it when attacked, depends very much upon their state of health." Dr. Voelcker, the chemist of the Royal society, has said, "I believe the soil has a great deal to do with mildew. An excess of available nitrogenous food appears to me to have a decided tendency to cause mildew in wheat. A clover-crop leaves a large amount of nitrogenous matter in a soil, and renders wheat following it liable to attacks of rust." Dr. Voelcker further agrees with Dr. Lawes when he says, in answer to Mr. Little's letter, "A sudden check by cold or continued wet weather has a decided tendency to favor the attacks of mildew in wheat; and this tendency is greater in highly manured land than in poor soil, or, at all events, on land which is manured with too much nitrogenous food, or on land naturally rich in such food." Four widely different soils upon which wheat had been grown were analyzed by Dr. Voelcker, and it was found that the amount of mildew determined by extended observations varied directly with the per cent of nitrogenous matter in the soil. But much depends on previous cropping, and therefore the ratio between mildew and nitrogenous matter in the soil may vary to a limited extent.

The large amount of evidence gathered, and presented in extended tables, shows that some sorts are more capable than others of resisting rust, though no varieties are rust-proof. White wheats suffer more than red sorts. It is best to sow early maturing varieties, and sow them early.

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THE CODEX CORTESIANUS.

Codex Cortesianus, manuscrit hiératique des anciens indiens de l'Amérique Centrale conservé du Musée archaeologique de Madrid photographié et publié pour la première fois avec une introduction et une vocabulaire de l'écriture hiératique Yucateque. Par LÉON DE ROSNY. Paris, *Maisonneuve*, 1883. 26 + 49 p., 42 pl. 4°.

THIS volume by Léon de Rosny is undoubtedly the most important contribution to Central-American paleography which has appeared since the publication of Landa's 'Relacion,' and the 'Manuscrit Troano' by Brasseur de Bourbourg. In it we have a photo-engraved reproduction of the recently found aboriginal manuscript known as the 'Codex Cortesianus,' thus adding one more to the brief list of pre-Columbian Maya documents which have so far been discovered. The name 'Cortesian' has been applied to it because of the supposition that it had once belonged to Hernando Cortez.

Up to 1876 but three of these manuscripts — the 'Dresden codex,' the 'Codex Troano,' and the 'Codex Peresianus' (or 'Manuscrit mexicain No. 2') — had been brought before the public. About this time a proposition was made to the Bibliothèque impériale of Paris by some one in Spain (the name is not given) to sell to it an ancient American manuscript. A photographic copy of two pages accompanied the proposition as specimens of the volume. On account of the high price demanded, the proposition was not accepted. Shortly afterwards it was obtained by the Spanish government, and deposited in the archeological museum at Madrid. One of these two pages was copied by Mr. Rosny in plate 11 of his "*Essai sur le déchiffrement de l'écriture hiératique de l'Amérique Centrale;*" and the other, which is beyond question a missing half of the initial page of the 'Codex Troano,' in plate 5 of his "*Documents écrits de l'antiquité américaine.*"

In 1880 Mr. Rosny went to Madrid expressly to see and study this codex, and, if possible, to obtain a copy of it. Through the kindness of Don Juan de Dios de la Rada, the curator of the museum; his mission was eminently successful, as he was permitted, not only to examine it, but to make two complete photographic copies of it. It was from these, I presume, that the plates of the present work were made.

We learn from the introduction, that the original, like the other three Maya manuscripts, is written on both sides of a strip (probably of Maguey paper) covered with a coat of white paint. Judging by the specimen given in Mr. Rosny's '*Essai sur le déchiffrement*,' plate 11, I presume the figures are partially colored, though not so highly nor to the same extent as in the Troano manuscript; but unfortunately this is not shown in the present work.

The general appearance, the figures, the form of the characters, and numerous other particulars, prove very clearly that it is more closely related to the Troano manuscript than to any other one of the Central-American codices. This is so apparent, that Mr. Rosny has suggested that the two are parts of one original work. The fact that we find here the missing half (by this we know that one-half is missing) of the 'titlepage' of the Troano manuscript is a very strong argument in favor of this view. Still, I am disposed to doubt its correctness, for the following reasons: 1°. On plates 39 and 40, upper division, we find an exact repetition of the five figures in the top division of plates 29 and 30 of the Troano manuscript; 2°. In the plates of the latter half, quite a number of numerals are introduced into the text, and joined to characters to which they are never attached in the manuscript; 3°. The form of the serpent-figures (no one can fail to remark the strong resemblance between the heads of some of these serpent-figures and the dragon-

heads on the pyramid of Xochicalco) ; 4°. The presence on plate 25 of a character found nowhere else in the Maya manuscripts except in the 'Dresden codex;' 5°. The peculiar bird-headed figures on plates 20 and 21 ; 6°. The numerous eight-day columns in the latter half, and a number of other minor peculiarities which might be mentioned.

But be this as it may, it does not affect the value of the codex; and we can join heartily with Mr. Rosny in esteeming it a truly 'precious document,' and extend to him our sincere thanks for bringing it to light.

Another peculiarity in this codex, worthy of special notice, is the *grand tableau cyclique*, as Rosny terms it, which commences on plate 13, and continues regularly in four lines on plates 14, 15, 16, 17, and 18.[1] The plan of this table (which is constructed upon an entirely different idea from the one which somewhat resembles it in form in the 'Codex Peresianus') so strongly resembles the cyclic tables, or Tonalamatl, in the 'Codex Bologna' and other Mexican codices, as to suggest the possibility of relation. In this case the series commences with *Ymix*, as Landa asserts was the custom. This table, as Mr. Rosny rightly affirms, furnishes us new data in relation to the Maya calendar, and may possibly enable us to untie some of the knots in that tangled skein.

A large portion of the introduction consists of a long extract from a paper on the Maya Calendar by Mr. Bouilhet presented to the Société américaine of France by Mr. Delaporte in 1880, but never before published.[2] The larger portion of this extract is devoted to a discussion of the Maya cycles, which leads the writer to the conclusion that the Ahau, or *Ahau-Katun* as he designates it, consisted of twenty-four years, and the Grand cycle of three hundred and twelve, agreeing in this respect with Perez. On the other hand, in attempting to adjust the years of the Maya system with those of the Gregorian calendar, he decides that the year 7 *Cauac* could not have been the first of an Ahau and at the same time the year 1392, as supposed by Perez. He agrees on both these points with my conclusions.[3] I judge from his language, and the figure of the calendar-wheel he gives, that he assigns *Kan* to the east, *Muluc* to the north, *Ix* to the west, and *Cauac* to the south; and hence follows Cogulludo and Perez, in which I believe he is correct.[1]

Mr. Rosny calls attention to the fact, that most of the European *savants* appear to be unacquainted with the various works and articles relating to the antiquities of Central America which have appeared within the last few years in America, and in a note and elsewhere in his introduction mentions most of them.

The vocabulary at the end of the volume contains a list or series of the signs or symbols of the Maya days, and the numerous variants found in the different codices ; of the months ; of the numeral characters ; of other single characters, of which a probably or possibly correct signification has been given by him or other authorities ; and, lastly, a list of character groups which have probably been correctly determined. The entire list is numbered consecutively.

It may not be out of place to state here, that I have discovered with satisfactory certainty that No. 17 of this vocabulary, which is the same as fig. 96 (p. 159) of my 'Study of the Manuscript Troano,' and is found in all of the Maya codices, is not a variant of *Cimi*, as he supposes, nor a death-symbol, as I surmised, but a symbol of the number *twenty*, and, if phonetic, of the Maya word *Kal*. This is readily determined by its position in various series of numbers in the different codices; as, for example, in the extended series in the third or lower division of plates 33 to 47 of the 'Dresden codex,' where the presence of days, by their succession, enables us to determine with absolute certainty the correctness of this conclusion. This fact compels me to differ from Rosny in his interpretation of group No. 224 of his vocabulary, and found on pl. 15.* of the 'Codex Troano.' Instead of *Cotz* (a 'divider' or 'sculptor') I would read *Cakal* ('twice twenty,' or 'forty'). Then this, together with the figure of the hatchet (which is certainly not phonetic), would signify that the artist should give twice twenty strokes or cuts, or draw twice twenty lines, with his machete, on the wooden image which he is carving.

The red diamond-shaped character so common in this codex in connection with numeral characters is also another symbol of the number twenty.

That Rosny is largely influenced in his interpretation of characters by Landa's alphabet and the names of the days, is quite perceptible in this vocabulary. I am satisfied that no

[1] See note on p. 20, of my Study of the Manuscript Troano, where that part of the table found on plate 14 is given from the copy in Mr. Rosny's *Essai sur le déchiffrement*, plate 11.

[2] It was put in press, and the first proof struck off; but for some reason its publication was then renounced. The title of the article, as we are informed by Mr. Rosny, who possesses the manuscript, is *Recherches mathématiques sur le calendrier Yucateque*.

[3] Manuscript Troano, pp. 29 and 50.

[1] I have discussed this subject in a paper to be included in the third annual report of the bureau of ethnology, now in the hands of the printer for publication.

decided progress can be made in deciphering these aboriginal documents until we break loose from these trammels, and use as a key the few characters which can be satisfactorily determined otherwise. The attempt, on the part of this author, to use the two classes as a basis, leads him into some inconsistencies. For example: he interprets his No. 176 (a cardinal-point symbol) as *Likin* ('east'), and No. 231 as *Ahau-al* ('enemy'); yet the leading character in both groups is the same, — the symbol of the day, *Ahau*. If the characters are phonetic, this is inconsistent; if they are not, then each must be determined independently.

I notice a number of clerical errors in the vocabulary, most of which can be readily corrected: therefore I only call attention to a few which may possibly lead to error. Under No. 174 the reference to No. 188 should be to 190. Under 178, *Sud* ('south') should be *Ouest* ('west'). Under No. 192 reference to 188 should be to 189. Under No. 200 reference to 199 should be to 201.

Of this work only eighty-five copies were published; and of these, as I learn elsewhere, but thirty-five or forty were to be offered for sale.

CYRUS THOMAS.

KELLERMAN'S BOTANY.

The elements of botany, embracing organography, histology, vegetable physiology, systematic botany, and economic botany. Arranged for school use or for independent study. By W. A. KELLERMAN, Ph.D. Philadelphia, *Potter*, 1884. 360 p., 354 fig. 12°.

TEACHERS of classes composed of beginners, to whom they wish to impart some knowledge of botany aside from the rudiments of phenogamic analysis, have long felt the need of an elementary text-book a little more comprehensive in its scope than books of this grade usually are, and they turn to every book like Professor Kellerman's with some expectation.

So far as its scope is concerned, this little treatise leaves nothing to be desired. Besides the topics indicated on its titlepage, it briefly treats of vegetable paleontology and the geographical distribution of plants. In the main, each topic is fairly presented, considering the needs of the pupils for whom the book is written; but a lack of care in the final revision of the manuscript is frequently noticeable in badly constructed sentences; and those minor errors which so persistently make their way into text-books written by the most competent authors are found pretty liberally scattered through the pages. Even more serious than these are several statements, which, from their brevity or other causes, are likely to mislead the reader: e.g., the generalizations concerning plant-food (p. 12), the office of the leaf (p. 15), the absence of chlorophyll in parasites (p. 19), and metastasis (p. 107), most of which are qualified in other places; and the statements with respect to the decay of insects captured by Nepenthes (p. 107), the growth from a single cell in all Pteridophytes (p. 154), and the necessity of extraneous aid in the pollination of all orchids, which find no correction. The usual number of old errors are further disseminated; e.g., the cotyledonary nature of the persistent leaves of Welwitschia (p. 165), the fertilization of dioecious Saprolegnieae by spermatozoids (p. 134), the intercommunication of tracheides through their bordered pits (p. 75), and free-cell origin 'about new centres of formation' in endosperm, etc. (p. 81).

The writers of several recent text-books have been unfortunate in illustrating their works; old and well-worn figures being borrowed, or home-made drawings being cheaply photo-engraved, for the occasion. The book before us unfortunately suffers in both ways. Quite a percentage of the illustrations are taken from the floral advertisements of the late Mr. Vick, and it must be said that few of them convey a correct idea of the plants they are named after. Nearly three hundred figures are original, and, properly executed, would add very greatly to the value of the book. As it is, they reflect much credit on the industry of the author; but several fall quite as far short of reality as the so-called 'cat' whose problematical contour puzzled the readers of a zoölogical text-book not many years since.

While the book is unsatisfactory in its execution in many respects, it comes nearer to filling a serious gap in botanical literature than any other thus far published; and, notwithstanding its shortcomings, it is a welcome addition to the teacher's auxiliaries, its low price allowing it to be put in the hands of students who could not afford a more expensive book in addition to the systematic manuals used by most elementary classes.

THE SOCIETY OF MICROSCOPISTS.

Proceedings of the American society of microscopists. Sixth annual meeting, held at Chicago, Ill., Aug. 7, 8, 9, and 10, 1883. Buffalo, *Haas & Klein, pr.*, 1883. 4 + 275 p., illustr. 8°.

THE proceedings of this society are published with commendable promptitude, and