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TREE-FLORA OF JAVA.

Mikrographie des Holzes der auf Java vorkommenden Baumarten. By Dr. J. W. Moll and H. H. Janssonius. Erste Lieferung (1906), pp. 368; and Zweite Lieferung (1908), pp. 369-568+160. (Leyden: E. J. Brill.) Price 6 marks each.

THIS work, like the earlier tree-flora of Java, was undertaken at the suggestion of Prof. M. Treub, director of the Botanic Garden at Buitenzorg. It will be convenient to begin by making a short reference to this earlier publication.

In the year 1888 Dr. S. H. Koorders began to collect material for a tree-flora of Java. The work connected with the compilation of this flora was carried out in a most careful and methodical manner. More than four thousand trees, many of which were in the primeval forest, were marked, and a special system of numbering the trees, and of indexes and maps, was instituted, so that each tree could be easily found again, and the rate of growth, leaf fall, &c., could be studied. In the course of naming and studying the plants for the tree-flora of Java ("Flora arborea Javanica," by S. H. Koorders and Th. Valeton), a collection of fifteen thousand specimens was made to illustrate the species dealt with in the flora.

This collection included a series of wood-specimens, which were sent in 1904 from Buitenzorg to the University of Gröningen for microscopic examination and description, and this work has been carried out, under the direction of Prof. J. W. Moll, by Herr H. H. Janssonius. The results appear in the present work, which may therefore be described as a counterpart to Koorders and Valeton's flora in the province of the anatomy of the wood. Hence a most important asset in the value of the work lies in the fact that there is no uncertainty as to the origin of the specimens. They have all been obtained from trees which have been carefully studied and determined by an expert, and, moreover, herbarium material from the same trees is to be found in the herbaria at Buitenzorg, Leyden, Berlin, &c.

In this work the authors have adopted a very orderly arrangement of the information. Under each species there are five principal headings, beneath which are given the literature, information on the material, the preparations made, the reagents used, and, lastly, under the name of micrography, a description of the structure of the wood. The section on micrography is generally subdivided into one on topography, dealing chiefly with the distribution of the tissues and elements as seen in transverse section, and another giving descriptions of the individual elements, based on a study of radial, tangential, and transverse sections, sometimes supplemented by macerated preparations. A separate paragraph is devoted to each kind of element, and gives full details of measurements, pitting, contents, &c. The section on topography is elucidated, in cases where this is advisable, by means of a diagrammatic figure showing the distribution of the vessels, wood-parenchyma, medullary rays, &c., in a

portion of a transverse section. When several species of a genus are found to differ only slightly in the structure of the wood, one of them is fully described, and the description of the others is shortened by comparative treatment. Under each family, except where only one species is dealt with, there is a description of the structure of the wood, founded on that of the different species described, and an analytical key for distinguishing the species, so far as this is possible by means of the wood, is added.

Part i. contains, first (pp. 5-62), general information, including the history of the material and an exposition of the method adopted in presenting the information in the succeeding pages. The remainder of part i. (pp. 63-368) is occupied by the description of the microscopic structure of the wood in species from Dilleniaceæ to Dipterocarpaceæ. Part ii. (pp. 369-547) continues the same from Dipterocarpaceæ to Tiliaceæ, followed by the index and contents of vol. i., after which pp. 1-160 form a first instalment of vol. ii., extending from Geraniaceæ to Meliaceæ. The last page of part ii. reaches species No. 230, twenty-one families having been dealt with up to this point.

The foregoing description of this work will serve to indicate its value, which lies in the authentic nature of the specimens, the large number of species and families dealt with, the completeness of the description of the microscopic structure, and, lastly, the strict uniformity of treatment adhered to by the authors.

This book will be an important aid in the determination of wood-specimens, and the authors are to be congratulated on the efficient way in which they are carrying out a difficult and laborious task.

L. A. B.

TWO AMERICAN MATHEMATICAL BOOKS.

- (1) *Plane and Spherical Trigonometry and Four-place Tables of Logarithms.* By Dr. Wm. A. Granville. Pp. xii+264+38. (London: Ginn and Co., n.d.) Price 5s. 6d.
- (2) *A Course of Mathematics for Students of Engineering and Applied Science.* By Fredk. S. Woods and Fredk. H. Bailey. Vol. II. Pp. xii+410. (London: Ginn and Co., n.d.) Price 10s. 6d.

THE type and diagrams in this book are models of elegance and excellence; evidently no pains have been spared in making both as clear and perfect as possible, and the logarithm tables at the end of the book add greatly to its completeness. One useful feature in them is the table of circular functions with the angles expressed in degrees and decimals of a degree, in addition to the usual table in degrees and minutes. The author also supplies a neat celluloid combined protractor and scale in a pocket attached to the cover.

In the plane trigonometry the author introduces the student to practical examples in connection with right triangles in the first chapter, but does not proceed to the solution of oblique triangles until chapter vii., after discussion of functions of the generalised angle, the addition theorems, inverse notation, and trigonometric equations, but to a certain extent teachers can choose their own order in taking these chapters.

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The proof of the addition theorem is not very satisfactory. The author proves the theorems for $\sin(x+y)$ and $\cos(x+y)$ for *acute* angles (using a revolving line of unit length, and so denoting the sines and cosines by lengths of lines instead of ratios, which seems a pity), and then says "it is a fact, however, that these formulæ hold for angles of any magnitude, positive or negative." This he illustrates by a couple of cases. Then, in the next section, he says "it was shown" that the formulæ hold good for all angles. The proof by projection now customary in the best English books would have been much more satisfactory.

The directions for solving trigonometrical equations are not altogether satisfactory, and would lead to difficulties in the case of such an equation as $\sin 3x = \cos 4x$. This part of the subject would need amplifying. The similar instructions for proving identities, though sometimes leading to rather heavy work, would always lead to success and be useful in the last resort, though not conducive to elegance.

The solutions of triangles are well explained, and there is a good chapter on the theory and use of logarithms and their applications to nautical and other problems, but one is sorry not to see the value of the characteristic given as the distance of the highest significant figure from the unit's place, plus or minus according as it is to the left or right. It is more fundamental and easier to remember than the old-fashioned method given in the text.

This part of the book finishes with a discussion of acute angles near 0° and 90° , and a collection of miscellaneous practical examples of the usual type, followed by a useful recapitulation of formulæ, with the pages on which they are proved.

The spherical trigonometry assumes some previous knowledge on the part of the reader, as far as the properties of the polar triangle, and one or two of the more advanced formulæ are quoted without proof. The chief features of this part are a good exposition of Napier's rules for right-angled triangles, and the use of the exterior angles (α, β, γ) in all the formulæ for oblique triangles, a most excellent innovation which the reviewer has advocated for many years, but has never before seen in a text-book. By this means all formulæ become dual without any change except the interchange between a, b, c and α, β, γ . It leads, perhaps, to a preponderance of obtuse angles in the practical applications, but the author in his logarithmic work, which is most excellently exemplified, disposes of them by the simple device of putting (n) to the logarithms of negative quantities, a method often used by practical computers, but not often seen in text-books. The book concludes with applications to astronomical and other problems, well explained and illustrated by good diagrams, with a fair number of examples for the student to solve.

(2) This volume completes the authors' plan of a course of mathematics for students of engineering and physics. The first chapter discusses infinitesimals, and defines differentials of functions of a single variable. Then come chapters on integration, with applications to geometry and mechanics, followed by special methods of integration applicable to partial fractions and trigonometric functions, including the

use of reduction formulæ. Chapter viii. deals with simple differential equations, with mechanical and geometric examples illustrating their importance. Chapters ix. and x. deal with solid geometry; chapter xi. with partial differentiation; chapters xii. and xiii. treat of multiple integrals and applications, with carefully drawn diagrams well illustrating the building up of such integrals, in rectangular, polar, and cylindrical coordinates. Then follows an introduction to line integrals and their connection with surface integrals (Stokes's theorem). Chapter xv. is devoted to infinite series, giving the easier tests of convergence, followed by Maclaurin's and Taylor's series and an introduction to Fourier's series, and finishing with the evaluation of indeterminate forms. Chapter xvi. contains a short treatment of complex numbers and conjugate functions. The remaining chapters are devoted to differential equations, total and partial.

The whole book is very solid reading, but the explanations are well given, and when proofs are not fully given references are made to other treatises. The intention of the authors evidently is to take the students over as much ground as possible, and introduce them to all the functions and processes which they are likely to need in their scientific work. There are numerous problems for solution throughout the book, and there is an index at the end to facilitate reference.

A. L.

ELEMENTARY PETROLOGY AND ORE FORMATION.

- (1) *Rocks and Rock Minerals*. A Manual of the Elements of Petrology without the Use of the Microscope for the Geologist, Engineer, Miner, Architect, &c., or for Instruction in Colleges and Schools. By L. V. Pirsson. Fifth edition. Pp. vi+414. (New York: John Wiley and Sons; London: Chapman and Hall, Ltd., 1908.) Price 10s. 6d. net.
- (2) *Genesis of Metallic Ores and of the Rocks which Enclose Them*. By B. Symons. Pp. xxxiii+494. (London: *The Mining Journal*, 1908.)

THE growing recognition of the economic uses of petrology and the increasing complexity of petrographic methods are rendering necessary the development of a less technical rock nomenclature for use in the field and by general geologists. No one who has acquired sufficient knowledge of petrology to determine the approximate chemical composition and qualities of a rock from a short study of a thin section is likely to discontinue the use of the microscope. The increasing number of students of mining, chemistry, engineering, and agriculture who have to study rocks, but have not much time to devote to the subject, is leading to the issue of special text-books on petrography without the microscope, and, thanks to its revelations, much can now be learnt from rocks by the examination of hand specimens.

(1) Prof. Pirsson's "*Rocks and Rock Minerals*" is the most advanced of the manuals of petrology without the microscope, but it may be recommended even to students who can use that instrument owing to its clear statement of the principles of petrogenesis and of the mode of occurrence of the sedimentary and