integrals, and terminates with certain classes of definite integrals, including elliptic and eulerian integrals; the nature of the xample is indicated by the following, which occurs in the study of vortices:

$$\frac{ab}{2\pi}\int^{2\pi}\frac{\cos\theta d\theta}{\sqrt{a^2+b^2+c^2-2ab\cos\theta}}.$$

After making the ordinary applications to mensuration in the eleventh chapter, the author undertakes the elements of the theory of differential equations in the twelfth chapter. The distinctions between the notions general, particular, and singular integral are clearly made. The cases of integrable ordinary differential equations are classified as follows: 1° variables separable; 2° functions homogeneous; 3° one variable absent; 4° second order equation lacking one variable always reducible to one of first order; 5° linear equation; 6° Bernouilli's equation; 7° Clairaut's equation; 8° the form $y = x\phi(y') + \psi(y')$, when not a Clairaut equation is reducible to a linear equation; 9° Riccati's equation and its characteristic property that the anharmonic ratio of any four particular integrals is constant. No reference is made to Lie's theories. A well selected list of resolved problems is followed by geometrical applications of differential equations to plane curves, trajectories and surfaces. The general linear equation and equations with constant coefficients are studied somewhat *in extenso*. Passing then to equations in more than two variables, the author takes up total differential equations and simultaneous ordinary equations and terminates the chapter with a short treatment of the partial differential equation.

The last chapter of the book gives the elementary notions of the calculus of variations in six pages. The volume concludes with notes on the concept of limit, oscillatory extremes, demonstration of Cantor's theorem, Hadamard's theorem, minima and maxima of functions, cusps and flexions at a pole, torsion of curves, calculation of the curvature of a surface, formulæ of Rodrigues, general formula of Stirling.

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Pflanzen- und Tierverbreitung, in Hann, Hochstetter und Pokomy, Algemeine Erdkunde. By A. Kirchhoff. Verlag, F. Tempsky, Wien. Aufl. 5. 1899.

This volume, by Alfred Kirchhoff, forms the third part of the new edition of a well-known and compendious manual of pure as distinguished from economic geography. It maintains the high standard of the preceding parts by Hann and by Brückner, and is a welcome addition to the literature of geo-biology. Of the 157 figures, a large proportion are not easily accessible elsewhere or are quite new. The maps, while not emphasizing the developmental phases of faunal and floral distribution as do, for example, those of Engler, are, nevertheless, more nearly in accord with modern ideas than those of Grisebach or Decandolle. The ecological factors are, by no means, neglected, as they were so generally in the older books. While it is true that they are scarcely so exhaustively discussed and laboriously analyzed as in the special treatises of Warming and Schimper, yet they are clearly, ably and adequately presented. Kirchhoff's work, has a certain advantage over the special *Tierlebens* and *Pflanzen-geographies* in its broad outlook upon both the fields of biological science. It falls naturally enough into three divisions, the first including the general discussion of the relations between the earth and the organisms that inhabit it, the second comprising the analysis of floral, and the third that of faunal regions. The peculiar excellence of the treatment is apparent at once in the opening chapters on the migrations of organisms, on the environmental conditions

of plants and animals, on the modifications and hereditary distribution, and particularly, perhaps, in the very admirable fifth chapter of the first part which, under the title of 'elements of plant and animal distribution' gives precisely the catholic and panoramic view of geographical distribution that must be regarded as most desirable. Here are included with much wealth of illustration and judgment as to detail, accounts of the distribution of species, both plant and animal, of genera and of families and orders. Statistics of distribution, physiognomic and climatic groups, plant and animal zones, domesticated plants and animals and colonial aggregates are skilfully compiled and made the basis for useful generalization.

The second chapter, that dealing with floral regions, reminds one upon the whole of the Grisebachian discussion, though somewhat tempered by recent research. It is scarcely abreast, however, of the work of Drude and a list of the *Florenreichen* will show that the tone, on the whole, is analytic rather than synthetic. They are as follows: Northern, Mediterranean, Turanian, East Asian, Indian, tropical African, South African, tropical American, extra tropical South American, Australian, New Zealandian, Polynesian, Oceanic, making in all thirteen principal floral divisions of the earth. The omission of an Antarctic region seems scarcely to be justified. The principal regions of faunal distributions are slightly different and are added here for comparison. They are: North-polar, Northern, Eurasian, Mediterranean, Turanian, Indian, Trans-Saharan, Madagascaran, North American, tropical American, Andian-Argentine, West Indian, Australian, Papuan, New Zealandian, Polynesian and Oceanic, making in all seventeen principal faunal regions. That the divisions for plants and animals correspond so generally is impressively indicated by these classifications. Minor differences, however, exist and indicate the rather stronger climatic influence upon the stationary plants and the relatively stronger influence of insular isolation upon the locomotive animals. Thus Papuan, West Indian and Madagascaran divisions are necessary in the classification of animal groups, but not in that of plant societies. Again, North America, exclusive of the polar regions, becomes a single province for animals, while for plants it is divided into two upon a basis of climate.

A quite insufficient index closes the volume, and it is to be regretted that its stores of useful and sometimes elaborate information are not made more easily accessible.

CONWAY MACMILLAN.

Sewage-Analysis. By J. ALFRED WANKLYN and WILLIAM JOHN COOPER. A practical treatise on the examination of sewage and affluents from sewage. Including also a chapter on Utilization and Purification of Sewage. Philadelphia, J. B. Lippincott Company. 1899. Pp. xvi + 220.

The first eighty-two pages are devoted to analytical processes not essentially different from those published in 'Wanklyn's Water Analysis,' and in view of the fact that polluted water and sewage differ but in degree of pollution, it is reasonable to doubt the necessity of repeating information such as this to those already familiar with water methods.

One must always open with respect a book bearing the name of 'Wanklyn,' but in these days of active and accurate water investigation it would seem that the author of the 'Albuminoid Ammonia Process' has hardly kept in touch with what advances have been made by those who would be glad to be accounted his pupils. Thus the old writing paper packing for the retort neck is yet retained in the treatise under consideration; and a confidence is reposed in the 'goodness' of 'good tap-water' for final rinsing, which many water-analysts know to be misplaced. Much space has been given to criticisms of methods of which the authors do not approve, and the style of such criticism suggests the old acrimonious discussion of some years ago.

It is most unfortunate that the authors should have seen fit to refer to the oxidation of organic compounds through the action of germ life as 'a fashionable fad and delusion of the day'; nor is it seemly to announce that "neither is the burning of the kitchen-fire nor the action of the steam-engine a manifestation of bacterial action."

Such remarks strike the reader as unworthy