

Rotifers Commensal with Caddis-worms.

It may be of interest to record the fact that, like *Gammarus pulex* and *Asellus aquaticus*, the larva of *Phryganea grandis* is a host for the commensal rotifer, *Callidina parasitica*. On one specimen, taken near Potter Heigham Bridge, I found between fifty and sixty of these commensals. As is the case with the commensals of *Gammarus* and *Asellus*, those of the caddis-worm gradually disappear when the hosts are kept in an aquarium. *Rotifer tardus* was also found among the materials of the larval case.

HENRY SCHERREN.

The Lost Books of Euclid.

Will you or any of your numerous readers kindly let me know, through the medium of your journal, if the lost books of Euclid (Books vii., viii., ix. and x.) have been found and published in English; if so, the name of the editor and that of the publishing house.

I may say, in reference to this inquiry, that an Indian Prince, who is at present in this country for the Jubilee celebration, possesses a complete copy of Euclid in Sanskrit—no book or books missing.

A. K. GHOSE.

6 Forest Road, Kew, June 8.

[We are indebted to Mr. H. M. Taylor for the following information:—

The first English translation of the Elements, published at London in 1570, had the title (16 Books):—

“The Elements of Geometrie of the most ancient Philosopher Euclide of Megara, Faithfully (now first) translated into the English tongue by H. Billingsley, City of London. Whereunto are annexed certain Scholias, Annotations and Inventions of the best Mathematicians both of time past and in this our age.”

The English edition of the first printed Greek text, published at Basel, contained all the extant works attributed to Euclid. This was published in 1703, at Oxford, by Dr. David Gregory, and was entitled “*Εὐκλείδου τὰ σωζόμενα*.”

See Encl. Brit., ninth edition, for further information.—EDITOR.]

ARCHAIC MAYA INSCRIPTIONS.

THERE can be no surer sign of the smallness of the number of persons in this country who take an interest in the progress of our knowledge of American archaeology, than the fact that not many years ago the editor of this journal asked me to review my own work on the subject, a request which, as far as courtesy would allow, I succeeded in avoiding by effecting a compromise which resulted in the publication of a few general notes on the ancient civilisation of Central America (NATURE, April 28, 1892). The far more grateful task has now been entrusted to me of calling the attention of the readers of this journal to an essay on the Archaic Maya Inscriptions, by Mr. J. T. Goodman, of California, which has been published as an appendix to the archæological section of the “*Biologia Centrali Americana*.”

It is to the liberality and sympathetic kindness of Mr. F. du Cane Godman and Mr. Osbert Salvin that my work on Central American antiquities is being published in its present sumptuous form. Their names, indeed, figure on the title-page as editors; but the old-fashioned and much abused title of patrons would be more appropriate in expressing an ideal relationship in which they have confined their editorial duties to giving the kindest and most valuable advice, whilst leaving me an absolutely free hand in the selection of material, and relieving me of all expense of printing and publication, and the reproduction of photographs, plans and drawings, which already extend over 175 double quarto plates.

It is again to this same liberality that my friend Mr. Goodman's interesting essay owes its publication; and were he here I know how heartily he would join me, and I think I may add so would every other student of American archæology, in a grateful acknowledgment of the deep debt of gratitude we owe to the editors of the

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“*Biologia*.” To Mr. Goodman, as to myself, has been accorded an unrestricted freedom in the expression of his views; and after fully acknowledging the assistance he has received on this side of the water, there are passages in the preface to his essay which may be taken to express a natural disappointment that the value of his work was not recognised, and its publication ensured in the land which he loves so well.

Such attempts as have previously been made to interpret American hieroglyphic inscriptions have been mainly directed towards the interpretation of the three or four Maya manuscripts or codices which alone have escaped destruction. Although Mr. Goodman has not failed to devote the most careful attention to that branch of the subject, giving years of study to the codices as well as to the Yucatec and Cachiqual Calendar systems, it is to the interpretation of what he terms the “*Archaic system*,” that is to say, the system of notation employed in the carved inscriptions found amongst the ruins of Palenque, Copan, Quirigua, Menché and Tikal—an almost untrodden field of research—that the present essay is devoted.

It will doubtless be disappointing to the general reader to learn that the greater part of the carved Maya inscriptions deal only with dates and the computation of intervals of time; but this is a fact which has gradually been forcing itself on the minds of students.

As Mr. Goodman says:—

“It may appear absurd, at first thought, that temples, monuments and altars should be covered with elaborately carved inscriptions that record nothing but dates and other forms of time reckoning. But a little reflection should convince one that such inscriptions, under certain conditions, would not be preposterous, but the wisest and most useful of records. A calendar is an indispensable requisite of civilisation. The very attempt to construct one is the first step towards evolution from savagery, and a completed calendar of any kind is proof that the transition has been accomplished.”

The work of constructing a satisfactory calendar system from the chaotic fragments of information which have come down to us, has been a work necessitating the most extraordinary patience and insight. Not only must such a system stand the test of application to the inscriptions which are already known, but it must be prepared to stand the further tests to which it will be continually submitted as hitherto undiscovered inscriptions are brought to light.

Of the methods employed by Mr. Goodman in the preparation of his calendar a slight sketch is given us, and he tells us how it was to the writings of Diego di Landa (A.D. 1566), the Bishop of Yucatan and arch-destroyer of Maya records, that he had finally to return as his only trustworthy guide.

It is impossible in a short notice even to touch on the numerous points which had to be considered in the preparation of the calendar tables which accompany Mr. Goodman's essay. The main factor is the concurrent use of two systems based, one on a year of 360 days, and the other on a year of 365 days.

The Chronological Calendar deals with the former system, the divisions of time being

20 days	...	...	...	...	1 Chuen.
18 Chuens	...	...	...	...	1 Ahau (360 days).
20 Ahaus	...	...	...	...	1 Katun.
20 Katuns	...	...	...	...	1 Cycle.
13 Cycles = 1 Great Cycle.					

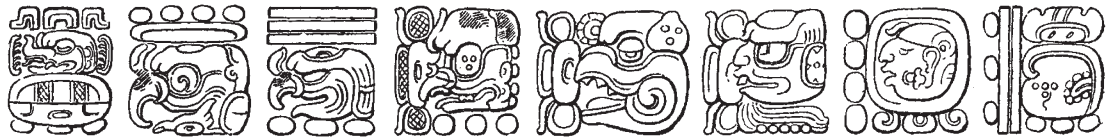
It is somewhat unfortunate that the Ahau, or period of 360 days, bears the same name as one of the twenty days of the Maya month, and in the same manner that the Chuen, or twenty-day period, is made to bear the name of another day of the month.

The Annual Calendar is divided into eighteen named

months, each of twenty named days, and one short month named Uayeb, of five days.

This Calendar repeats itself at the end of fifty-two years.

I called attention, some years ago, to the fact that the greater number of the carved inscriptions commenced with easily recognised series of glyphs with numerals or faces attached to them, which I called the Initial Series. Mr. Goodman now shows that the Initial Series expresses a date thus :—



1 (1) The Great Cycle sign. (2) The Cycle. (3) The Katun. (4) The Ahau. (5) The Chuen. (6) The Day. (7) The named day. (8) The named month.

As has been long known, each bar counts as five, and each dot as a unit. (The roundish marks *under* the glyphs are not part of the numerical series.)

The signs in front of the Ahau, Chuen and Day signs denote a "full count" of those periods. The date thus reads :—

54th	...	...	...	...	...	Great Cycle.
9th	...	...	...	...	...	Cycle.
15th	...	...	...	...	...	Katun.
"Full count"	...	...	...	...	...	Ahaus.
"Full count"	...	...	...	...	...	Chuens.
"Full count"	...	...	...	...	...	Days.
4 Ahau (day).					13 Yax (month).	

A reference to Mr. Goodman's chronological Calendar shows that the 15th Katun of the 9th Cycle of the 54th Great Cycle commences with the day 4 Ahau, the 13th day of the month Yax, the date which is here given in the inscription. The combination 4 Ahau 13 Yax can only occur once in a period of fifty-two years.

One of Mr. Goodman's discoveries is the system on which the Mayas numbered the different series of time divisions. For instance, the twenty Ahaus are not numbered 1, 2, 3, &c., up to 20, but they were numbered 20, 1, 2, 3, &c., to 19.

If we should nowadays wish to use a similar notation, we should probably number the series 0, 1, 2, &c., 19; but it seems as though the Mayas, having no sign for 0, wrote the sign for 20 or a "full count" of Ahaus in the first place.

The 18 Chuens are in like manner numbered 18, 1, 2, 3, &c., to 17; the same sign being used for a "full count" of Chuens as is used for a "full count" of Ahaus.

As a "full count" of days (twenty) is a Chuen, a "full count" of Chuens (eighteen) is an Ahau, and a "full count" of Ahaus (twenty) is a Katun. The foregoing inscription may be read thus :—

The 15th Katun of the 9th Cycle with no odd Ahaus, Chuens, or days added, begins with 4 Ahau 13 Yax.

Had the date been one including a specified number of Ahaus, Chuens, or Days, we should have had to make use of the Annual Calendar. Without giving examples and tables it is not easy to explain the method employed, which in practice is very simple, and almost invariably gives a satisfactory result; so that we can now locate in the Maya Calendar almost all the initial dates inscribed on the monuments, and many of those expressed in the body of the inscriptions.

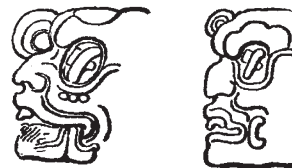
In the first chapters of the essay Mr. Goodman discusses each of the time periods used in the dates and

computations, and identifies the glyphs by which they are expressed in the carved inscriptions.

Next follows a chapter on the "Burner Period" (260 days) and the "Bissexile Count," and then a series of chapters on the signs employed to express numbers, in addition to the well-known dot and bar system. The most interesting of these chapters is that devoted to the "Face Numerals," in which it is shown that the face so frequently met with in the inscriptions in connection with Cycle, Katun, and other signs for time periods, are in

reality numerals, and the whole series of numeric faces from 1 to 20 is determined in some cases with certainty, and in others with a fair degree of probability.

The "face sign" for 10 is a death's-head, and it is interesting to note that some of the faces representing numbers from 10 to 20 are repetitions of the faces representing numbers from 1 to 10, with the addition of a death's-head jaw, or some other similar combination of 10 and the lesser numeral. Thus 6 is expressed by a grotesque face with a hafted stone axe in the eye.



And 16 is expressed thus—



the death's-head jaw replacing the more natural form of a jaw.

With the remaining chapters of this essay it is impossible to deal within the limits of this article; although the student may not always be able to agree with the conclusions arrived at, he will find an abundance of helpful suggestions. A table of signs is given which denote "the beginning"; numerous "directive" signs are distinguished, such as those indicating a reckoning "from the beginning of a cycle" "from the preceding date," &c., as well as "declarative" signs, such as "the beginning of a Katun," &c.

Then follow "Exercises in Decipherment" and "A Review of the Inscriptions"—that is, of those inscriptions of which drawings have already been published in the "Biologia Centrali Americana," and some others now in course of publication.

The essay is accompanied by a "working chart" in which the equivalent of each of the different time periods is given in days, and by a "Perpetual Chronological

Calendar"; also by a complete "Annual Calendar" for each of the fifty-two years of the Calendar round, and a complete "Chronological Calendar" for three great cycles. In these three great cycles all the dates as yet found in the inscriptions can be located; and, according to Mr. Goodman's theory of a Grand Era of seventy-three great cycles, these three great cycles are numbered the 53rd, 54th and 55th.

No doubt the first objection raised to the scheme will be the improbability of the Mayas having had a chronological system extending over 374,400 years, the number of years composing a Grand Era. And the objection will have all the more force, in that no such time period is mentioned by Landa or any other authority. Mr. Goodman says the Grand Era is a necessity to round off the various time periods on which the Mayas rested their computations. It does not appear to me that this would of itself necessitate a phenomenal antiquity for Maya civilisation, for the Mayas, like every other race, must have been confronted by the question, "When did time begin?" We ourselves have avoided the difficulty by taking a certain point of time, and reckoning forwards from it and backwards until we are lost in the mists of antiquity; but it must be remembered that it is only in the last few years that the date 4004 B.C. has disappeared as a marginal note from the first chapter of Genesis. Is it, therefore, impossible to believe that a people may have reckoned backwards to an imaginary beginning of time, fixed by a purely arithmetical calculation as the point when all the complicated time periods with which they were in the habit of reckoning could have started fair? How those time periods became so complicated, and needed such a vast stretch of time to work themselves out, is another matter—possibly it may have originated from the combination of various methods of reckoning time employed by different branches of the race. However, I must not start theorising on my own account, but refer the reader to the chapter on the "Era and Duration of the Archaic Maya Civilisation," where Mr. Goodman gives reasons for his belief in the great antiquity of Maya civilisation, and shows that between the earliest and latest dates recorded on the sculptures at Palenque there is a difference of 7082 years.

I am so fully aware of my own incompetence to deal with such an abstruse subject as the construction of Calendar systems, that I shall not venture on any critical review of Mr. Goodman's methods or conclusions; but I am glad to have an opportunity of saying that my acquaintance with Mr. Goodman and with his partner in his investigations, Dr. Gustav Eisen, commenced with a correspondence about the drawings of the inscriptions published in the "Biologia Centrali Americana"; and when I was afterwards able again to compare these drawings with the original sculptures, I found that the alterations of form suggested to me with regard to certain obscure and weather-worn minerals and glyphs had nearly always to be confirmed as correct. Then, as Mr. Goodman's methods became more familiar to me, I found myself constantly making use of the results at which he had arrived without any opportunity of acknowledging the source of my information. I was therefore urgent with him to publish the results of his researches, although he lingered fondly over his work, by no means considering it as yet complete.

Since commencing this article a photograph of a carved inscription, lately discovered on the banks of the Rio Usumacinta, has been forwarded to me from Yucatan by Mr. T. Maler. This inscription contains forty-eight glyphs. With the use of Mr. Goodman's tables I am able to locate (in the Maya Calendar) the date expressed in the inscription, and to follow five distinct reckonings to other dates—the reckoning made with the tables giving in every case the same result as that which is

expressed in the inscription—and can thus ascertain with certainty the meaning of twenty-two out of the forty-eight glyphs contained in the inscription.

ALFRED P. MAUDSLAY.

TWENTY YEARS OF INDIAN METEOROLOGY.

SOME years ago, when the Indian Meteorological Service was started, under the directorship of the late Mr. H. F. Blanford, F.R.S., he predicted that the Indian area would yield results second to none in importance in clearing up the mysteries which surround the working of atmospherical conditions. At that time the "Indian Meteorological Memoirs," designed to embody compilations and discussions of data in the spare time of the hard-worked officials of the service, were only just starting.

Six portly volumes of these Memoirs have now been completed since 1876; and, to judge from the character of their contents, and the evident growth of certainty and breadth of view with augmenting experience and improving data, Mr. Blanford's prediction is being fulfilled even more satisfactorily than he could have anticipated.

In 1883 a series of articles, by Mr. Archibald, appeared in NATURE, in which vol. i., containing the first twelve Memoirs, were reviewed at some length. Since that date five more volumes have appeared, containing papers by the late Mr. H. F. Blanford, F.R.S., Mr. Hill, of Allahabad, Mr. Frederick Chambers, Mr. John Eliot, F.R.S. (the present head of the department), Mr. Dallas, and Mr. Archibald. In some of these papers the phenomena dealt with, such as hot winds and special storms, are of purely local incidence. In others, conditions outside the Indian area and their variations over a long course of years are discussed. We shall in the present article direct our attention principally to the light thrown upon the latter in the more recent Memoirs. Before doing this, however, allusion must be made to a very important series of papers, which form a large proportion of these volumes, in which the normal diurnal elements are discussed at twenty-five observatories scattered over the entire Indian area.

The adequate presentation of such normals is of vital importance to the efficient work of the Meteorological Department. To estimate an anomaly or abnormal, we must manifestly be able to refer to a correct normal. One of the points early foreseen by Mr. Blanford, and continually insisted upon by his successor, Mr. Eliot, has been the accurate determination of normals for as many stations as possible over the Indian area. At these twenty-five selected observatories, not merely have the normal means been determined, but the diurnal variations in temperature, pressure, wind, cloud, &c., have been worked out most exhaustively with the guiding aid of the harmonic formula, and the critical epochs determined with no stint of labour by the aid of the analytical process known as Jelinek's method of approximation. The series began with Sibsagar, by Mr. Blanford, on June 16, 1882, and was completed by a special monograph on Calcutta, by Mr. Douglas Archibald, in the present year. The area represented by these observatories extends in longitude from Aden to Dhubri in Assam, and in latitude from Leh in Thibet to Trichinopoly in Southern India. Many valuable points in connection with diurnal variations have been determined and discussed; and if ever the vexed problem of the cause of the daily variation in atmospheric pressure is completely solved, it will only be by the aid of this valuable series of papers.

In the Calcutta Memoir, which has only just reached us, the discussion embraces the temperature, pressure, and humidity observations, registered autographically