SCIENTIFIC BOOKS

LEGENDRE ASSOCIATED FUNCTIONS

Tables of Legendre Associated Functions. By ZAKI MURSI, Cairo: E. and R. Schindler. 1941. xii + 286 pp. 22.8 × 29.5 cm.

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Legendre's polynomial of the nth degree, or zonal surface harmonic of the first kind, may be defined by

$$z = P_n(x) = \frac{1}{2^n n!} \frac{d^n(x^2-1)^n}{dx^n},$$

which is a particular solution of Legendre's equation,

$$(1-x^2)\ \frac{d^2z}{dx^2} - 2x\frac{dz}{dx} + n(n+1)z = 0.$$

The Legendre functions $P_n(x)$ were first introduced in a paper of Legendre published in 1785. Legendre's associated functions of the first kind, of the mth order and nth degree, are the functions $P^m_n(x)$ defined by the equation

$$P^m_n(x) = (1-x^2)^{\frac{1}{2}m}\frac{d^m P_n(x)}{dx^m}.$$

The present table gives values of $P^m_n(x)$ for $n = 1,2, \ldots, 10$, $m = 1,2, \ldots, 10$, and for x over the range [0.000(0.001)1.000]. These values are to eight decimal places in the beginning, and to three near the end, where the values are large. Some values are given to twelve significant figures.

For purposes of interpolation the utility of the table is greatly increased by the inclusion of columns of modified second differences, the theory of which was set forth by Dr. L. J. Comrie in the British *Nautical Almanac* for 1937. A 7-place table of Everett coefficients, for using these modified differences, is given on pages 282–283; four errata in the differences in the main body of the table are noted on p. 284. The next two pages contain an Arabic translation of the preface.

The author cherishes the hope that his table attains to a high degree of accuracy. The computations were carried out in duplicate, during the years 1937–41, by the author and three assistants. Dr. Comrie differenced 6,000 entries of the original calculations and thus found ten errors. Checking was also effected by comparison with one of A. H. H. Tallqvist's tables of 1908 (*Acta Societatis Scientiarum Fennicae,* v. 33, no. 9) for the range [0.00(0.01)1.00]. This table of Tallqvist may be regarded as the first of its kind, if the less extensive one given in his *Grunderna af Teorin för Sferiska Funktioner jämte Användingar inom Fysiken* (Helsingfors, 1905) is excluded. Mursi seems to have been ignorant of the existence of G. Prévost, *Tables de Fonctions Sphériques et de leurs Intégrales* (Bordeaux and Paris, 1933). Among other things this contains a table from $P^1_1(x)$ to $P^8_8(x)$, to not more than five places of decimals, with differences.

Thus Mursi's volume makes a notable new tabular contribution in an important field. The volume is clearly and neatly printed, and the paper is reasonably good. War conditions doubtless prevented the earlier distribution of the volumes. Up to four months ago even Dr. Comrie did not know of its publication. Since such an excellent publication is No. 4 of a series issued by the Faculty of Science of this Egyptian university, only eighteen years of age, the reader may be curious as to what works are represented by Nos. 1, 2 and 3. Although I have not seen these works I learn that they are as follows:

(1) H. Sandon, *The Food of Protozoa. A reference book for use in studies of the physiology, ecology and behavior of protozoa,* 1932.

(2) [Book of the Science of Algebra and Mathematics by Mohammed ibn Mûsâ al-Khowârizmî, with commentaries by Dr. Ali Moustapha Mochrafa Bey and Dr. Mohammed Moursy Ahmed] (in Arabic), 1937. An Arabic and English edition of this work by F. Rosen appeared at London in 1831. An Arabic and Spanish edition, by J. A. Sánchez Perez, appeared at Madrid in 1916. A Latin edition by Libri was given in his *Sciences Mathématiques en Italie,* vol. 1, Paris, 1838. L. C. Karpinski's edition of Robert of Chester's Latin translation of part of al-Khowârizmî's work was published with an English translation, at New York in 1915.

(3) Mohammed Hassib. *Cucurbitaceae in Egypt,* 1938.

R. C. ARCHIBALD

BROWN UNIVERSITY

MAN AND HIS PHYSICAL UNIVERSE

Man and His Physical Universe. F. C. JEAN, E. C. HARRAH, F. H. HERMAN and S. R. POWERS. 608 + vii pp. Ginn and Co. 1943. $3.25.

"MAN and His Physical Universe" is a text-book intended for a survey course in science. Such courses are taken by persons who do not intend to become professional scientists but who desire to be acquainted with the results of science for cultural or general educational reasons. The authors have approached the problem of presenting the results of the physical sciences by dividing the book into six "units," in which astronomy, physics, chemistry, meteorology and geology are discussed in turn. The sections are not