This specimen will be fully described and discussed as soon as the bones have been prepared for study.

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## A NEW RECORD FOR FRESH-WATER MEDUSAE IN PENNSYLVANIA

ON August 17, 1937, a single specimen of fresh-water medusa was brought to the writer for identification. In the afternoon of this day approximately 150 jellyfish were collected in an abandoned limestone quarry filled with spring and drainage water, near the village of Almedia, Columbia County, Pennsylvania. This collection, made with a dip net from the shore, was a small part of the population seen. Collections were made at regular intervals until October 25. Residents of the neighborhood who use this pool for bathing report that these animals were noticed several weeks previous to August 17. During this period the density of population varied from several dozen to many thousands. At the height of population density they welled up from the depth of the pool in cloud-like multitudes. This pool is 225 feet wide, 375 feet long, 35 to 90 feet deep, with very abrupt slopes.

The medusae collected in the field ranged from 0.5 mm to 18.0 mm in diameter. No hydroid forms were observed. Live medusae taken to the laboratory survived about four weeks in aquaria supplied with water and Elodea from their natural habitat. The contents of one aquarium in which the medusae had died and disintegrated suddenly became populated with minute medusae and small green hydra. This aquarium had been frequently observed with the hope that the hydroid form might have been brought in on the Elodea. The smallest of these medusae was 0.35 mm in diameter, had eight buds for tentacles, a short manubrium and well-developed velum. Specimens 0.75 mm to 1.00 mm in diameter developed 16 or more tentacles. It is estimated that a total of 250 small medusae were produced in this aquarium during a period of 28 days with a peak population of 100 specimens. Approximately half of these specimens were preserved. Some of the others were isolated with the hope that they might develop to maturity, but without success.

According to Professor Payne these medusae are *Craspedacusta ryderi*.

This is the first locality record for Craspedacusta in this section of Pennsylvania.

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## NEW EXPOSURES OF ORDOVICIAN BENTONITE IN SOUTHWESTERN VIRGINIA

SEVERAL excellent exposures of bentonite have been uncovered by recent road-building activities on Virginia Highway 64 in Turkey Cove, northeastern Lee County, Virginia. The bentonite beds, which vary in thickness from three inches to two feet, occur in the Lowville and Trenton formations (Middle Ordovician). The rocks have been folded and faulted so that the same bed is exposed more than once. When the writer left the area in early September, 1937, seven exposures at three horizons had already been laid open. Road-building was not complete at that time, however, and new cuts will be made in Lowville and Trenton rocks for another mile or more. Hence it is likely that ten or a dozen sections of bentonite will be available for study by the next field season. The susceptibility of the soft volcanic ash to weathering and relatively rapid removal lends especial interest to these fresh exposures.

In a recent paper on the stratigraphy of Ordovician bentonites in southwestern Virginia, Rosenkrans[1] states that the exposures of bentonite in Lee County are poor, and at the same time that the area is one of great importance in establishing by means of bentonite the stratigraphic relations of the Lowville formation in Tennessee, Kentucky and Virginia. This is the case because the sediments of Lowville age in this area are apparently transitional between the limestone deposits of the interior and the clastic rocks in the eastern part of the Appalachian Valley. The bentonite sections newly exposed in Turkey Cove fill the need expressed by Rosenkrans. It is hoped that they will receive the detailed study to which their excellence and strategic position entitle them.

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# SCIENTIFIC BOOKS

## GENERAL CATALOGUE OF STARS

*General Catalogue of 33,342 Stars.* By BENJAMIN Boss. Carnegie Institution of Washington. 5 vols. Quarto.

THIS publication represents the final five volumes of a general program of work started by Professor Lewis Boss about the time he became director of the Dudley

Observatory at Albany, sixty years ago. Professor Boss's first catalogue of standard stars was published in 1877, and his "Catalogue of 627 Principal Standard Stars, distributed from the north to the south pole and derived from a homogeneous treatment of all available

[1] R. R. Rosenkrans, *Va. Geol. Survey Bull.*, 46–I: 99, 1936.

material" appeared in 1903. This latter work was aided by the first of a series of grants from the Carnegie Institution of Washington, and these grants became a continuing fund when in 1905 the trustees of the Institution created a Department of Meridian Astrometry, cooperating with the Dudley Observatory, and with Professor Boss as director.

Under this arrangement the "Preliminary General Catalogue" (P.G.C.) of 6,188 stars, foreshadowing the "General Catalogue" (G.C.) of to-day, was developed and published by 1910. The positions of over 11,000 stars observed at Albany prior to 1901 were reduced and published by 1918. Additional observations of all stars to be in the projected catalogue were made with the meridian circle of the Dudley Observatory, the positions of 15,333 stars, observed at San Luis in the southern hemisphere from 1909 to 1911, being reduced and published by 1928, and the positions of 20,811 stars observed at Albany from 1907 to 1918, being reduced and published by 1931. And by combining this new material with all other available material of the past and present, there was throughout the gradual development of the great catalogue, just distributed, which gives definitive positions and proper motions for all stars in the sky to the seventh magnitude and for thousands of fainter stars.

The work was carried on under the direction of Professor Lewis Boss until his death in October, 1912, and since then it has been brought to a successful conclusion under the direction of Professor Benjamin Boss. Among the assistants of long connection with the work may be mentioned Mr. Roy and Mr. Varnum, both of whom carried on responsible portions of the work for over 40 years.

A general catalogue of stars is one that gives positions and motions of stars founded upon the combined results of all the principal observational catalogues available—these catalogues being reduced uniformly with the same general reduction constants depending upon the elements of the solar system and positions of the fundamental planes of reference. Professor Lewis Boss held that a standard catalogue must represent as consistently as possible the sum total of observations having fundamental value such that the sum of the squares of the deviations of the several component star catalogues at various epochs from the standard catalogues shall be a minimum. Inherently such catalogues are old before they appear. They are most accurate at their mean epoch, which in the present case is about 1900.

The publication is in five volumes, averaging 350 pages each. The first volume gives the introduction, ephemerides of 610 circumpolar stars and systematic corrections for 238 observational catalogues. The other four volumes—one for each fourth of the sky—

give the positions and proper motions for 1950 of 33,342 stars.

The general arrangement and treatment of the subject-matter and the printing features are excellent.

The introduction gives a brief history of the work and explains the methods used in determining corrections to the system of the P.G.C. which was used as the provisional system for comparison. The periodic and progressive errors are thoroughly investigated, using about one hundred of the principal observational catalogues of the last one hundred years. The well-known periodic errors in the right ascensions were found to vary with the epoch. It is definitely stated that the P.G.C. system uncorrected for these periodic errors was adopted as the basis of the new system. The G.C., therefore, does not represent the observations in this respect. As these errors enter into the proper motions, also, the error of the positions will increase with time, as is shown in the large differences from the new "Dritter Fundamentalkatalog" (F.K.3), by A. Kopff.

The important correction to the declinations varying with declination was carefully determined, following the method of Professor Lewis Boss by intercomparison of observations taken at observatories in the northern and southern hemispheres with a general discussion of the refraction. This principle involves the instrumental spacing of the 180° from pole to pole as fundamental points. Other investigators make use of a third fundamental point half way between the two poles given by observations of the sun and planets. Modern observations furnish reliable positions of the equator among the stars, giving a correction of $+0\rlap{.}''2$ to the declinations of the G.C.

The equinox was corrected and the finally adopted corrections to the P.G.C. are given together with systematic corrections and weights for 238 observational catalogues, 1750–1925, from which positions were taken in constructing the final catalogue. The comparison with the catalogue FK3 shows larger differences than might be expected. These two outstanding catalogues—the two general fundamental investigations of this half of the century—using quite largely the same observational material from 1750 to 1925, have systematic differences at various points of the sky amounting to $0\rlap{.}''5$ at 1950 and increasing to $1\rlap{.}''0$ at the end of the century. Statistical investigators and others should bear this in mind and not confuse systematic errors with stellar motions.

In the catalogue the use of the Draper numbers instead of the conventional historic names or Durchmusterung numbers, is an innovation. Data are given so that observations in the future may be added, thus increasing the accuracy of the positions and motions of individual stars.

The probable error of a catalogue position for a fundamental star is less than 0".1. For two thirds of the stars including the fainter stars in general the probable error of the 1950 position is 0".3 or larger. The authors call attention to the need for reobservation of the larger part of the stars. They also suggest that many stars should be added to the list for the more uniform spacing required in photographic work.

One of the many valuable results of this work is that it makes possible the reduction of all star observations of the last two centuries on a uniform system.

The very large number of definitive proper motions all on a uniform basis will be of special value in many researches, and the catalogue will immediately meet a need in a wide field of statistical and positional investigations.

All those who have taken part in this production are to be heartily congratulated for a most excellent astrometric history of the brighter stars. The work is by far the most comprehensive and important of its kind ever undertaken, and it is a worthy monument to the genius and foresightedness of Professor Lewis Boss; to the zeal and ability of Professor Benjamin Boss and his collaborators; and to the generous support for over thirty years by the trustees of the Carnegie Institution of Washington.

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## QUANTUM MECHANICS

*Principles of Quantum Mechanics.* By A. LANDÉ. xii + 115 pp. New York: Macmillan Company. 1937. $2.25.

PAULI once said regarding quantum mechanics: "In analogy to the term relativity theory one could call modern quantum theory the theory of complementarity." The concepts of the fundamentals of quantum mechanics were clarified by Heisenberg's famous paper of 1927 on the uncertainty principle and Bohr's papers (1928–1930) on atomic theory and the description of nature. Landé's book tries to carry out the program of quantum theory as a theory of complementarity systematically. The great amount of material is covered in some 100 pages with great skill. The program of

the book is set forth in an excellent preface and an introductory chapter on observation and interpretation. It is followed in part I by the elementary theory of observation: the principle of complementarity. The first paragraph of this chapter deals with the analogy between mechanics and wave theory (a short remark on the history of these considerations, which started with Bernoulli and were fully developed by Hamilton, might be of interest in a future edition.) In this first part the view-points of the corpuscular and wave theory are clarified. The second part deals with the principle of uncertainty and its application to standard experiments. Classical and quantum mechanical pictures and their correlation are discussed. This leads to the third part dealing with the principle of interference and Schrödinger's equation. The following chapter is devoted to the principle of correspondence between mechanics and wave theory. The term principle of correspondence, however, is not used in the same sense as used by Bohr—asymptotic coincidence between quantum frequencies and classical frequencies—but it refers "to all analogies and asymptotic coincidences of quantum mechanics with both the classical theory of charged particles of matter and with the classical hydrodynamics of a continuous density serving as a medium for matter waves." The book closes with a short mathematical chapter on the theory of transformations and the principle of invariants.

While we have now-a-days a great number of texts available, to introduce the student to the technique of wave mechanics, this book of Landé's will be of great value to student and teacher alike for the clarification of the fundamental concepts, their logical development and the connection between the different fields of mathematical development. May we express the hope that a future edition will include also treatment of subjects omitted now, such as photo-effect, Raman effect (as a classical effect), and one of the typically wave mechanical phenomena, "the tunnel effect."

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# SPECIAL ARTICLES

## INHIBITION OF PARTURITION IN THE RABBIT BY THE INJECTION OF ESTROGENIC HORMONE

THE corpus luteum is essential to the maintenance of pregnancy in the rabbit. It has been shown that parturition can be delayed and in many cases prevented for a considerable length of time if new corpora lutea are induced in the ovaries in the latter part of pregnancy by the injection of a suitable gonadotropic

hormone, or if an active corpus luteum extract or progesterone, the pure corpus luteum hormone, are injected daily beginning a few days before term. It is well known that delivery occurs within 48 hours following removal of the ovaries at any time from the 20th to the 28th day of pregnancy. (Removal prior to the 20th day results usually in resorption rather than premature delivery of the foetuses.) One supposes, therefore, that in this species parturition is precipated,