

more offered than can be given in the time usually allotted to such a course. The work as here outlined is unquestionably not intended for the casual student who first enters upon the study of entomology as a part of a liberal education. But, on the other hand, if an entomological student's interest can not survive the rigorous drill demanded of him by the course outlined in Dr. MacGillivray's text, then he probably has not the making of an entomologist in him.

In the opinion of the reviewer, there are more new terms proposed than appear absolutely essential, some of them replacing older ones, without any apparent justification. Thus, the term *alacardo* is applied to a part which already has two other names. And so with many others. It is true, as the author says, that names of parts of animals are not subject to rules of biological nomenclature; nevertheless, an arbitrary change of a well-established term is sure to cause confusion. Furthermore, the fact that hybrid combinations of Latin and Greek terms abound does not warrant the erection of others of a similar nature. The use of the plural form *ocellae* to designate simple or adaptive ocelli is particularly objectionable on both philological and practical grounds. It is rather doubtful also if the various mutations, *ocellalae*, *ocellanae*, *ocellarae* and *ocellasae*, to designate the several types of simple eyes, will find acceptance. It is not clear why *mesowing* and *metawing* are more appropriate than the words *fore wing* and *hind wing*. This list might be greatly extended. These faults, however, are trivial and need not interfere with the usefulness of the work.

The most serious defect is the lack of adequate illustrations. Suitable detailed diagrams of the parts of head, thorax and abdomen of a number of representative insects would greatly have enhanced the value of the book as a reference text. The fear that students would make an illegitimate use of such figures is groundless, since the illustrations might have been made representative of forms not in common use in the laboratories.

The work is a notable contribution to insect anatomy; and while in some cases there are homologies suggested upon which specialists do not agree, as, for example, that of the clypeus and front of the Cicada, nevertheless it is, on the whole, a safe guide for entomologists to follow and it should prove of greatest value to students, teachers and systematists alike.

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*The Rhind Mathematical Papyrus. Introduction, Transcription, Translation and Commentary.* By T. ERIC PEET, Brunner Professor of Egyptology in the University of Liverpool. The University Press

of Liverpool, Limited. London, Hodder & Stoughton, Limited, 1923. Folio, 1 + 136 pp., with 24 plates. Price, 63 shillings.

No lover of the history of mathematics as an integral part of the general history of the slow intellectual development of mankind can fail to welcome with keen delight the new translation of the Rhind Mathematical Papyrus, with very full notes by Professor T. Eric Peet, of the University of Liverpool. This papyrus, by far the most important of the papyri of Egypt which treat of their mathematical processes, was discovered in a building near the Ramesseum about the year 1858, and coming into the possession of a Mr. Rhind, from whom its name is derived, is now in the British Museum.

A translation into German was made in 1877 by Professor August Eisenlohr, assisted by Dr. Cantor, which, for the state of knowledge of Egyptology of that date, must be considered as a remarkable production. This translation, however, is now entirely out of date and has many small errors. During the past fifty years our knowledge of the Egyptian language has very greatly increased. Hence, a new translation and commentary have long been a desideratum.

The early pages of the scholarly work before us contain a naccount of previous studies of the Rhine papyrus, a description of the papyrus, including a discussion of its date, and an account of its contents and of documents available for the study of Egyptian mathematics. The general character of Egyptian mathematics is considered in some detail on pages 10-24. A comparison of mathematics of the Egyptians and Babylonians is indicated on pages 27-31, and this is followed by a sketch of Greek influence on Egyptian mathematics. The English translation of the original hieratic text and commentary occupy pages 33-131. The plates at the end of the volume include a hieroglyphic translation of the hieratic made from the papyrus itself.

Professor Peet has brought to his work not only the mind of a trained Egyptologist, but also an interest in mathematics, and I, who have given some years of study to the papyrus, have nothing but praise for the way in which the work has been done. While I may not agree entirely with some of the details of Professor Peet's explanations of the various mathematical processes, the care with which the translation is made and the thoroughness and clearness of the notes is very great. The book should be placed in every mathematical library in the country, and should be studied by every one who wishes to understand the mathematical processes of the Egyptians approximately seventeen centuries before Christ.

It is interesting to note in this papyrus the beginning of several of our present mathematical processes. For example, division was really performed by mul-

tiplication, problems which with us would lead to equations were solved by a process of trial, a general rule was often derived from special numerical examples. In the same way to-day mathematicians by a kind of induction often find a rule from a special example, but this must afterwards be proved.

One receives the impression from Professor Peet's work that the mathematics of the Egyptians was developed largely in caring for the needs of their daily life. On the other hand, in a recent account of the Edwin Smith Medical Papyrus, J. H. Breasted, professor of Egyptology and Oriental history at the University of Chicago, has expressed the opinion that the surviving mathematical papyri clearly demonstrate the Egyptian's scientific interest in pure mathematics for its own sake. With this point of view I am in entire sympathy. To me the whole papyrus seems to be constructed on a scientific basis, and is not a mere collection of problems for practical use. Easier problems come before more difficult ones in the same way as in a modern arithmetic.

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## LABORATORY APPARATUS AND METHODS

### INDICATOR REACTION AS A SOURCE OF ERROR IN pH DETERMINATIONS

THE colorimetric determinations of hydrogen-ion concentrations, expressed as pH, are now a part of routine procedure in various lines of work. In many cases no electrometric check is feasible and the prevention of errors incident to the preparation and use of standard buffer and indicator solutions is of paramount importance. The purpose of this paper is to point out one of these errors, that is, the change of reaction of indicator solutions stored in glass bottles. It has been found that such a change will in many cases seriously affect the results obtained and that the use of the same indicator solution in both the standard and the unknown solutions does not remove this error.

In the course of some determinations of the pH of soil extracts it was found that the readings were in several cases too high (*i.e.*, alkaline) and change in the reaction of the indicator solutions used, probably due to alkali dissolved from the storage bottles, was found to be the cause. Forty-three soils were tested with indicators both unadjusted and corrected as to reaction, and, of these, twenty-two showed a difference in readings of from .3 to .9 between the adjusted and the unadjusted indicator solutions. The usual experimental error in determinations of this kind is less than .2. Buffer solutions tested under similar conditions showed no differences of color. The need for

such indicator adjustment has been noted by Karraker in his recent paper on soil reaction studies.<sup>1</sup>

It is in some cases necessary to adjust the reaction of the indicator solutions quite frequently, and it has been found that a convenient means for doing this, when electrometric apparatus is not available, is by the "spot" method. An ordinary porcelain plate used for color reactions is suitable for this purpose. Twenty milliliters of the indicator to be adjusted are taken from the stock bottle and a drop placed in one of the depressions on the plate. A drop of N/20 hydrochloric acid is then added to the 20 ml. and another drop placed on the plate. This procedure is repeated until the acid color is reached. A spot is now selected which corresponds as nearly as possible to the color midway of the workable range of the indicator. A buffer solution of the desired pH plus the indicator being tested may be used for comparison or the colors in the excellent chart in Clark's book on hydrogen ion concentrations<sup>2</sup> may be referred to. The use of this chart provides a simple and efficient method of comparison as the flat colors more nearly approach the "spot" colors for comparative purposes than do the tubes of standard buffer solutions. The proper "spot" may also be approximated by selecting the one in which the two component colors of the indicator appear most nearly equal. Having decided on the proper color a quantity of the stock indicator solution is adjusted to this point by the addition of a calculated amount of N/20 hydrochloric acid. It will be found, after repeating this procedure once or twice, that the "midway" color can be readily determined without a preliminary 20 ml. test.

For highly buffered solutions this adjustment of the reaction of the indicator is apparently unnecessary, but for unknown solutions or those of known low buffer content it is essential, for if this source of error is disregarded there can be no assurance as to the accuracy of the results obtained.

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## SPECIAL ARTICLES

### OBSERVATIONS ON TAXONOMIC FACTORS USED IN THE GENUS *CERCOSPORA*

THE fungi which are included in the genus *Cercospora* have been and still are classified on the basis of spore size, host reaction to parasite and known host range of the causal organism. This taxonomic

<sup>1</sup> "A Note on Soil Reaction Studies," P. E. Karraker, *Soil Science*, Vol. 15, No. 6.

<sup>2</sup> "The Determination of Hydrogen Ion Concentrations." (1922 Edition.) W. Mansfield Clark.