FIELD MUSEUM OF NATURAL HISTORY

PUBLICATION 241

ANTHROPOLOGICAL SERIES VOL. XVII, No. 1

A CORRELATION OF THE MAYAN AND EUROPEAN CALENDARS

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CHICAGO, U. S. A.

January, 1927

PRINTED IN THE UNITED STATES OF AMERICA
BY FIELD MUSEUM PRESS

INTRODUCTORY NOTE

The correlation suggested in this publication was first proposed as long ago as 1905 by J. T. Goodman ("Maya Dates," *American Anthropologist*, New Series, Volume VII). At that time Goodman's correlation was unanimously rejected by his fellow students of Mayology. The chronicle of Oxkutzcab was then unknown, and the astronomical information contained both in the Dresden Codex and the monuments had not been worked out. The present contribution is offered, not in the sure conviction that the correlation is correct, but in the sincere belief that it bears more evidence of being the true correlation than others yet published. There is always the possibility that the Maya time machine had broken down before the arrival of the Spaniards, in which case a day for day correlation based entirely on astronomical evidence may eventually be accepted.

I should like to express my gratitude to Mr. T. A. Joyce of the British Museum, and Dr. S. G. Morley of the Carnegie Institution, through whose writings I first became acquainted with this fascinating subject.

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THE GENERAL PROBLEM

A day for day correlation of the Maya and European chronologies, providing the Maya day count continued to function unimpaired up to the time of the arrival of the Spaniards, must be based on two distinct and unrelated sets of evidence.

(1) The historical data supplied in the books of Chilan Balaam and the writings of the Spanish priests and conquistadores.

(2) The astronomical evidence contained in the monuments and the Dresden Codex.

Unfortunately the historical evidence is to a large extent contradictory, and the astronomical data have been translated in two different ways.

Correlations such as those of Bowditch and Morley have been based entirely on the historical data, and do not fit in with the astronomical evidence, whereas the correlations of Willson and Teeple based on astronomical evidence alone are utterly at variance with the historical evidence.

Spinden's correlation was based on historical evidence, but subsequently astronomical evidence has been interpreted to fit in with the historical correlation in a manner which the writer believes is not correct.

The present correlation is an attempt to reconcile the historical and astronomical data.

THE HISTORICAL EVIDENCE

The historical evidence is very fully dealt with by Morley in "The Inscriptions at Copan," and therefore it is not presented here again in full. The evidence although in places very conflicting indicates that a Katun 13 Ahau ended between 1536 and 1541. The amount of evidence actually favors 1536 as the date of the close of the katun, but the most reliable information indicates the year 1539. This reliable document is a page of the Chronicle of Oxkutzcab, a collection of titles, family papers, births, etc., of the Xiu family, who prior to the Spanish conquest were one of the ruling families of Yucatan, and in all probability the most

important family in the land. Along with these family papers is a page of historical information of the time of the conquest signed below by Don Jhoan Xiu, and the statement that the signer had copied it from "an ancient book, namely in characters as they are called, Anares." Morley has pointed out that Anares is probably the same as "Analtehes," a word used to describe hieroglyphic manuscripts.

The following is Gates' translation of this document. Dots represent places where the text is illegible.

Page 66 of the Chronicle of Oxkutzcab

153 . . The tun on 18 Yaxkin. The town was desolated because of the Maya dead in the year . . . .

. . . . 5 Kan being the year-bearer on Pop 1 . . . . ahau the tun on 7 Yaxkin.

1535 6 Muluc the year-bearer on Pop 1 . . . . . the tun on 11 Ceh.

1536 7 Ix the year-bearer on Pop 1, 3 ahau on 7 Yaxkin.

1537 8 Cauac on 1 Pop, when there died the rainbringers at Otzmal, namely Ahtz'un Tutul Xiu and Ahziyah Napuc Chi, and Namay Che and Namay Tun, and the priest Evan, ... men at Mani they were, rainbringers at Chichén Itzá then, and there escaped Nahau Veeh, Napot Covoh. On 10 Zip it took place, in 12 Ahau it was, the tun on 2 Yaxkin, that it may be remembered.

1538 9 Kan the year-bearer on Pop 1, when there happened a hurricane causing death. 8 Ahau the tun on 16 Xul.

1539 10 Muluc on Pop 1. 4 Ahau the tun on 11 Xul.

1540 11 Ix on Pop 1. 13 Ahau the tun on 7 Xul.

1541 12 Cauac on Pop 1. 9 Ahau the tun on 2 Xul.

1542 13 Kan on Pop 1 when the Spaniards founded the city Ti-Hoo [Merida] when they settled, and the tributes first began through those of Mani, and the province was established 5 Ahau on 16 Tzec.

1543 1 Muluc on Pop 1 when there died those of Tz'itz'omtun at the hands of the Spaniards in a battle, their captain being Alonso Lopez. 1 Ahau it happened on 11 Tzec.

1544 2 Ix on Pop 1. 10 ahau on 6 Tzec.

1545 13 Cauac on Pop 1, when began Christianity through the friars here in the town. These were the names of the fathers, fray Luis Villapando, fray Diego de Vehar, fray Juan de la Puerta, fray Mechor de Benabente, fray Julio de Herrera, fray Angel . . . . they founded at the city Ti-Hoo 6 Ahau the tun on 1 Tzec.

Now on the 29th of May in the year 1685 I have copied this from an ancient book, namely in characters as they are called Anares.

I, Don Jhoan Xiu.

Now changing the Christian years to correspond to the beginnings instead of the endings of the Mayan years, and correcting the month co-efficients and transferring them into the Old Empire style (i.e. 3, 8, 13, and 18 instead of 2, 7, 12, and 17) and making the correction of 13 Cauac to 3 Cauac, the following result is obtained:—

1532	4 Cauac was the year bearer. In this year ended the Tun	2 Ahau	3 Mol
1533	5 Kan	11 Ahau	18 Yaxkin
1534	6 Muluc	7 Ahau	13 Yaxkin
1535	7 Ix	3 Ahau	8 Yaxkin
1536	8 Cauac	12 Ahau	3 Yaxkin
1537	9 Kan	8 Ahau	18 Xul
1538	10 Muluc	4 Ahau	13 Xul
1539	11 Ix	13 Ahau	8 Xul
1540	12 Cauac	9 Ahau	3 Xul
1541	13 Kan	5 Ahau	18 Tzec
1542	1 Muluc	1 Ahau	13 Tzec
1543	2 Ix	10 Ahau	8 Tzec
1544	3 Cauac	6 Ahau	3 Tzec

We then find that our Katun 13 Ahau which ends some time between 1536 and 1542 is the Katun 13 Ahau 8 Xul which corresponds to 11-16-0-0-0 in the long count, and this will be taken as the basis of the correlation. If the Katun 13 Ahau did not end in 1539 then its positions in the long count would be either 12-9-0-0-0 13 Ahau 8 Kankin or 13-2-0-0-0 13 Ahau 3 Zotz. With these three possibilities and taking into account that 1 Pop fell on July 16th [O.S.] in Landa's typical year 1553, let us take up the astronomical evidence in the codices and on the monuments.[1]

THE VENUS CALENDAR

The fact that the Mayas reckoned the Venus years in groups of five, making 2920 days equal to 8 years of 365 days, and that these five-year

[1]The one-day shift. Some time in the course of the New Empire the month coefficient corresponding to any day sign dropped one place. That is, instead of a round number being, for example, 10 Akbal 1 Pop it became 10 Akbal 0 Pop. This change may have taken place in one of two ways either

(1)	or	(2)
9 Ik 0 Pop		9 Ik 0 Pop
10 Akbal 0 Pop		11 Kan 1 Pop
11 Kan 1 Pop		

That is, either a day of the month could have been repeated twice, or a day sign may have been dropped. The writer is inclined to favor the second method, as thereby the long count is less seriously affected. Acceptance of the second alternative means that Landa's typical year that commenced on 12 Kan 1 Pop would by old style have been 11 Akbal 1 Pop, and therefore 0 Pop fell on July 15th and not July 14th, as would happen if the first method was followed.

groups were further reckoned in groups of 65 Venus years equal to 104 years of 365 days, that is 5-5-8-0, exactly two calendar rounds, is too generally accepted to need discussion. The question that has to be solved is as to whether or not the Maya realizing that five Venus years equaled 2919.6 days and not 2920, took steps to correct this error, which at the end of a hundred Venus years would amount to eight days.

To Dr. John E. Teeple Mayologists owe a great debt of gratitude, for to him is due not only the discovery of the meanings of glyphs C, D, and E of the supplementary count, but also the method used by the Mayas to correct the Venus calendar. He has shown how the Mayas at the end of 61 years deducted four days, thus correcting the error, and that once in three hundred years an eight-day correction was made. The dates thus obtained by Dr. Teeple for the commencement of the Venus periods are as follows:—

9-4-17-8-0 1 Ahau 13 Kankin
9-9-16-7-0 1 Ahau 3 Yaxkin
9-14-15-6-0 1 Ahau 18 Kayab

Probably omitted 1 Ahau 8 Yax, to make an eight-day correction.

9-19-7-14-0 1 Ahau 18 Uo
10-4-6-13-0 1 Ahau 13 Mac
10-9-5-12-0 1 Ahau 3 Xul

Dr. Teeple then backs up his argument with two inscriptions from the monuments.

Altar K at Copan has a Venus tun sign instead of an introducing glyph and probably another Venus sign immediately after the date in Glyph 7. The date of this monument is 9-12-16-7-8 3 Lamat 16 Yax. Now this date is the end of the 37th Venus year after 9-9-16-7-0.

9- 9-16-7-0	1 Ahau 3 Yaxkin
3- 0-0-8	37 Venus years
9-12-16-7-8	3 Lamat 16 Yax

Again the wooden lintel in Temple C at Tikal gives the calendar round date 11 Ik 15 Chen, which it is generally agreed occupies the position 9-15-12-2-2 in the long count, and to quote Dr. Teeple, "In the immediately following glyphs is a statement that the Venus year ended in Kayab 24 days from a new moon day. Now the 10th year of our 1 Ahau 18 Kayab Venus calendar would have ended on 9-15-11-10-0 4 Ahau 18 Kayab, and the actual appearance of Venus might have been a day or two before at 16 or 17 Kayab. There was a new moon about

9-15-11-11-3, just twenty-four days after 17 Kayab, all of which at least is in agreement with our long count dates."

The writer now intends to bring forward further evidence which he believes will further confirm Dr. Teeple's interpretation of the Venus Calendar, and at the same time demonstrate that the Mayas subdivided the Venus year into eight periods of 73 days each. Again 73 is the only common factor of 365 and 584.

(1) Stela P at Copan opens with an Initial series date 9-9-10-0-0. In glyph B8 there is an Imix-Venus sign associated with a head and a hand, which probably represents Glyph C of the Supplementary series. The combined glyph seems to mean a Venus year began on the new moon day. Now the new moon before 9-9-10-0-0 fell on 9-9-9-16-11. According to the tables, a new Venus year should have begun on 9-9-9-16-8; that is, three days later. However, according to the correlation followed here 9-9-9-16-11 plus the equations 584285 equals the Julian date 1948656, which was actually four days after an inferior conjunction of Venus, the day when Venus first appeared to view.

(2) Altar R at Copan opens with the date 9-16-12-5-17 6 Caban 10 Mol, in glyph 16 is a Venus sign and following it in glyphs 20 and 21 is the date 7 Ahau 3 Zip which Morley places in the long count at 9-15-9-13-0. Now 6 Caban 10 Mol occurs on many monuments, but is nowhere else associated with the Venus sign, we can therefore presume that the Venus sign refers to 7 Ahau 3 Zip.

9-15-9-13-0 7 Ahau 3 Zip occurs three days before 8⅞ Venus years from 9-14-15-6-0.

(3) In the Dresden Codex the last picture of the lunar count represents Venus, and is associated with the date 9-17-17-14-6. This date is one day after 18 2/8 Venus years from 9-14-15-6-0.

(4) Stela J at Quirigua opens with the date 9-16-5-0-0 8 ahau 8 Zotz. In glyph C 1 8 ahau is repeated, and in glyph C3 occurs the Venus glyph and in glyph C 4 there is a secondary series of one uinal and 1 Kin subtracting this date 9-16-4-16-19 is reached. This is one day after 18 2/8 Venus years from 9-14-15-6-0.

(5) Stela K at Quirigua has a Venus sign in the introducing glyph. The initial series reads 9-18-15-0-0 followed by a secondary series 10 uinals and 10 Kins, and the date 10 c 18 Kayab that is 9-18-14-7-10 followed by a 5 spot glyph which it has been suggested is associated with Venus. This date is 48 6/8 Venus years from 9-14-15-6-0.

(6) Lintel 29 at Yaxchilan has a Venus introducing glyph followed by the Initial Series date 9-13-17-12-10, which is 3 days before 50⅛ Venus years after 9-9-16-7-0.

(7) Stela 24 at Naranjo has Venus glyph in introducing glyph. The closing date of the inscription is 9-13-10-0-0. This is one day more than 45⅜ Venus years from 9-9-16-7-0.

Finally two doubtful dates might be added to this list.

(A) Altar S at Copan opens with the date 9-15-0-0-0, followed by the statement 5 Katuns end of cycle 10, then in glyph 9 is a Venus sign. If this refers to 9-15-0-0-0 and not 10-0-0-0-0, it is one day after 2⅞ Venus years from 9-14-15-6-0.

(B) Temple 1 at Tikal has a Venus glyph associated with a day 6 Caban, which is usually considered to be 9-15-12-14-17 in the long count. Possibly 6 Caban is a mistake for 12 Caban occurring one uinal earlier. In that case the date would be one day before 10 6/8 Venus years from 9-14-15-6-0.

As the Venus year does not constantly run to 584 days, an error of three or four days either before or after the fixed date can probably be shown to be due to the vagaries of the year.

These dates combined with those already brought forward by Dr. Teeple seem to establish definitely that the Mayas did correct the calendar, that 9-14-15-6-0 was the end of a Venus year and that on that date Venus was either at inferior conjunction or on the point of emerging from the Sun's rays four days later.

THE LUNAR CALENDAR

The Dresden Codex seems to indicate that a lunar count began on the day 9-16-4-10-8 or a day earlier or later. Presumably the date of either a new moon or less likely a full moon and possibly an eclipse date. Dr. Teeple's elucidation of glyphs C, D, and E of the lunar series has established the fact that this date was actually the basis from which the lunar count was reckoned. Again there is the possibility that no intercalation took place and that the recorded new moons did not coincide with the actual appearances of the moon, but the evidence of the lunar count in the Dresden Codex and the Supplementary Series on the monuments definitely point to an adjustment of the calendar to fit the actual duration of the lunar period.

APPLICATION OF EVIDENCE TO THE DIFFERENT CORRELATIONS

We have thus four checks to apply to any correlation based on the assumption that the Maya calendar continued to function uninterruptedly from its inception till its extinction on the arrival of the Spaniards:—

(1) That a Katun 13 Ahau came to an end between 1536 and 1542.

(2) That the Mayan year in 1553 began on July 16th (Julian Calendar).

(3) That the date 9-9-9-16-8 was within two or three days of either an inferior conjunction or a heliacal rising of Venus four days later.

(4) That 9-16-4-10-8 or a day before or after was the date of a new moon, or a full moon, and possibly too the date of an eclipse.

Applying these tests if 13-2-0-0-0 equals the 13 Ahau of the conquest, then Landa's typical year would commence on the date 13-3-1-2-4, and the 13 Ahau Katun would end in 1532. The Mayan date 9-9-9-16-8 with the required Ahau equation of 394485 is some forty days short of a heliacal rising of Venus and 9-16-4-10-8 six days off a new moon date. Thus this correlation conflicts with the second, third, and fourth of our postulates.

If 12-9-0-0-0 equals the 13 Ahau of the conquest, then Landa's typical year would commence on the date 12-9-17-9-4, and the 13 Ahau Katun would end in 1536. The Mayan date 9-9-9-16-8 with the required Ahau equation of 489385 would fall some three hundred and fifty days after a helical rising of Venus, and eleven days after a new moon date. This correlation therefore, while in agreement with the second, conflicts with the third and fourth postulate.

If 11-16-0-0-0 equals the 13 Ahau of the conquest, then Landa's typical year would commence on the date 11-16-13-16-4, and the Katun of the conquest would end in 1539. The Mayan date 9-9-9-16-8 with the ahau equation 584285 falls one day after an inferior conjunction of Venus (Julian day 1948652) and three days before the heliacal rising of Venus. The Mayan date 9-16-4-10-8 with the ahau equation becomes the Julian date 1997133, a new moon date falling on November 8, A.D 755 (Julian).

Therefore this correlation and this alone fulfills the four conditions laid down, and is therefore the basis of this present correlation.

THE INAUGURATION OF THE CALENDAR

We have seen then that the date 9-9-9-16-8 9 Lamat 6 Cumhu was the date of either an inferior conjunction of Venus or a heliacal rising of that planet.

If the Venus calendar is now run back four hundred and fifty Venus years, and a correction of 4 days for every 61 Venus years, and four more days for the Complete 300 Venus years as indicated in the Dresden Codex is made, the date 7-13-0-0-0 10 Ahau 13 Pop will be obtained. This I believe was the date of the inauguration of the Venus calendar just two years after the inauguration of the solar calendar, which I

believe took place on the date 7-12-17-16-0 4 Ahau 8 Cumhu. Now this date is removed exactly 3016 years of 365 days from the mythical beginning of the world, and within less than a day of 3014 tropical years. In other words, the Mayas recovered both the actual calendar round date, and the same position in the tropical year by the following equation:—

7-12-17-16-0	4 Ahau	8 Cumhu	Aug. 13th, 99 B.C.
-58 Calendar Rounds			
13- 0- 0- 0-0	4 Ahau	8 Cumhu	Aug. 13th, 3113 B.C.

Surely this is the only reasonable explanation that has yet been offered for the choice of a day three thousand years before the inauguration of the calendar as the starting-point of Maya chronology.

Now the date 7-13-0-0-0, which we have seen there is reason to believe was the date of the formal inauguration of the Maya calendar, fell on 10 Ahau 13 Pop. The actual beginning of the year was therefore 7-12-19-17-7 10 Manik 0 Pop. In passing it might be noted that here is a possible explanation of the sign Manik. Manik is represented by a hand, which usually has the meaning of zero or completion. A zero sign would be very appropriate for the zero day of the Maya calendar. 7-12-19-17-7 10 Manik 0 Pop falls, according to the suggested correlations, on the Gregorian date Aug. 29th, 97 B.C. Now the Carnegie Expedition to Copan this year showed that the famous line of sight at Copan marks either the days April 12th or August 30th in the tropical year. Here possibly is an explanation: the line of sight was erected to indicate the day of the year that was the anniversary of the inauguration of the Mayan calendar. There is a reasonable possibility that the Mayas considered 1 Pop the New Year day. This certainly was the custom in Yucatan at the time of the Spanish Conquest. But a more probable explanation is that the interval from about 9-15-0-0-0 back to 7-13-0-0-0 is slightly over 800 years, and if the Mayas reckoned the year as 365.24 days, they would in reckoning back from the beginning of cycle nine consider August 30th as the 0 Pop of the year in which 7-13-0-0-0 10 Ahau 13 Pop fell, whereas by the Gregorian calendar, which reckons every 400th year a leap year, the date of this first 0 Pop had fallen to August 29th. A total eclipse of the sun visible all over Central America occurred on Julian day 1685880; that is, on 5 Men 8 Pop, five days before the official inauguration of the count, and within a day of the inferior conjunction of Venus with the sun, or the disappearance of Venus into the sun's rays. One can well imagine what an eclat such an event must have given the inauguration of the calendar, based as it was to such a large degree on the planet Venus.

The Maya year therefore at the inauguration of the calendar had as its equivalent in Christian dates the following points of the year:—

0 Pop	Aug. 29th	0 Mol	Jan. 16th	0 Muan	June 5th
0 Uo	Sept. 18th	0 Chen	Feb. 5th	0 Pax	June 25th
0 Zip	Oct. 8th	0 Yax	Feb. 25th	0 Kayab	July 15th
0 Zotz	Oct. 28th	0 Zac	Mar. 17th	0 Cumhu	Aug. 4th
0 Tzec	Nov. 17th	0 Ceh	Apr. 6th	0 Uayeb	Aug. 24th
0 Xul	Dec. 7th	0 Mac	Apr. 26th		
0 Yaxkin	Dec. 27th	0 Kankin	May 16th		

Now the meanings of the Maya months are for the most part obscure. Three only have straightforward translatable names that show any connection with the calendar. These are the months Xul, Yaxkin, and Kankin. Xul means "end," and Yaxkin means "new, strong or green sun." Now Xul, according to the proposed correlations, ran from December 7th to December 26th, and Yaxkin from December 27th to January 15th. In other words Xul marked the end of the seasonal year when the sun finished its journey southward, and Yaxkin marks the birth of a new year when the sun had turned on its course and was travelling northward once again. The word Kankin signifies yellow sun. Now this month fell in May and early June at the time of inauguration of the calendar. The sun at this time of the year is strong, and cloudy weather is uncommon, whereas in the following month Muan the rains occur, and the sun is often obscured for long intervals. According to the Pio Perez dictionary, the following month was known as Moan instead of Muan, and Moankin means a "showery or clouded day." Now Kin means "day" or "sun," therefore Moan means "clouded." The month Muan runs from June 6th to June 25th, and, as has been pointed out above, is a period of rainy weather, and is therefore very aptly named.

ARGUMENTS AGAINST THE CORRELATION

Dr. Morley, in his book "The Inscriptions at Copan," produces a number of arguments against the suggested correlation after admitting, to quote his own words, "No matter how seriously the archæological and historical (U Kahlay Katunob) evidence contradicts the correlation of the Long Count and Christian chronology indicated on page 66 of the Chronicle of Oxkutzcab, the fact remains that such a correlation was actually in use at the time of the conquest."

Dr. Morley's arguments against the correlation are as follows:—

"(1) If 11-16-0-0-0 13 Ahau 8 Xul be substituted for the Katun 13 Ahau of Napot Xiu's death, i.e. 13 Ahau 8 Kankin, it will be found that

the katun of the Chichen Itza lintel, namely 10-3-0-0-0 1 Ahau 3 Yaxkin, will fall some two centuries after Chichen Itza is said to have been abandoned, and after the Itza had moved to Chakanputun, and a century before Chakanputun is stated to have been abandoned, and the Itza had moved to Chichen Itza and established themselves there a second time. In short this correlation would make the Chichen Itza lintel date from a Katun 1 Ahau, in which the city is definitely stated to have been unoccupied.

"(2) If 11-16-0-0-0 13 Ahau 8 Xul be substituted for the Katun 13 Ahau of Napot Xiu's death, then Chichen Itza was discovered in 9-1-0-0-0- 6 Ahau 13 Kayab, a date actually prior to the earliest date at Copan, and earlier than all the Old Empire dates, save only the very earliest at Uaxactun and Tikal, clearly an impossible situation from the historic point of view, since it makes Chichen Itza the contemporary of Tikal, Copan, and the other Old Empire cities, instead of subsequent to them as was actually the case.

"(3) If 11-16-0-0-0 13 Ahau 8 Xul be substituted for the Katun 13 Ahau of Napot Xiu's death, then the opening entry of the U Kahlay Katunob . . . occurred in 8-7-0-0-0, at which time it may well be doubted whether the Maya had yet reached their historic habitat during the Old Empire, since the earliest date in that region, 8-14-10-13-15 on Stela 9 at Uaxactun, is a century and a half later.

"(4) The Central capstone of the outer chamber of the east range of the Monjas Quadrangle at Uxmal presents the following date: 5 Imix 19 Kankin falling in a tun 18 of a Katun 13 . . . . The only place where this date could occur within a range of several hundred thousand years was at 11-12-17-11-1. 5 Imix 19 Kankin or 3-2-6-19 earlier than 11-16-0-0-0 13 Ahau 8 Xul, or, according to the Oxkutzcab correlations of the two chronologies, in 1478. But by this latter date Uxmal had already been abandoned for more than 30 years; hence this correlation flatly contradicts the evidence furnished by this lintel.

"(5) The ring on the east wall of the Ball court at Uxmal presents the following date: 10 Ix 17 Pop in Tun 17 ending on the day 12 Ahau. The initial series corresponding to this date is 11-15-16-12-14. 10 Ix 17 Pop, or only 3-5-6 earlier than 11-16-0-0-0 13 Ahau 8 Xul, that is 1536 in the Oxkutzcab correlation. But by this latter date Uxmal had already been abandoned nearly a century, and the Spaniards had already made their first unsuccessful attempt to subjugate the country; hence this correlation flatly contradicts the evidence furnished by the inscription on this ring.

"(6) Finally, the South Column in front of the Sanctuary of the high priest's grave at Chichen Itza presents the following period ending

date 2 Ahau 18 Xul end of Tun 11. The only Tun 11 in a period of 18,707.70 years which ended on this date was 11-19-11-0-0 2 Ahau 3 Xul, or 3-11-0-0 later than 11-16-0-0-0 13 Ahau 8 Xul; that is, in 1609. But by this latter date Chichen Itza had already been abandoned for more than a century and a half, and in fact the whole country had been under the Spanish rule for 67 years. This is *reductio ad absurdum*, and compels the rejection of the Oxkutzcab correlation as the proper alinement of the long count with Christian chronology."

I am inclined to follow the opinion of Dr. Solis Alcala that two different tribal histories are interwoven in the Books of Chilam Balaam of Mani and Tizimin, the histories of the Xiu and the Itza, whereas the Chilan Balaam of Chumayel outlines only the history of the Itza. I further believe that a 13 Katun series has been interpolated, and that fighting around Mayapan only occurred once. It seems too much to believe that in a katun 8 Ahau Mayapan was invaded and fighting took place, that in the following Katun 11 Ahau Mayapan was again invaded and depopulated, and that a king Ulmil should again figure in the fighting, and that lastly on the following 8 Ahau Katun Mayapan should again be depopulated (Chilam Balaam of Mani). Furthermore the Chilan Balaam of Tizimin and Chumayel allege that the fighting at Mayapan just prior to the arrival of the Spaniards was due to the joint government. Now the joint government came to an end two hundred and sixty years previously if no Katun was interpolated, whereas if an interpolation is allowed, the fighting on the question took place at the end of the joint government. Therefore discounting for the interpolation and assigning the different movements of the Itza and Xiu to their proper order as indicated in the Chilan Balaam, the following tables are obtained:—

	HISTORY OF THE ITZA	GENERAL HISTORY	HISTORY OF THE XIU
11-16-0-0-0 13 Ahau		1539	
11-15-0-0-0 2 "		Smallpox	
11-14-0-0-0 4 "		Pestilence	
11-13-0-0-0 6 "		End of the war	
11-12-0-0-0 8 "	Itza abandon Chichen	Mayapan invaded by the Itza under King Ulmil.	
11-11-0-0-0 10 "			
11-10-0-0-0 12 "			
11-9 -0-0-0 1 "			
11-8 -0-0-0 3 "			
11-7 -0-0-0 5 "			
11-6 -0-0-0 7 "			

		HISTORY OF THE ITZA		HISTORY OF THE XIU
11-5 -0-0-0	9 "			
11-4 -0-0-0	11 "			
11-3 -0-0-0	13 "	Ah Mex Cuc King, landmarks taken from water (?)		
11-2-0-0-0	2 "	Itza returns to their homes (i.e. Chichen Itza).		Xiu found Uxmal (?)
11-1-0-0-0	4 "			
11-0-0-0-0	6 "	Itza houseless.		
10-19-0-0-0	8 "	Itza leave Champutun.		
10-18-0-0-0	10 "			Xiu found Uxmal (?)
10-17-0-0-0	12 "			Xiu settle at Champutun Chichen Itza destroyed Xiu leave.
10-16-0-0-0	1 "			
10-15-0-0-0	3 "			
10-14-0-0-0	5 "			
10-13-0-0-0	7 "			
10-12-0-0-0	9 "			
10-11-0-0-0	11 "			
10-10-0-0-0	13 "		Mayapan founded (?)	Xiu settle at Chichen Itza.
10-9-0-0-0	2 "			
10-8-0-0-0	4 "			Xiu discover Bakhalal.
10-7-0-0-0	6 "	Itza seize Champutun.		
10-6-0-0-0	8 "			Xiu set out from Nonoual.
10-5-0-0-0	10 "	Itza abandon Chichen Itza.		
10-4-0-0-0	12 "			
10-3-0-0-0	1 "			
10-2-0-0-0	3 "			
10-1-0-0-0	5 "			
10-0-0-0-0	7 "			
9-19-0-0-0	9 "			
9-18-0-0-0	11 "			
9-17-0-0-0	13 "	Pop put in order.		
9-16-0-0-0	2 "			
9-15-0-0-0	4 "			
9-14-0-0-0	6 "	Itza settle Chichen Itza.		
9-13-0-0-0	8 "			
9-12-0-0-0	10 "			

On the acceptance of this chronology the first three arguments of Morley's against the proposed correlation fall to the ground, and a large number, though by no means all, of the contradictory statements of the various Chilan Balaam are removed.

Turning now to the two dates which Morley states fall after the abandonment of Uxmal, I feel that the second date, as explained else-

where, is highly doubtful. Morley's interpretation requires that a missing day coefficient be supplied, that the broken sign following the *tun* sign be restored as an *ahau* sign, and finally that the coefficient of this sign be read as twelve, when it might be 12, 13, or 14.

Furthermore I am convinced that Uxmal was occupied, although no longer the Tutul Xiu capital, up to the time of the Spanish Conquest. Chichen Itza was certainly occupied after its abandonment by the Itza right up into Spanish times, as shown by various extracts from the Chilan Balaam of Chumayel.

Finally the last date, the date on the temple of the high priest's grave at Chichen Itza, I believe, has been wrongly translated for the following reasons:—

(1) There is no statement that a tun 11 ends on 2 Ahau 18 Xul; the statement reads, "Tun 11 ends on 2 Ahau."

(2) The fifth glyph appears to resemble the winged *cauac* sign with the coefficient 8 which would mean that 2 Ahau 18 Xul fell in a tun eight.

(3) If Morley's reading is correct, the old style month coefficient was still in vogue at Chichen Itza one hundred and thirty-four years after the new style had been introduced at Uxmal. Now Chichen Itza, as the religious and therefore astronomical and calendrical capital of the Mayas, was surely more likely to have been the first to introduce the change, and not have lagged behind. Furthermore, if the view that the change was due to Nahua influence be correct,—a view that Morley accepts,—surely the change would have occurred first at Chichen Itza, far and away the greatest centre of Nahua influence in Yucatan.

I suggest therefore as the reading of this text:—

2 Ahau 18 Xul occurring in a tun 8. Tun 11 ends also on 2 Ahau.

(2 Ahau 18 Xul 11-13-7-7-0, 2 Ahau 3 Kayab 11-13-11-0-0.)

Since the publication of "The Inscriptions at Copan" Morley has translated dates at Yula and the temple of the four lintels as 11-8-19-5-8 and 11-9-13-0-0. This date is on stylistic grounds alone surely too late. The glyphs appear to date from the period of the Initial series lintel at Chichen Itza. I suggest the following dates in the long count in place of Morley's readings: 10-2-12-1-8 9 Lamat 11 Yax followed by 10-3-13-0-0 1 Ahau end of Tun 13.

This date is an instance of the first date not falling in the tun that closes the reading,—a condition which Morley requires for his interpretation of the date of the High Priest's grave.

Thus we see that all the historical arguments against the correlation can be met. There remains the question whether at the time of the conquest a second or third calendar was in use. There is, as has been pointed out, considerable evidence indicating 1536 as the year in which the Katun 13 Ahau ended, and lesser evidence pointing to 1541 as the year in which this same Katun ended; but, as no correlation can be found which will bring them into line with the astronomical evidence while maintaining July 16th as the beginning of the Mayan year in 1553, we can safely reject them as being correct. There is always the possibility, however, that more than one calendar was functioning at the time of the Spanish Conquest, and that whereas the 13 Ahau 8 Xul correlation was the unbroken count maintained from cycle seven times, other counts had sprung up more recently, probably in the sixty odd years of disorder and anarchy following the fall of Mayapan.

THE CAAN-KIN-CABAN GLYPH

It has been suggested by J. H. SPINDEN[1] that this glyph has the meaning of an observation of the sun at the horizon. The bottom element is the Caban sign, which is generally accepted to signify the earth; the Kin element stands for the sun; and the third element, Spinden suggests, may be the glyph for the sky.

This glyph is found on a number of different monuments at Copan associated with the following dates. The equivalent positions in the Gregorian year, according to the suggested correlation, are given in parenthesis.

1	Stela 8	Copan	9-17-12-6-2	9 Ik	15 Zip	[March 24th]
2	Altar R	Copan	9-15-9-13-0	7 Ahau	3 Zip	[March 21st]
3	Reviewing Stand	Copan	9-17-0-3-0	8 Ahau	13 Zip	[March 26th]
4	Stela N	Copan	9-16-10-0-0	1 Ahau	3 Zip	[March 17th]
5	Altar L	Copan	9-16-11-0-5	2 Chicchan	3 Zip	[March 17th]
6	Altar Q	Copan	9-17-5-0-0	6 Ahau	13 Kayab	[Dec. 29th]
7	Stela 11	Copan	9-17-5-0-0	6 Ahau	13 Kayab	[Dec. 29th]
8	Altar 2	Copan	9-16-18-9-19	12 Cauac	2 Zac	[Sept. 22nd]
9	Altar D[1]	Copan	9-16-13-9-0	13 Ahau	8 Zac	[Aug. 30th]
10	Altar U	Copan	9-16-12-5-17	6 Caban	10 Mol	[July 1st]

It will be noted at once that the first five dates cluster around the spring equinox. Whereas the first and second are probably within a day, the other three dates are four or five days off, but it will be noted that the fourth 9-16-10-0-0 was a lahuntun ending and therefore a very

[1]Reduction of Maya Dates. Papers of the Peabody Museum of American Archaeology and Ethnology, Vol. VI, No. 4, 1926.

important approximation. The date 9-16-11-0-5 is three days short of the calendrical 22nd Venus year after 9-14-15-6-0, and is probably intended to mark both the spring equinox and the Venus year. Nos. 6 and 7 mark the hotun ending 9-17-5-0-0, a hotun approximation to the winter equinox. No. 8 marks the autumn equinox. No. 9 commemorates the introduction of the calendar. No. 10 is associated with the date 6 Caban 10 Mol falling on July 1st, and the connection is not at present apparent.

On Stela B at Copan following the initial series 9-15-0-0-0 4 Ahau 13 Yax in A 10, 11 and 12 are three glyphs which appear to be an expanded form of the Caan-Kin-Caban glyph. The second glyph bears a strong resemblance to the Kin variant.[1]

The third glyph is a sure Caban sign, and the first is in all probability the Caan glyph. The date in the tropical year of this initial series is August 21st. This may be an approximation to the 0 Pop August 29th of the inauguration of the calendar falling on the important ¼ cycle date.

The same date occurs on altar S at Copan, and in glyph 6 we find this same variation of the Caan-Kin-Caban glyph, this time occurring as two glyphs, the Kin to the left with the Caan and Caban to the right.

This, I believe, exhausts the Caan-Kin-Caban glyphs associated with decipherable dates at Copan.

TABLE OF ENDINGS WITH THE GREGORIAN EQUIVALENTS ACCORDING TO THE PROPOSED CORRELATION

					B.C.
13-0-0-0-0	4 Ahau	8 Cumhu	Aug.	13th	3113
7-0-0-0-0	10 Ahau	18 Zac	June	5th	353
7-12-17-16-0	4 Ahau	8 Cumhu	Aug.	13th	99
7-13-0-0-0	10 Ahau	13 Pop	Sept.	11th	97
					A.D.
8-0-0-0-0	9 Ahau	3 Zip	Sept.	6th	41
9-0-0-0-0	8 Ahau	13 Ceh	Dec.	10th	435
9-1-0-0-0	6 Ahau	13 Yaxkin	Aug.	28th	455
9-2-0-0-0	4 Ahau	13 Uo	May	16th	475
9-3-0-0-0	2 Ahau	18 Muan	Jan.	30th	495
9-4-0-0-0	13 Ahau	18 Yax	Oct.	17th	514
9-5-0-0-0	11 Ahau	18 Tzec	July	5th	534
9-6-0-0-0	9 Ahau	3 Uayeb	March	22nd	554

[1]See S. G. MORLEY, An Introduction to Maya Hieroglyphs, Fig. 34, c and d.

9-7-0-0-0	7 Ahau	3 Kankin	Dec. 8th	573
9-8-0-0-0	5 Ahau	3 Chen	Aug. 25th	593
9-9-0-0-0	3 Ahau	3 Zotz	May 12th	613
9-10-0-0-0	1 Ahau	8 Kayab	Jan. 27th	633
9-11-0-0-0	12 Ahau	8 Ceh	Oct. 14th	652
9-12-0-0-0	10 Ahau	8 Yaxkin	July 1st	672
9-13-0-0-0	8 Ahau	8 Uo	March 18th	692
9-14-0-0-0	6 Ahau	13 Muan	Dec. 3rd	711
9-15-0-0-0	4 Ahau	13 Yax	Aug. 22nd	731
9-16-0-0-0	2 Ahau	13 Tzec	May 8th	751
9-17-0-0-0	13 Ahau	18 Cumhu	Jan. 24th	771
9-18-0-0-0	11 Ahau	18 Mac	Oct. 11th	790
9-19-0-0-0	9 Ahau	18 Mol	June 28th	810
10-0-0-0-0	7 Ahau	18 Zip	March 16th	830
10-1-0-0-0	5 Ahau	3 Kayab	Nov. 30th	849
10-2-0-0-0	3 Ahau	3 Ceh	Aug. 18th	869
10-3-0-0-0	1 Ahau	3 Yaxkin	May 5th	889
10-4-0-0-0	12 Ahau	3 Uo	Jan. 20th	909
10-5-0-0-0	10 Ahau	8 Muan	Oct. 7th	928
10-6-0-0-0	8 Ahau	8 Yax	June 24th	948
10-7-0-0-0	6 Ahau	8 Tzec	March 12th	968
10-8-0-0-0	4 Ahau	13 Cumhu	Nov. 27th	987
10-9-0-0-0	2 Ahau	13 Mac	Aug. 15th	1007
10-10-0-0-0	13 Ahau	13 Mol	May 2nd	1027
10-11-0-0-0	11 Ahau	13 Zip	Jan. 17th	1047
10-12-0-0-0	9 Ahau	18 Pax	Oct. 4th	1066
10-13-0-0-0	7 Ahau	18 Zac	June 21st	1086
10-14-0-0-0	5 Ahau	18 Xul	March 8th	1106
10-15-0-0-0	3 Ahau	18 Pop	Nov. 23rd	1125
10-16-0-0-0	1 Ahau	3 Muan	Aug. 10th	1145
10-17-0-0-0	12 Ahau	3 Yax	April 28th	1165
10-18-0-0-0	10 Ahau	3 Tzec	Jan. 13th	1185
10-19-0-0-0	8 Ahau	8 Cumhu	Sept. 30th	1204
11-0-0-0-0	6 Ahau	8 Mac	June 17th	1224
11-1-0-0-0	4 Ahau	8 Mol	March 4th	1244
11-2-0-0-0	2 Ahau	8 Zip	Nov. 21st	1263
11-3-0-0-0	13 Ahau	13 Pax	Aug. 8th	1283
11-4-0-0-0	11 Ahau	13 Zac	April 25th	1303
11-5-0-0-0	9 Ahau	13 Xul	Jan. 10th	1323
11-6-0-0-0	7 Ahau	13 Pop	Sept. 27th	1342
11-7-0-0-0	5 Ahau	18 Kankin	June 15th	1362

11-8-0-0-0	3 Ahau	18 Chen	March 2nd	1382
11-9-0-0-0	1 Ahau	18 Zotz	Nov. 17th	1401
11-10-0-0-0	12 Ahau	3 Cumhu	Aug. 4th	1421
11-11-0-0-0	10 Ahau	3 Mac	April 21st	1441
11-12-0-0-0	8 Ahau	3 Mol	Jan. 6th	1461
11-13-0-0-0	6 Ahau	3 Zip	Sept. 23rd	1480
11-14-0-0-0	4 Ahau	8 Pax	June 10th	1500
11-15-0-0-0	2 Ahau	8 Zac	Feb. 25th	1520
11-16-0-0-0	13 Ahau	8 Xul	Nov. 13th	1539
11-17-0-0-0	11 Ahau	8 Pop	July 31st	1559
11-18-0-0-0	9 Ahau	13 Kankin	April 17th	1579
11-19-0-0-0	7 Ahau	13 Chen	Jan. 2nd	1599
12-0-0-0-0	5 Ahau	13 Zotz	Sept. 20th	1618
12-16-0-0-0-	12 Ahau	18 Muan	Feb. 15th	1934

APPLICATION OF THE CORRELATION TO PLANETARY DATES

Six dates from the Dresden Codex were converted into their Julian equivalents by the addition of the Ahau equation 584285 and submitted to the U. S. Naval Observatory.

The dates were:

Long Count	Julian Equivalent	Supposed Planet
9-19-7-17-7	2019952	Mars
9-18-0-12-9	2010134	Mars
8-16-14-11-5	1856750	Jupiter
8-16-14-9-3	1856708	Jupiter
9-13-10-15-14	1977799	Saturn
9-19-7-2-14	2019659	Saturn

The following information was received from Captain W. S. Eichelberger, U. S. Navy, Director of the Nautical Almanac:—

"Calculations have been made in this office with the data provided by you, using the tables of Dr. Paul V. Neugebauer, with the following results:—

Julian Day	Sun's Long.	Planet	Hel. Long.	Hel. Lat.
2019952	43.2°	Mars	240.1°	−0.6°
2010134	84.8	Mars	143.0	+1.8
1856729.7	82.1	Jupiter	262.1	0.0
1977799	253.8	Saturn	14.7	−2.5
2019659	112.2	Saturn	335.2	−2.0

Julian Day	Geoc. Long.	Geoc. Lat.	Right Asc.	Decl.
2019952	270.3°	−1.6°	270.3°	−25.2°
2010134	121.5	+1.3	124.1	+21.2
1856729.7	262.1	0.0	261.4	−23.3
1977799	9.1	−2.7	9.4	+ 1.1
2019659	339.7	−2.2	342.1	−10.0

"For the two dates given for Jupiter in your letter has been substituted a single date mid-way between the two; and this proves to have been a date of opposition; which occurred on Julian Day, 1856729.7."