of words Professor Edgeworth lays before us the investigations of a lifetime of study and experience, clearly, simply and modestly. "The theories here advanced," he writes, "may not be generally acceptable, but they are founded on evidence which has not hitherto been utilized in attempting to solve these difficult problems."

The mind of the master is evident in a writer who can see beyond his own technique. The necessity of neurological investigations, especially by experiment, is stressed at once in the preface. The new attack on comparative myology by investigation of muscle action currents naturally enough finds no place in this volume, but its significant contribution is foreshadowed.

The nineteenth century was the heyday of comparative morphology, as study of the literature cited demonstrates. The twentieth century brought experimental method to bear on the theme and pure morphological studies have dwindled in number, but the author has kept adding, even in proof, references of significance.

Another important feature in the volume is the table of synonyms, for the nomenclature of structures "has been difficult though there is an abundance of names from which to choose."

The text is the more readable because it is not peppered with reference marks. This may be a drawback to those who desire, above all things, speed in identification of source. But the volume is written for the student who knows his literary material, not as a labor-saver for the beginner in his task of mastering literature.

There is a spaciousness of presentation which strides over points of detail, again assuming that the reader knows the field. For example, on page 151, absence of the spinal accessory nerve in a giraffe seems to be attributed to Lesbre and myself, whereas Lesbre never mentioned this form and I merely quoted Elliot Smith. The attack by Zuckerman and Kiss was indeed leveled at me, but, had they recalled the literature, they would have known they were assaulting their own chief. It is unfortunate for the discussion of the cucullaris that Professor Edgeworth did not add (even in proof) the significant paper by Howell and Straus which clears up all discrepancies. A related problem of laryngeal innervation in camel and llama finds isolated expression thirty pages later on.

One of the most stimulating and original sections of the book is that on the larynx. No student of laryngeal anatomy should fail to master this section which, by its breadth of treatment and its practical application, is a choice example of scientific presentation.

Other reviewers doubtless, in browsing through the pages of so compact and enthralling a dissertation, will light on other treasures. None will a[illegible]ult with the proofreading. Punctuation also is perfect. The hiccoughing comma does not affront one's propriety and full-stoppery is sparingly used. Nevertheless the implications of each sentence are clear, for he who is familiar with other languages can best handle his own.

The illustrations, so simple and effective in their line, so apt in their reinforcement of the text, should be singled out for special praise save that the singling out does violence to the symmetry of the whole.

This monograph is the record of an inspiration which has glowed through all the years of a busy life and quickens to a flame at last. "Now do's my Project gather to a head; my charmes cracke not; my Spirits obey and Time goes upright with his carriage."

T. WINGATE TODD
WESTERN RESERVE UNIVERSITY

STATISTICS AND NUMERICAL TABLES

Elements of Statistics with Applications to Economic Data. By HAROLD T. DAVIS and N. F. G. NELSON. The Principia Press, Inc., Bloomington, Indiana. 424 pp. Price, $4.00. 1935.

THIS book is copyrighted by the Cowles Commission for Research in Economics, of which the authors are respectively mathematician and economist. The purpose of the work may be inferred from the recommendation in 1932 of a committee of the Social Science Research Council to the effect that students of social science should be prepared for the study of statistics by a six to nine semester hour course in the mathematical essentials involved. The topics treated are largely those traditional in the statistics of economics, but there is a wealth of fresh economic data, a good choice of new "problems" (with solutions in the back of the book) and abundant enlightening notes of a critical, historical, biographical or bibliographical nature. Despite a first heavy impression created by its large format, thick paper, sober binding, extensive appendices, numerous footnotes and formula-strewn pages, the mathematical difficulties are reduced to a minimum and the work remains within the grasp of any serious and inquiring college student, while offering at the same time many fresh ideas to the veteran teacher.

Tables of the Higher Mathematical Functions. Computed and compiled under the direction of HAROLD T. DAVIS. The Principia Press, Bloomington, Indiana. Vol. I, 1933, 377 pages. Vol. II, 1935, 391 pages.

THIS work, of which the third volume is soon to appear, is obviously the most ambitious project at preparing numerical tables of special mathematical functions attempted in this country. To those interested in such tables this monumental enterprise needs no

announcement at this time. In Volume I there are five "parts" of interest to the general reader prior to the main tables themselves. Part One concerns the classification and history of tables. Part Two deals with mathematical series used in computation. Part Three treats of interpolation. Part Four gives auxiliary interpolation tables. Part Five devotes 28 pages to general bibliography concerning tables. The separate tables constituting the main substance of this work are prefaced in each case by a discussion of the mathematical setting, with history, bibliography, etc., and a graph of the real values assumed. The number of decimal places given are usually from 10 to 20 with differences recorded, the number of places depending upon the part of the range considered. In Volume I are the log gamma function and Psi function. Volume II opens with further polygamma functions (derivatives of the Psi function). This volume continues with the Bernoulli polynomials and numbers, Euler polynomials and numbers, Gram polynomials and functions of polynomial approximation. Fundamental tables computed in this extensive fashion should serve as definitive for many generations. With the growth of statistical laboratories these tables should fill a special need. They represent the first substantial evidence in this country of a creative interest along lines in which recent British enterprise has been so conspicuously fruitful.

ALBERT A. BENNETT

BROWN UNIVERSITY

REPORTS

A CENTURY OF GEOLOGIC SURVEYS IN PENNSYLVANIA

ON June 12 and 13, there was celebrated at Harrisburg the centennial of the founding of the First Pennsylvania Geological Survey. A total number of 285 persons registered for the meetings, and many others besides attended the commemorative exercises.

The first survey was created by act of the legislature dated March 29, 1836. Henry D. Rogers, the first state geologist, served until the expiration of this survey in 1858. The second survey came into being under Joseph P. Lesley, second state geologist, in 1874 and continued for about twenty years. In 1899 the third ("Commission") survey was created. Richard R. Hice served as state geologist during part of its existence, which terminated in 1919. The present or fourth survey traces its start to a new legislative act passed in 1919. This was marked by the appointment of George H. Ashley, state geologist. During the intermittent existence of the four surveys a total publication of nearly 200 reports, amounting to over 40,000 pages of text and some 50 maps and atlases, have appeared, including a number of works published jointly with the United States Geological Survey under a cooperative agreement.

The program of the celebration running through two days offered a variety of interesting events not merely to the technical guests and visitors but to the layman as well. During Friday morning the visitors registered at the offices of the Pennsylvania Topographic and Geologic Survey. Here exhibits had been arranged. Important among these were a file of publications of all four surveys, a comparison of various state maps, illustrative material of progress in topographic and geologic mapping, maps of the development of petroleum and natural gas fields, rocks and minerals, recently discovered fossils new to science or to Pennsylvania, stratigraphic charts and miscellaneous material mostly of historical interest in that it touched upon early geologic work in the commonwealth. Among the last were manuscript maps and sketches by the first survey, which were exhibited by the archives and history branch of the State Library in the Education Building. Walking tours of the capitol buildings were conducted at intervals during the morning. At noon a complimentary luncheon to the visiting delegates and invited guests was served at the survey offices.

The afternoon of Friday was devoted to a formal program in the forum of the Education Building. Addresses of welcome by Governor George H. Earle (a letter of welcome was read in the governor's absence), Secretary of the Department of Internal Affairs Thomas A. Logue and State Geologist George H. Ashley opened the program. Responses were given by M. M. Leighton, chief of the Illinois Geological Survey; W. C. Mendenhall, director of the United States Geological Survey, and Frederick Watson, His Britannic Majesty's consul general. After the responses, papers were read as follows: F. Lynwood Garrison, "Philadelphia, the Cradle of American Science"; R. W. Stone, "The Survey, 1836–1936"; George H. Ashley, "The Romance of Geology and the Part Played by Pennsylvania." On Friday evening a symposium, "The Mineral Industry and the Geologic Survey," was conducted with Samuel Taylor as chairman. The leaders were: George B. Hadesty, representing the Anthracite Industry; Carl E. Lesher, the Bituminous Coal Industry; Norman E. Maxwell, Petroleum and Natural Gas, and Paul B. Reinhold, non-metallic products.

Saturday, June 13, was devoted largely to field trips