NOTE

ON THE

ANCIENT MEXICAN CALENDAR SYSTEM

BY

ZELIA NUTTALL.

COMMUNICATED
TO THE TENTH INTERNATIONAL CONGRESS OF AMERICANISTS.

STOCKHOLM
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PREFACE.

When I communicated the results of my investigations of the Ancient Mexican Calendar System to the International Anthropological Congress at Chicago, August 1893, I announced their speedy publication by the Peabody Museum, Harvard University, Cambridge, Mass.

It was then my intention to publish my communication as it stood and I forwarded it to the Salem Press without delay. When, after some weeks, I received the proof-sheets and read them through, I realised the serious drawbacks of publishing as a permanent memoir a paper originally intended for a spoken address to a Congress. The necessity of making this as short as possible had obliged me to treat certain points of the intricate subject superficially and to omit desirable references to the writings of previous investigators.

I saw that I would be doing an injustice to my subject and to myself were I to publish, in permanent form, the bare outlines of an investigation that I could not even regard as terminated. For I had not come to any definite conclusion regarding several obscure problems and could only hope to do so after a prolonged and close research.

With Prof. Putnam's kind approval I decided to delay my publication until I had completed my investigations satisfactorily.

I returned my revised manuscript to Cambridge in February, but then an unexpected delay of several months

occurred in the printing of proof-sheets. This delay has proved to be of utmost value to me, for it afforded me leisure to continue and extend my researches.

The results I have recently gained are of such definite interest that I am tempted to submit them to the International Congress of Americanists as my complete work is in press and is not likely to appear for several months.

In presenting these results I am somewhat at a disadvantage, for I am not able to refer my readers to the 4 large and 10 small analytical tables of the Mexican Calendar System, that accompany my publication. Nor am I able to discuss the opinions of previous writers as thoroughly as in my work.

On the other hand the results I desire to make known are solid facts that, to a great measure, explain themselves and can be readily verified.

I am therefore encouraged to present them, in as plain and brief a manner as possible, on the present memorable occasion.

It is a well-known fact that the Ancient Mexican Calendar System was based on a combination of 20 day signs with numerals ranging from 1 to 13. The ritual year of 260 days contained every possible combination of 20 and 13 and formed therefore an unit. An unbroken series of such units formed the ground-work of the Solar Calendar. Among the 20 day-signs there are four that are known as year-symbols, the years being invariably named after them in rotation. The reconstruction of the Calendar System that I exhibited at the Huelva Meeting of the Congress and at the Madrid and Chicago Expositions, constituted a demonstration of the harmonious results obtained when the solar year was made to commence on a day bearing its symbol and number.

I based my reconstruction on the following distinct statement contained in the Anonymous Ms. of the Biblioteca Nazionale, Florence: "The year always begins with one of four day-signs and takes its name accordingly. When it begins on a day Acatl the year is named Acatl, when it begins on Tecpatl the year is named Tecpatl, and so on." Boturini and Veytia likewise record this order of days, but not one of these three authorities mentions any connection between the numeral of a year and that of its first day.

As far as I know Sigüenza is the only one to state that "the year must always begin on a day of its number." This authority is quoted by Orozco y Berra, Historia Antigua de Mexico, vol. II p. 54.

While my reconstruction exemplified both of the above rules relating to day-signs and numerals it taught me that what I will term the law of concordant numeration was the prime factor in producing a methodical and harmonious development of the system.

Thus the year 1 Acatl, for instance, beginning with a day 1 acatl, naturally divided itself into 4 quarters headed by a day numbered 1. After 365 days the day 2 tecpatl began the year II Tecpatl that contained 4 quarters headed by days numbered 2. Moreover by beginning a count of solar years on the day 1 acatl and allowing it to develop itself according to the laws of the system, a Great Epoch of 1040 years is formed, containing 20 cycles of 52 years, each beginning with a day and year numbered 1.[1]

Impressed though I was with the harmony and plausibility of the method of beginning a year with a day of the same name I nevertheless realised that the mass of authentic evidence established the employment of a solar Calendar in which the years Acatl, Tecpatl, Calli and Tochtli, began respectively on days Cipactli, Miquiztli, Ozomatli and Cozcaquauhtli. This order is recorded by Sahagun, Duran, Gama, Humboldt, Ramirez, Orozco y Berra and Chavero who remarks (Anales del Museo Nacional II p. 245) that it is observed in the Vatican, Borgian and Telleriano Remensis Codices and is adopted by their interpreters, Fabregat, Rios and others.

Having duly tested and examined the evidence of the foregoing authorities and found it as firm as that maintaining the employment of the first method I was forced to conclude that both methods must have been used. In my endeavour to account for the existence of two orders of days I was inclined to believe, at an early stage of my

[1] In his valuable contribution: Ensayo sobre los simbolos cronograficos de los Mexicanos, Anales del Museo Nacional, vol. II, p. 346. Señor Francisco del Paso y Troncoso first demonstrated that the period of 1040 years was the natural outcome of the Mexican Calendar System.

investigation, that the Calendar had served in a demotic and an hieratic form. But recent researches lead me to the firm conviction that one method was as much the natural outgrowth of the system as the other and that both were employed, in turn. Before proceeding to present the facts upon which I base my conviction, I must state that it differs widely from the views of recent writers on the subject who advocate the employment of one method only.

The distinguished Mexican historian, Orozco y Berra maintained that the years began with the days: cipactli, miquiztli, ozomatli and cozcaquauhtli, and he demonstrated that the year III Calli (A. D. 1521) must have begun with the day 2 ozomatli and the month Itzcalli at a date corresponding to January 30th.

On the other hand Dr. Ed. Seler, in a recent publication[2] denounces Orozco y Berra's views as erroneous and states his belief that the years began on days of the same name only. His final conclusion is: "that the Mexican year took its name from the first day of its fifth month!" and that the year III Calli, for instance, began with the month Atlacahualco on a day 1 Calli, corresponding to February 12th.

While both of these investigators were equally justified in respectively upholding the employment of both orders of days it is remarkable that neither of them seem to have recognised the fundamental law of the system requiring that the number of a year and of its first day should be identical.

In my reconstruction according to Order I, in which the year begins with a day of the same name, the importance of the numerals as factors in regulating the succession of years and cycles is apparent. The same results are obtained by observing concordant numeration in Order II, as exemplified on the accompanying plate to which I now refer.

[2] Die Mexikanischen Bilderhandschriften . . . in der königlichen Bibliothek zu Berlin . . . Berlin 1893, p. 20.

In the first case the year I Acatl, beginning on a day 1 Cipactli is found to hold, in the centre, a complete ritual year beginning with the day 1 Acatl. It is preceded and followed by a period of 4×13 = 52 days and forms, so to speak, the kernel of the solar year. The years II Tecpatl, beginning with a day 2 Miquiztli and III Calli, beginning with 3 Ozomatli, respectively enclose ritual years beginning with 2 Tecpatl and 3 Calli, and so on. Now as it is well known that in Ancient Mexico the religious festivals and observances were regulated by the ritual year, it is extremely significant to find that there was a definite connection between the name of the solar year and of the first day of the ritual year it enclosed.

What is more, the solar year divides itself into four quarters beginning with days bearing the numeral of the year, a point to which I will revert.

Having verified these striking and significant facts on my tables, I next determined the date, according to our Almanach, of the day that the system itself seemed to designate as the first of the year. In order to do this it was merely necessary to refer to the historical dates that were recorded by Spanish and Mexican historians according to their respective Calendars. The best known of these, the date of the surrender of the last Mexican ruler, the unfortunate Quauhtemoc, was first adopted by Orozco y Berra and then by Dr. Ed. Seler as a starting point for their widely divergent investigations and conclusions.

According to Spanish historians the event took place on August 13th 1521 (Julian Calendar). Chimalpahin and Sahagun relate that it occurred on the day 1 Coatl, in the month Tlaxochimaco, year III Calli.

With an Almanach in hand it can be easily verified that if the day 1 Coatl corresponded to August 13th, the day 3 Ozomatli corresponded to March 11th (Julian Calendar) and consequently, with the vernal equinox.

It is scarcely necessary to recall the well-known fact that, at the time of the Gregorian reformation in 1582, the Julian Calendar had gained 10 complete days upon the equinox since A. D. 325, when the Council of Nice was held. During the 16th century, therefore, before 1582, the vernal equinox corresponded sometimns to the 10th but generally to the 11th of March. After the Calendar had been reformed by the suppression of 10 days, March 21st was adopted as the fixed date of the equinox. It may be well to state here that A. D. 1520 was a leap-year, consequently 1519 and 1521 were ordinary years and coincided in length with the Mexican year. It was a striking fact that the day 3 Ozomatli that I had reason to look upon as the first of the year III calli should correspond to the period of the vernal equinox. But this did not acquire its full importance until I had connected it with the following statement contained in a curious old chronicle dated 1547 and known as the Codex Fuenleal:[3]

"They reckoned the year from the equinox in March, when the sun casts a straight shadow, and as soon as it was observed that tho Sun began to rise they counted the first day. And from the day of the equinox they counted the days for their feasts and thus the feast of bread, in commemoration of the birth of Huitzilopochtli, occured when the sun was in its decline and in the same way the other festivals (were counted)."

Nothing could seem more natural and plausible than that the Mexicans, who are known to have been Sun-worshippers, should have dated the commencement of their solar year from the vernal equinox and held festivals to celebrate other marked periods of its course. But, strange to say, with the single exception quoted above, the Sun as a factor in regulating the solar Calendar, has been entirely ignored by all writers on the subject down to the present day.

[3] Published in the Anales del Museo Nacional, vol. II p. 85.

The accompanying list of the dates assigned to the commencement of the Mexican year by the best authorities, will show the variety of opinions held:

January 1.	MS. attributed to Olmos.
„ 9.	Gama, Humboldt.
„ 30.	Orozco y Berra.
February 2.	Sahagun, Torquemada, Veytia, Vetancourt, Fray Martin de Leon.
„ 12.	Dr. Ed. Seler.
„ 24.	Interpreters of the Vatican and Telleriano-Remensis Codices.
„ 26.	Acosta and Clavigero.
March 1.	Duran, Valades, Anonymous Author of the Biblioteca Nazionale MS. and Motolinia.
„ 20.	Ixtlilxochitl.

Referring the reader to the works of these writers containing their reasons for fixing upon these dates, I will but remark that the majority of them were influenced, in doing so, by their views as to which of the native months was the first of the year.

Sahagun is a notable exception. Writing in 1577, he relates that he had at some previous time, assembled a number of the oldest and wisest Indians at Tlatelolco and confronted them with the most able of the Spanish collegiates in order to discuss the Ancient Calendar system. "After spending many days in altercation they finally concluded that the Mexican year began at a date corresponding to February 2nd." Sahagun further states, however, that he had observed great discrepancies in the testimony that he had collected in different localities. In some he was informed that the native year began in January, in others on the 1st of February, in other places he was told that it began in March.

It is much to be regretted that absolutely no clue is furnished to the reasons that influenced the Spanish collegiates and native elders to decide that the Mexican year

began on Feb. 2nd. It is evident that the matter must have seemed a complicated and difficult one since many days had to be spent in discussion and altercation before any conclusion was reached. It is improbable that any of the old priest-astronomers should have been among the converted Indians present at the consultation, for the privileged ruling caste had been the first to perish in the Conquest. The secrets of the Calendar system had been rigidly guarded by the initiated and the Anonymous Friar, quoted by Sahagun, records that "the Indians who knew the secrets of the Calendar taught or revealed them to very few, for through their knowledge they gained their livelihood and were esteemed as wise and learned men. Now although nearly all adult Indians knew the correct name of the year, of its number and symbol, it was only these master calculators who knew the many secrets and counts that the . . . . calendar contained." All matters considered it is admissible to question the value of the Tlatelolco decision, for it would seem as though the native elders assembled had exemplified an ancient proverb: "Those who spoke, knew not and those who knew, spoke not." Again, in their case, no hint is given of a connection between the solar Calendar and the marked periods of the Sun's course.

Upon close examination some of the dates on the list given above prove to harmonise with my demonstration that the year III Calli and the year preceding it began March 11 (Julian Calendar) and the statement by the author of the Fuenleal Codex, that the Mexicans dated their solar year from the vernal equinox.

In order to demonstrate this agreement I must revert to the accepted fact that the Mexicans employed the vague solar year in their Calendar and rectified retrogression at the end of 52 years by adding a group of 13 days. As bissextile intercalation was employed in the Julian Calendar it is evident that a divergence at the rate of one day every four years would necessarily occur in any simil-

taneous count of Mexican and Julian years. The fact that the year III Calli began on a day corresponding to the vernal equinox enables us to determine that the year II Acatl, the first of the Cycle, must have begun three days after the vernal equinox, a fact I will discuss later. On the other hand the first day of the 52nd year of the cycle would correspond to March 1 and fall 10 days before the vernal equinox. It is recorded that as the Spaniards had subjugated and occupied Mexico in 1559 no celebrations were held in that year at the beginning of the new Cycle, according to the ancient custom. The native Calendar was not adjusted to the equinox in that year, as formerly, and consequently the divergences between the Mexican year, the equinox, and the Julian Calendar went on increasing proportionately.

Thus when Duran, Motolinia, Valades and the Anonymous Author of the B. N. MS. state that the Mexican year began on March 1, they were perfectly right-but this date held good for 1546—1550 only. From 1550—1554 the Mexican year began on Feb. 29 or 28, from 1562—1566 on Feb. 25 and so on. It must also be borne in mind that the reformation of the Julian Calendar by the suppression of 10 days took place in 1582 and that the different dates on the list above were partly assigned according to the Julian and partly according to the Gregorian Calendars.

Ixtlilxochitl, the native historian, who died in 1648, naturally recorded the date March 20 according to the Gregorian Calendar — it reads March 10 in the Julian Calendar and coincides, in either case, with the period of the equinox.

I think that I have sufficiently demonstrated the fruitlessness of all attempts to connect the Mexican New Year's Day with a fixed date of our Calendar. For its relation to this and to its own Calendar was subject to respective changes by the shifting of a day every four years. But while I have exposed the doubtful value of

the fixed dates assigned by various writers I have also shown that those given by the reliable authorities: Duran, Motolinia, Ixtlilxochitl, Valades and the An. Author of the B. N. MS. connect the commencement of the year with the vernal equinox. Further evidence corroborates this connection, moreover Senor Troncoso (op. cit.) has amply proven that the Mexicans were acquainted with the use of the gnomon. He also quotes the following extremely interesting though somewhat confused passage from the MS. Historia de los Indios by Padre Motolinia. "The festival or month Tlacaxipehualiztli, in honour of Tezcatlipoca, fell when the Sun occupied the centre of Huitzilopochtli, who was the equinox. Because it (a statue or column?) was slightly crooked, Montezuma wished to fell it and have it straightened."

The same writer further states: "At the time when the Spaniards entered and conquered New Spain the natives began their year at the commencement of March: but as they did not employ bissextile intercalation their years and months are subject to variation."

In the Biblioteca Nazionale MS. the description of the feast Tlacaxipehualiztli is accompanied by the date: March 21, a fact that further connects this festival with the vernal equinox. Gomara, Gemelli Careri and Diego Valades state that it was the first of the year, but Sahagun, Duran, Torquemada, Betancourt, Fray Martin de Leon, Rios and Clavigero agree that the year began with the previous month Atlacahualco or as it is also named, Quahuitleloa or Xilomaniztli.

Both views are compatible, for supposing that the cycle and its first year began with the vernal equinox on the first day of Tlacaxipehualiztli it naturally followed that the first day of the vague solar year would gradually recede from this date and fall in Atlacahualco. Indeed after the fourth year of the cycle the years would always begin in this month until the intercalation of 13 days, at the end

of 52 years would adjust New Year's Day to Tlacaxipehualiztli.

Let us next consider the fixed order of months as given by Sahagun, collated with Gama and the Anon. Author of the B. N. MS. —

Sahagun.	Gama.	Anon. Author.
I. Atlacahualco Quauitleloa.	Xilomaniztli.	Xilomaniztli Alcauale.
II. Tlacaxipehualiztli.		
III. Tozoztontli.		
IV. Hueytozoztli.		
V. Toxcatl.		
VI. Etzacualiztli.		
VII. Tecuilhuitontli.		
VIII. Hueitecuilhuitl.		
IX. Tlaxochimaco.	Miccailhuitontli.	Miccailhuitontli.
X. Xocohuetzi.	Miccailhuitl.	Miccailhuitl.
XI. Ochpaniztli.		
XII. Teotleco.	Pachtli.	Pachtli.
XIII. Tepeilhuitl.	Hueypachtli.	Hueypachtli.
XIV. Quecholli.		
XV. Panquetzaliztli.		
XVI. Atemoztli.		
XVII. Tititl.		
XVIII. Itzcalli.		

It is generally assumed that each of these 17 "months" contained 20 days, that the eighteenth had 25 and that these periods had special names just like our months.

My investigations lead me to believe that this was not exactly the case.

According to Sahagun's own statements[1] "the divisions of the year arose from the custom of dedicating to each deity a period of 20 days during which feasts and sacrifices occurred in his honor. But there were two months during which four deities were feasted, ten days being dedicated to each. Thus, although there were 18 months, 20 feasts were celebrated."

[1] op. cit. ed. Bustamante p. 338.

This being the case it is evident that none of the above lists are complete, since each gives the names of 18 instead of 20 festival-periods.

A clue to the names and positions of the two missing festivals is perhaps furnished by the circumstance that the three lists united, assign four names to months IX and X and four names to months X and XI. At the same time it must be noted that several months, the first for instance, are known to have been designated by several names. It is therefore impossible to venture an opinion on this intricate subject without going further into details than I can at present. It suffices for my purpose to show that, contrary to the current view, the Mexican year contained not 18 but 20 festival-periods.

Reference to Sahagun's and Duran's descriptions[5] of the festivals reveals the irregularity with which they fell in their respective fixed periods. Indeed in an appended note, Sahagun himself states that these feasts were only in so far fixed, that they alway occurred during the "month" or a day a two before it. He adds that there were moveable feasts that were regulated by the cycle of 260 days and that these varied and fell in a different month each year.

Referring to Sahagun's list of the moveable feasts "that usurped the places of some of the Calendar festivals in some

[5] Thus Sahagun records that in Months I, XIII and XVII the festival was celebrated during the month.

In Months II, III, IV, V, VI? on first day.

In Months VIII, XIV and XVIII on tenth day.

„ „ IX two days previous.

„ „ XI five days previous to this all the festivaties of the tenth month ceased. After its beginning certain ceremonies were observed for eight days, making thirteen days in all, after which another feast occurred, lasting four days.

„ „ XII Festival began on fifteenth day. The great festival of the month was held on eighteenth and nineteenth days.

„ „ XV Second, ninth and sixteenth days.

„ „ XVI Sixteenth and last days.

years as sometimes happens with us", we find that the first given is in honor of the Sun and invariably fell on the day 4 Ollin, a day-sign symbolising the "4 movements of the Sun."

We further learn that on each day 1 Acatl a great festival was held in honor of Quetzalcoatl. On the days 1 Miquiztli and 2 Coatl Tezcatlipoca was feasted.

The day 1 Tecpatl was dedicated to Huitzilopochtli and 1 Itzcuintli to Xiuhtecuhtli, the god of fire, or of the year. On the latter day they also "held the elections of their chieftains . . . and decided upon wars against their enemies." As Sahagun describes the feast 1 Quiahuitl twice, his list actually consists of 13 moveable festivals. Besides these he describes the great feast held every four years on a fixed day and another held every eight years, previous to which a fast of eight days was observed.

Padre Duran's Historia de las Indias de Nueva Espana contains an extremely important chapter on the native Calendar, dated 1579. It shows that Sahagun's list of 13 moveable feasts was incomplete for, "in order to honor each of" "the 20 days-signs the first day of each period of 13 days" "was observed as a solemn feast like Sunday. When the" "same day occurred twice in the year it was not observed" "the second time."

This being the case it is but logical to infer that the series of such festivals in the year 1 Acatl, for instance, began with the day 1 Acatl and were concentrated in the central ritual year, each festival occurring on a day combined with number 1. When the same day recurred before or after this ritual year it was not celebrated in the same way. On the other hand the first and twentieth day of each Calendar festival were specially solemnised and "many feasts had what was an equivalent to the octaves" of the Catholic church festivals.

A most important and little known feature of the ancient Calendar system is recorded by Duran. He states

that on the first day of each period of 20 days in the solar year a complete rest from all manual labor was rigorously enforced, so much so that "all houses had to be swept and all food prepared and cooked on the previous day."

Accordingly, in the year 1 Acatl on my table, each day of the sign Cipactli would be a day of rest, in the year 11 Tecpatl each Miquiztli day and so on.

Duran likewise relates that an old woman who had formerly been a priestess and enjoyed a reputation for wisdom, had drawn his attention to the curious fact that the most important of ancient native festivals used to be held at the same times of the year as Easter, Corpus Christi and Christmas. She pointed out further coincidences of the kind but the friar, unfortunately, does not record them. From the testimony of this ex-priestess it is not difficult to gather that the principal feasts of the native year coincided with the equinoxes and solstices.

Duran remarks (p. 155) that Tlacaxipehualiztli was the first feast of the native Calendar and fell on March 21. He laments that it seriously interfered with the celebration of Easter, as it was difficult to discriminate which of the festivals the Indians were observing. The above and foregoing testimony suffices to establish Tlacaxipehualiztli as the feast of the vernal equinox and the first religious festival of the year.

The festival Toxcatl is designated as the fourth and greatest of all festivals of the native Calendar and it presumably corresponded to Corpus Christi and began in May. Its 20th day was the climax of the festival and coincided with the summer solstice. An idol or image of Huitzilopochtli was solemnly borne in procession around the courtyard of the great temple on the 20th day and, "with uplifted arms the participants implored the Sun for water, for it always happened that there was a scarcity of water at this time of the year." On this day, every fourth year, prisoners were sacrificed at mid-day.

The above and further fragmentary evidence that I cannot attempt to include in this brief sketch, definitely establishes the connection between the festival Toxcatl and the summer solstice, and it is extremely interesting to note that it was considered the greatest festival of the entire year.

This is not surprising for, as Prof. Norman Lockyer has remarked: (Nature July 2. 1891) "the solstices and their accompaniments are the most striking things in the natural world . . . . . to people who live in tropical and subtropical countries a summer solstice is a very much more definite thing than it is with us."

An extremely valuable and suggestive detail in preserved to us in the official report of Alvarado's trial for the unauthorized massacre of the native chieftains whilst they were assembled during the inaugural festivities of the festival Toxcatl.

Alvarado states that on the morn of the festival he saw that a number of poles had been raised in the courtyard of the Great Temple and that one, taller than the rest surmounted the principal pyramid. I do not hesitate in assuming that these poles had been set up for the purpose of serving as gnomons and observing the approaching summer solstice which is the day when the shortest shadow is thrown at noon.

That such observations were actually made by the Mexican priest-astronomers has already been proved by the Codex Fuenleal and also by the statement, by Padre Rios: (Vatican Codex, Kingsborough VI. p. 205) "They alledge that the cause of winter being so disagreeable is the absence of the Sun and that summer is so delightful on account of its presence and that the return of the Sun to our zenith is nothing else but the approach of their god to confer favors upon them." He further states that the Sun reigned over the sign 1 Tecpatl. Since Huitzilopochtli was supposed to have been born on this day the connection

is suggestive and tends to identify Huitzilopochtli as a Sun-god.

At the end of the month Pachtli in September, the "advent of Huitzilopochtli" was celebrated with great solemnity and human sacrifices. At this time a certain constellation was also observed. The "advent of the god" during the festival Pachtontli undoubtedly coincided with the autumnal equinox, and I except to be yet able to identify the constellation observed at that time.

In the month Atemoztli, in December, another „advent of Huitzilopochtli" was commemorated. Duran, who wrote in 1579 states that this feast fell on the day of St. Stephen, or the day after Christmas. This native feast was unquestionably in connection with the winter solstice, as I will more fully prove elsewhere.

Any lingering doubts as to whether the Mexicans feasted the Sun during its apparent annual course are dispelled on studying attentively the significance of the curious ceremony always performed on the day Nahui Ollin, a name meaning, as authorities agree in stating, the four movements of the Sun.

This feast was always celebrated with equal splendor, even when it occurred twice in a year, as sometimes happened.

Duran alludes to a year in which it fell on the 17th of March and the 2nd of December as it doubtlessly may have done about the time he wrote. Only warriors and chieftains took part in the festivities that were held in the court-yard of the temple of the Sun, where its painted image was preserved. Incense was usually burnt before this four times during a night and day.

On the day of the festival, towards noon, the priests assembled the people by blowing on conch shells. A richly attired prisoner or slave, the chosen messenger to the Sun was sent to the summit of the temple to deliver an invocation, acting as the mouthpiece of the people.

"He ascended the high flight of steps slowly, making "long delays. He remained standing for a while on "each step then mounted another and halted again, accor- "ding to the instructions given him. This ceremony "denoted the slow ascent of the Sun in his course "and this was the reason why the messenger lin- "gered on each step. When he ad attained the "summit he went and mounted on a great circular stone "in the centre of which were the arms of the Sun. Standing "on this and addressing himself partlyto the painted image "that hung in the open temple and partly to the Sun itself, "he delivered his message. After this he was sacrificed "and his heart was offered to the Sun in the presence "of the entire population who were obliged to fast until "then. The ceremony was so timed that the victim mounted "on the sacrificial stone at noon precisely."

Referring again to the accompanying table I draw attention to the correspondence and probable connection between the four quarters of the Mexican solar year, headed by day-signs united to the numeral of the year, and the solstices and equinoxes. Of course the correspondence would be approximate only and subject to alteration, but is would never amount to more than 13 days in 52 years. It is therefore admissible to connect these 4 signs and the 12 days preceding them with the solstitial and equinoctial periods. Deferring a closer examination of these signs as they occur in the different years, I must now view the solar year of the Mexican Calendar from a secular stand-point.

Hitherto I have concentrated attention on the festivals of a more or less religious character. I have verified that Sun-worship prevailed and ruled the religious Calendar and that the true beginning of the solar year was the vernal equinox. Every four years this receded one day from the first day of the civil or Calendar year, followed by a shifting of other Sun festivals as well. But the ritual year preserved its central position throughout, so that the feasts in honor of

the 20 day-signs remained unaltered. Moreover the 18 periods of 20 days each, began with days of enforced rest. Occasionally, as we are told, one of the moveable feasts fell on one of these days of rest and then it was solemnised with double splendor.

Besides, the above the solar year possessed one permanent feature of utmost importance that was not affected by the shifting of religious festivals. Whilst they moved, according to a mysterious law whose secret was known to the priest-astronomers only, this feature remained intact and made the Calendar system act like a giant heart whose regular beat caused a vivifying force to circulate through the entire Mexican commonwealth. I allude to the remarkable and admirable institution of the macuiltianquiztli, or market that took place every five days.

The entire weal of the communal government depended upon the apportionment of labor, the active exchange of products and the payment of tributes. Just but cruel and severe laws regulated the production, collection and distribution of all the necessities of life. In the centre of each town there was a large market-place to which broad, well kept roads led from the four quarters, and it was imperative that all adult members of the community should assemble there on the market-day. I find strong indications that these invariably fell on the days bearing year names. It is well known that these symbolised the four quarters and the elements as follows:

Acatl	(Reed)	east, water
Tecpatl	(flint)	north, fire
Calli	(house)	west, air
Tochtli	(rabbit)	south, earth.

It is impossible not to realise how admirably the periodical collection of tribute and the assortment or choice of products for the market, according to season and necessity, could be regulated by means of the rotation of the above

symbolic names applied to market days. Thus on each of these day-signs respectively, at convenient intervals, the tribute from the subjugated tribes to the east, north, west or south of the City of Mexico might fall due and thus the produce from each quarter would arrive regularly at set intervals.

In the tribute-rolls of Montezuma, contained in the Mendocino Codex, it is noted that certain tributes were payable every 20, 40, or 80 days respectively, in each case a period being designated on which the same day-sign would inevitably recur.

On the other hand, supposing that a division of all labour performed in the community be divided into four categories, according to the elements with which each industry or pursuit was connected, it would naturally follow that on Acatl market-days aquatic or vegetable products, on Tecpatl days mineral products etc., on Calli days, (the element air being symbolised by a house) all manufactured articles? on Tochtli days all products of animal life, should predominate in the market place.

Of course any such distribution would necessarily vary according to climate, season or necessity and the result would often be a different division of labor in each community. In my forthcoming publication I will produce evidences showing how these circumstances explain and account for the peculiar fact recorded by various writers, that in each locality the year began on a different day-sign and the markets were held on different days.

There are strong indications proving that the different branches of industry or pursuits were identified with certain day-signs and that in this way the entire population of Mexico was sub-divided into 20 castes or kinships, grouped under four heads.

The fact that four day-signs were always ruled over by one of the element symbols established a further connection between these. From a practical point of view nothing

could be more simple and admirably adapted for a communal government than such a distribution of labour or occupation into categories connected with day-names. By this means a thorough control of all the human activity and the products of the land was in the hands of the rulers and could be easily regulated as required. I must defer entering deeply into this subject, a further presentation of which would require much time and space. Suffice it to maintain here the paramount importance of the market as an institution of the communal government and the fact that the regular rotation of market-days and the day of enforced rest every 20 days, were the prominent and permanent features of the civil solar year.

The market day, according to Padre Duran, (op. cit. II pp. 215 and 216) used to be connected with many obscure superstitious observances and the custom of resorting to the market-places was so deeply rooted and had been so rigorously enforced in ancient times that the Spaniards found it extremely difficult to extirpate it. In Ancient Mexico no one was allowed, under severe penalties, to barter or exchange the produce of their labour elsewhere than in the market-place where all such transactions were superintended by appointed inspectors. Duran relates a curious instance of the survival of the ancient custom. Taking pity on a naked half frozen Indian who was carrying a heavy load of wood to the market on a frosty November morning, he bestowed the price of the load upon him and bade him return to his home and warm himself by burning his load. But the Indian showed his preference to relinquish the friar's gift sooner than the performance of what he considered his sacred duty.

There can be no doubt that the regular order of market-days, regulating as they did the distribution of all of the necessities of life, could not be interrupted without serious, widely felt consequences. It must therefore have been imperative that the religious festivals should not interfere with

the fixed order of market days, and doubtlessly this circumstance exerted an influence over the positions of the religious festivals. What is more: since the first day of the solar year and of each of its "months" or periods of 20 days was a day of enforced rest it would also be necessary to avoid beginning the year with a day that had become identified, through custom, with the market. If this had been the case with the days Acatl, Tecpatl, Calli and Tochtli, for instance and that the years were made to begin with these element symbols after they had become identified with market days, it is evident that a change would have to be made, and that it would be advisable to preserve the sequence of market days intact.

In this connection it is suggestive to learn that the alleged reason why Montezuma the Elder transferred the commencement of the cycle from 1 Tochtli to 11 Acatl in 1507, was that there had always been a dearth of food in the year 1 Tochtli.

I draw attention to the fact that in a year 1 Tochtli beginning with a day 1 Tochtli all the enforced days of rest would fall on this sign that is connected with the products of animal life. Undoubtedly an irregular supply of animal food would make itself felt more readily than in the case of vegetable products that can be more easily preserved. Since the alteration was made in order to avert a scarcity of food I am inclined to suspect that the order of days adopted was preferable for the practical reason that it did not cause interference with the periodical market? At all events the year 11 Acatl began, with the day 2 Cipactli. On the other hand, as I will demonstrate further on, there were astronomical reasons of utmost importance that designated this day as the first of the new Epoch that began in 1507. I have defined the permanent features of the civil year; its market-days and days of rest, and also shown how the great festivals of the religious Calendar shifted

their positions at the rate of a day every four years and were rectified once in 52 years.

Let us now verify certain historical dates on the accompanying table and ascertain what light they throw upon the positions of the religious festivals in the years 1519 to 1521.

Returning to the date of Quauhtemoc's surrender, August 13, 1521, we verify this day as 1 Coatl, year III Calli. Since native historians state that this day fell in Tlaxochimaco[3] we see that this would be the eighth and Tlacaxipehualiztli the first. The latter position agrees perfectly with the testimony of Duran and others and with the established connection between this festival and the vernal equinox.

Provisionally adopting therefore the following order the festivals, we will proceed to examine further dates:

I. Tlacaxipehualiztli.
II. Tozoztontli.
III. Huey tozoztli.
IV. Toxcatl.
V. Etzacualiztli.
VI. Tecuilhuitontli.
VII. Huitecuilhuitl.
VIII. Tlaxochimaco.
IX. Xocohuetzi.
X. Ochpaniztli.
XI. Teotleco.
XII. Tepeilhuitl.
XIII. Quecholli.
XIV. Panquetzaliztli.
XV. Atemoztli.
XVI. Titutl.
XVII. Itzcalli.
XVIII. Atlacahualco.

[3] "In a chronicle, supposed to have been written by one of the Mexican warriors who had taken part in the siege, the author refers to the month as Nexochimaco", an alteration of the name Tlaxochimaco, conveying the meaning unlucky. (See Gama, Dos Piedras, notes pp. 79 and 80 also p. 83.) Chimalpahin designates Tlaxochimaco also. Dr. Seler quotes these authorities but his conclusion is that the day 1 coatl was the third day of the month Xocohuetzi.

The only date known at present, in which the position of the day in its month is recorded with its name, is that of the entry of the Spaniards into the City of Mexico. Bernal Diaz dates this event November 8, 1519. Chimalpahin gives the native date: 8 Ehecatl, the eve of the 10th day of the month Quecholli, year 1 Acatl. It can be easily verified on my table that there is a discrepancy of one day between these statements. For the day 8 Ehecatl corresponds to November 9th. I endorse Dr. Seler's view that this must have arisen from a confusion between the eve and the day of the occurrence, or from an omission to take the leap-year 1520 into consideration whilst fixing the native date. At the same time there undoubtedly existed the tradition that the eventful day bore the sign Ehecatl, because this is also recorded in Sahagun's Historia, but through an evident mistake, it is accompanied by the numeral 1 instead of 8. Now the day 8 Ehecatl could only have been the eve of the 10th day of Quecholli if this month began on the day 13 ocelotl.

I am inclined to accept this indication as a most valuable proof of the position of the festival Quecholli in the year 1 Acatl. I note that the day 13 Ocelotl occurs precisely 40 days before the day 1 Ocelotl, the sign of the autumnal equinox. I also notice that 8 Ehecatl is the 10th day after 12 acatl, the sign that heads the periods of the central ritual year beginning with 1 Acatl.

If therefore 8 Ehecatl had been designated as the 10th instead of the eve of the 10th day, we would have an established connection between the periods of the ritual year and the religious festival. The subject is difficult and intricate and demands most careful investigation. A step in this direction is the further examination of other historical dates.

The cruel massacre of the "flower of Mexican nobility" by Alvarado and his followers, during the inaugural festivities of the month Toxcatl took place, according to Ixtlilxochitl

on May 19, 1520; to Bustamante on Whitsunday May 25 or 27, to Ramirez on May 16. A follower of Alvarado testifies that it was on a Thursday.

From Sahagun's Historia we learn, however, that 40 days elapsed between the massacre and the Noche Triste, or June 30, 1520, corresponding to 8 Cozcaquauhtli, year II Tecpatl. Calculating that a period of 40 days lay between these two critical days we might fix the date of the massacre as May 21, or the day 7 Cozcaquauhtli. But to fix a historical date by intervening periods of days is scarcely a precise or satisfactory method and I prefer to seize the occasion and put my conclusion: that the feast Toxatl coincided with the summer solstice, to a crucial test. If this was the case, the massacre of the dancers on the first day of the feast must have taken place precisely 20 days before the sign of the summer solstice. Referring to my table it will be seen that the latter was 2 Ollin, corresponding to June 11 Jul. Cal. The true date of the solstice was June 12.

Therefore the inaugural dance must have been celebrated on the day 9 Tecpatl corresponding to May 23 and this establishes, beyond doubt, a connection between the periods of the central ritual year and the religious festival. For the ritual year II tecpatl consisted of 13 periods of 20 days each and the day 9 tecpatl heads the second of these. This connection is further proven by a careful verification of the fact recorded in Sahagun's Historia, "that the Spaniards fled during the night of the festival Tecuilhuitontli." Now if Toxcatl and Etzalcualiztli contained 20 days each it is evident that the festival-period Tecuilhuitontli would only have commenced 2 days after the recorded date, on the day 10 Tecpatl or July 2.

But a reference to Sahagun's description of the religious festivals (ed. Bust. vol I. p. 59) teaches that celebration of Tecuilhuitontli began on the eve of its first day and lasted throughout the night.

It is therefore clear that the Spaniards, fled from the

city during the night of June 30, or the eve of the inaugural celebration of Tecuilhuitontli. This explanation reconciles the dates recorded on both sides, and furnishes us with two well authenticated instances of a religious festival beginning on the first day of a division of the ritual year.

These instances are in perfect agreement with a mass of evidence that I cannot attempt to analyse at present, but duly take into account while formulating the following conclusions:

The religious festival-periods of the Mexican year must not be confounded, as heretofore, with the 18 so-called "months" of the civil solar year. Each of the latter were headed by a day of enforced rest and contained set market-days, at intervals of 5 days.

The religious festival-periods were partly moveable and partly ruled by the central ritual year contained in each solar year. In three well-authenticated instances the beginning of a festival-period is shown to have coincided with the first day of one of the 13 periods of 20 days contained in the ritual year.

The subject demands further study and much has to be ascertained before an attempt can be made to define the exact order and relative lengths of the Mexican festival-periods and to determine whether and in what manner the "month names" preserved applied to the civil or religious periods, or to both combined.

Let us merely glance at a few more historical dates of special interest. Spanish historians relate[6] that their brigantines were launched and Cortés mustered his forces on April 28, 1521. This date corresponds to 11 Tecpatl, year 111 Calli and falls 108 days before 1 Coatl, the day of Quauhtemoc's surrender.

[6] See H. H. Bancroft's History of Mexico vol. I, pp. 647 and 689.

They further date the actual beginning of the siege from May 30, a day corresponding to 3 Atl and falling 76 days before 1 Coatl.

Cortès (Cartas and Grant to Cortès) states that the siege lasted 75 days, Duran and Ixtlilxochitl extend it to 80, Chimalpahin to 90 and Bernal Diaz to 93 days. I consider that the evidence of Cortès is decisive in this matter moreover it agrees exactly with the number of days between May 30 and August 13.

At the beginning of this communication I stated my conviction that the method by which the years began with the days Acatl, Tecpatl, Calli and Tochtli was as much the natural result of the system as the method by which the years began with Cipactli, Miquiztli, Ozomatli and Cozcaquauhtli.

I will now proceed to demonstrate my assertion with the assistance of the accompanying table, regretting that I cannot refer to the set of analytical tables of my publication.

Designating the day 1 Acatl, in the table of the year 1 Acatl (third column) as a point of departure I request the reader to imagine that a count of vague solar years is started on this day, even with vernal equinox. Following the development of the system we ascertain that after 52 vague solar years, of 365 days each, the day 1 Acatl once more resumes its position as the first of the year. But, as the years have been counted as of 365 days only, and bissextile intercalation has not been employed, the day 1 Acatl, at the end of the cycle, is precisely 13 days behind the equinox.

At is it known that, in order to right the Calendar the the missing 13 days were added to the Cycle, it can be easily verified that this circumstance would make the next Cycle begin on the day 1 Miquiztli, thirteen days later than 1 Acatl. A repetition of this rectification causes a third Cycle to begin with 1 Quiahuitl and so on, until 20 Cycles, each beginning with one of the 20 day-signs in succession,

have completed themselves. I cannot pause here to refer to the progression of the Calendar, amounting to nearly 9 days at the end of this Great Cycle of 1040 years, for it is the order of the cycles that concerns us at present. At a first glance it would seem as though 20 different orders of days were produced by the above rotation of day-signs. But a careful study shows that this is not the case and that only 5 orders of day-signs prevailed. For when 4 cycles had succeeded the cycle Acatl beginning with the day 1 Acatl, a cycle Tecpatl occurred, beginning with the day 1 Tecpatl, and throughout this cycle the same order of days as in the Acatl cycle would necessarily prevail.

After 5 cycles the cycle Calli beginning with 1 Calli and then the cycle Tochtli beginning with 1 Tochtli would follow and thus, in 1040 years, four cycles would exhibit precisely the same order of days, each year beginning with a day bearing the name of the year, a method I will designate as Order I. The following tables exhibits this and the other four Orders, two of which are also known to have been employed: Order II, in which the years begin with the days Cipactli, Miquiztli, Ozomatli and Cozcaquauhtli is that whose existence is recorded by the majority of historians. My reconstruction, moreover, is a demonstration that it was in actual use at the time of the Conquest.

Order III is known to have been employed by the Mayas and is that recorded with one variation in the centre of the famous Calendar Stone of the City of Mexico.

It is an open question whether the Calendar-makers began the cycles with the four year-symbols in rotation, as follows:

1 ACATL

Great Symetrical Cycle consisting of 4 × 5 × 52 = 1,040 solar years = 379,860 days.

Order:	Acatl Age	Tecpatl Age	Calli Age	Tochtli Age
I	Acatl—Acatl	Tecpatl—Tecpatl	Calli—Calli	Tochtli—Tochtli
First day	1 acatl	1 tecpatl	1 calli	1 tochtli
II	Tecpatl—Miquiztli	Calli—Ozomatli	Tochtli—Cozcaquauhtli	Acatl—Cipactli
First day	1 miquiztli	1 ozomatli	1 cozcaquauhtli	1 cipactli
III	Calli—Quiahuitl	Tochtli—Cuetzpalin	Acatl Atl	Tecpatl—Ocelotl
First day	1 quiahuitl	1 cuetzpalin	1 atl	1 ocelotl
IV	Tochtli—Malinalli	Acatl—Ollin	Tecpatl—Ehecatl	Calli—Mazatl
First day	1 malinalli	1 ollin	1 ehecatl	1 mazatl
V	Acatl—Coatl	Tecpatl—Itzcuintl	Calli—Quauhtli	Tochtli—Xochitl
First day	1 coatl	1 itzcuintli	1 quauhtli	1 xochitl

or grouped five cycles under the head of one year-symbol after which the following year-symbol would naturally succeed, as follows:

Order	Acatl cycles	Tecpatl cycles	Calli cycles	Tochtli cycles
I	Acatl—Acatl	Tecpatl—Tecpatl	Calli—Calli	Tochtli—Tochtli
II	Acatl—Miquiztli	Tecpatl—Ozomatli	Calli—Cozcaquauhtli	Tochtli—Cipactli
III	Acatl—Quiahuitl	Tecpatl—Cuetzpalin	Calli—Atl	Tochtli—Ocelotl
IV	Acatl—Malinalli	Tecpatl—Ollin	Calli—Ehecatl	Tochtli—Mazatl
V	Acatl—Coatl	Tecpatl—Itzcuintli	Calli—Quauhtli	Tochtli—Xochitl

In either case Order I remains the same while in Orders II—V a mere difference in the combination of identical signs results. The above tables constitute the first demonstration of the method by which one cycle could have been distinguished from another in this remarkable Calendar System.

It clearly shows how easily and effectually this could have been done by adopting a combination of the signs of the first day and the symbol of the first year as the name of the cycle. Thus one might be known as the Acatl-Acatl another as the Acatl-Coatl cycle and so on. A feature that firmly establishes the law of

concordant numeration is the peculiarity that if the first cycle be started on a day number 1, for instance, the 20 cycles infallibly follow suit. It is therefore evident that one epoch or Great Symetrical Cycle of 1,040 years could have been distinguished from another by its ruling numeral merely.

Now is it a historical fact that a Cycle began in 1507 with the year II Acatl. The given results of my investigation establish that it began on a day 2 Cipactli, consequently with Order II. For a cycle to be ruled over by the number 2 it is obvious that it followed an epoch in which cycles were ruled by number 1, therefore it may be safely inferred that the cycle II Acatl that commenced in 1507, formed part of a cycle that had been preceded, at its outset, by a period of 1,040 years. This unavoidable inference constitutes the first firm step backwards into the mysterious past of American civilisations, and it carries us further than may be realised at first sight. For it establishes the adoption of a highly perfected and artificial Calendar system at a remote date and this must have been preceded by a prolonged period during which the intricate and admirable system had slowly developed from its primitive form.

It would be premature to venture now to express an opinion as to the position, in Epoch II, of the cycle II Acatl-Cipactli, during which the Conquest of Mexico and the destruction of its ancient civilisation took place. But I see the possibility of being able to determine this ultimately.

I will now cite some important verifications of astronomical dates that I have recently obtained from the distinguished astronomer Dr. A. Berberich of Berlin.

Nothing could form a more convincing endorsement of my assertion that the year III Calli must have begun on the day 3 Ozomatli, corresponding to March 11, 1521 and coinciding with the vernal equinox, than the following verifications kindly made at my request:

„Vernal equinoxes occurred in

1507	March	11	$7^h\ 52^m$
1519	March	11	$5^h\ 37.2^m$ p. m.
1520	March	10	11 26 p. m.
1521	March	11	5 15 a. m.
1522	March	11	11 4 a. m.

The above dates are given in Greenwich time. For Mexico the precise time of the equinox was $6^h\ 36^m$ earlier." On page 12 of this communication I stated that the fact that the Mexican year III Calli began even with the vernal equinox enabled us to determine that the year II Acatl, the first of the Cycle, must have commenced three days after the equinox, or on a day corresponding to March 14. For the day 2 Cipactli coincided with this date.

This fact puzzled me somewhat at first, for I was inclined to expect that the Cycle would have naturally started exactly even with an equinox. The assertions of several old writers, to the effect that the Calendar system was based on observations not only of the Sun but also of the Moon and Planet Venus, afforded me a hint as to the causes that might have determined the Calendar-makers to begin a new Cycle three days after the vernal equinox.

Referring to Dr. Berberich he informed me that according to calculations made with v. Oppolzer's Tables a new Moon fell on March 13, 1507, at 11. 40 a. m.!

It is well known that the solemn rite of kindling New Fire with which the high-priest announced the beginning of the new Cycle was performed at midnight on a certain hill near the City of Mexico. Sahagun relates that at sunset the priests began their preparations for the religious observances and that at nightfall they began to march in slow and solemn procession towards Huixachtlan.

It is now evident that the delicate crescent of the new Moon, becoming first visible for a little while after sunset on March 14, 1507 was the signal for the Mexican priest-

astronomers to perform, for what was destined to be the last time, the impressive ceremony of ushering in the new era.

Through Dr. Berberich I have ascertained that on this same evening the Planet Venus was clearly visible as evening-star and set "31 minutes after the Sun. From March 14 to March 18 it is possible that the Planet Venus was visible both as morning and evening star from the City of Mexico where the twilight is very short, but it is also possible that it was lost in the splendor of the Sun's rays. It is certain however, that Venus must have been visible as evening star after March 22."

It is thus clearly proved that on the day 2 Cipactli, or March 14, 1507, the New Moon and the Planet Venus were visible together in the west immediately after sunset. Was it in order to wait for this striking phenomenon that Montezuma transferred the beginning of the cycle to 2 Acatl-Cipactli instead of beginning the year with the regular registration of the vernal equinox?

On the other hand if the statement in the Codex Fuenleal be carefully studied, it shows us that it was not customary to date the beginning of the year from the exact time when the Sun cast a straight shadow. For it was only "after this, when the Sun was observed to rise, that they counted the first day".[3]

Now the exact date of the vernal equinox in 1507, furnished me by Dr. Berberich, is: March 14, 7. 52 p. m. consequently it was probably observed in the great temple of Mexico at noon on March 12.

After this the shadow would shorten daily at the rate of three inches a day and on March 14, at noon, it would be 6 inches shorter than on March 12.

It may be that custom required that this difference should be noted before "the first day began". It is not

[3] "luego cuando se sintia que el sol subia, contavan el primer dia" op. et loc. cit.

impossible, in fact, that the falling of the shadow at noon, across a certain altar or sacred symbol in the Great Temple, may have been the given signal for the commencement of the new cycle. Therefore it may well be that the Mexican religious solar year actually began about three days after the true vernal equinox, on March 14, when the Moon and the Planet Venus also occupied exceptional positions.

On the other hand it is just as possible that the Calendar-makers may have delayed the commencement of the New Cycle until the day 2 Cipactli on account of its sign and number and of the given position of the Moon and Venus. The adoption of this day may even have been an attempt at a rectification of the Calendar, for it is quite obvious that by beginning the cycle 3 days after the equinox there would only be a retrogression of 10 instead of 13 days at the end of the cycle of 52 years. Besides, as Dr. Berberich has carefully demonstrated, the effect of commencing the year 3 days after the equinox would tend to make the 4 divisions of the Mexican year coincide more closely with the solstices and autumnal equinox.

I regret that I cannot enter more fully into this interesting subject at present, without exceeding the limits of this brief communication.

The foregoing data will suffice to prove beyond a doubt that historical evidence, the law of concordant numeration that a prolonged study of the Calendar-system enabled me to recognise and astronomical facts concur in establishing that the Mexican solar year began with the vernal equinox. They also prove that the native Calendar system attempted to bring into accord the apparent movements of the Sun, Moon and Planet Venus, which fact agrees with my observation and also with my conviction that the astronomer priests employed a lunar calendar, consisting of periods of 265 days each, for the registration of astronomical and historical dates. The rôle of the Planet Venus and the adaptation of the

Calendar to a systematic registration of its synodic periods and those of other planets have been described by Senor Troncoso y Paso and will be found demonstrated, by means of tables and further elaborations, in my forthcoming publication.

This will also show the intricacy of other lines of investigation that I am steadily pursuing and how much time and labor these involve.

I trust that the recognition of these facts will explain and excuse the delay that has occurred and is likely to occur in the appearance of the publications I had announced as speedily forthcoming, little knowing what proportions my task was about to assume.

I cannot close without stating that, in this brief presentation of small portion only of my work, I have not been able to even allude to many important facts that should be taken into consideration in weighing some of my conclusions. In view of this I request my fellow-scientists to look upon this as a preliminary note merely, that will be followed, in time, by a complete presentation of the results I have obtained through my prolonged study of the Ancient Mexican Calendar System.

In conclusion I desire to express my grateful appreciation of the valuable services rendered by Dr. A. Berberich who undertook, with promptitude and painstaking thoroughness, the verification of astronomical data.

It is a great satisfaction to be able to count upon his invaluable collaboration in the complex investigations that will be necessary in order to obtain further knowledge of the astronomical basis of the Mexican Calendar.

RECONST

IN WHICH THE MEXICAN YEAR 1 ACATL BEGINS
AND THE YEARS II TECPATL AND II

A. D. 1519. A. D. 1520.

YEAR I ACATL

Days:	Months:	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX
	Cipactli	**1**	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3		
	Ehecatl	2	9	3	10	4	11	5	12	6	13	7	1	[8]	2	9	3	10	4		
	Calli	3	10	4	11	5	12	6	13	7	**1**	8	2	9	3	10	4	11	5		
	Cuetzpalin	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6		
	Coatl	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7		
	Miquiztli	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8		
	Mazatl	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9		
	Tochtli	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10		
	Atl	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11		
	Itzcuintli	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12		
	Ozomatli	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13		
	Malinalli	12	6	13	7	**1**	8	2	9	3	10	4	11	5	12	6	13	7	1		
	Acatl	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2		
	Ocelotl	1	8	2	9	3	10	4	11	5	12	6	13	7	**1**	8	2	9	3		
	Quauhtli	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4		
	Cozcaquauhli	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5		
	Ollin	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6		
	Tecpatl	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7		
	Quiahuitl	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8		
	Xochitl	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9		

Cipactli	10	1	11	5	2	6	1														
Ehecatl	11	7	12	6	13	7	1														
Calli	12	6	13	7	1	8	2														
Cuetzpalin	13	7	1	8	2	9	3														
Coatl	1	8	2	9	3	10	4														

YE

	I	II	III	IV	V	VI
	2	9	3	10	4	1
	3	10	4	11	5	1
	4	11	5	12	6	1
	5	12	6	13	7	1
	6	13	7	1	8	2
	7	1	8	2	9	2
	8	2	9	3	10	3
	9	3	10	4	11	4
	10	4	11	5	12	5
	11	5	12	6	13	6
	12	6	13	7	1	7
	13	7	1	8	2	8
	1	8	2	9	3	9
	2	9	3	10	4	10
	3	10	4	11	5	11
	4	11	5	12	6	12
	5	12	6	13	7	13
	6	13	7	1	8	1
	7	1	8	2	9	2
	8	2	9	3	10	3
	9	3	10	4	11	4
	10	4	11	5	12	5
	11	5	12	6	13	6
	12	6	13	[7]	1	[8]
	13	**2**	9	3	1	
	1	8	2	9	3	1
	2	9	3	10	4	1
	3	10	4	11	5	1
	4	11	5	12	6	1
	5	12	6	13	7	1
	6	13	7	1	8	2
	7	1	8	2	9	3
	8	2	9	3	10	4

NOTE

THE DAY 8 EHECATL, YEAR I ACATL, CORRESPONDS TO NOV. 9, 1519.

7 COZCAQUAUHTLI, YEAR II TECPATL, TO MAY 24, 1520.

8 COZCAQUAUHTLI, YEAR II TECPATL, TO JUNE 30, 1520.

11 TECPATL, YEAR III CALLI, TO APRIL 28, 1521.

8 CIPACTLI, YEAR III CALLI, TO MAY 22, 1521.

3 ATL, YEAR III CALLI, TO MAY 30, 1521.

1 COATL, YEAR III CALLI, TO AUGUST 13, 1521.

JCTION

TH A DAY CORRESPONDING TO MARCH 12.

ALLI WITH MARCH 11. JUL. CAL.

P-YEAR.	A. D. 1521.	A. D. 1522.

II TECPATL.

VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
2	6	13	7	1	8	2	9	3	10	4
3	7	1	8	2	9	3	10	4	11	5
1	8	**2**	9	3	10	4	11	5	12	6
2	9	3	10	4	11	5	12	6	13	7
3	10	4	11	5	12	6	13	7	1	8
4	11	5	12	6	13	7	1	8	2	9
5	12	6	13	7	1	8	2	9	3	10
6	13	7	1	8	2	9	3	10	4	11
7	1	8	2	9	3	10	4	11	5	12
8	2	9	3	10	4	11	5	12	6	13
9	3	10	4	11	5	12	6	13	7	1
10	4	11	5	12	6	13	7	1	8	2
1	5	12	6	13	7	1	8	2	9	3
2	6	13	7	1	8	**2**	9	3	10	4
3	7	1	8	2	9	3	10	4	11	5
	8	2	9	3	10	4	11	5	12	6
2	9	3	10	4	11	5	12	6	13	7
3	10	4	11	5	12	6	13	7	1	8
	11	5	12	6	13	7	1	8	2	9
	12	6	13	7	1	8	2	9	3	10

YEAR III CALLI.

—	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5
4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6
5	12	6	13	7	1	8	2	9	**3**	10	4	11	5	12	6	13	7
6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8
7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9
8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10
9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11
10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12
1	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13
2	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1
3	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2
4	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3
5	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4
6	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5
7	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6
8	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7
9	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8
10	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9
11	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10
12	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11
13	4	11	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12
1	5	12	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13
2	6	13	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1
3	7	1	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2
4	8	2	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3
5	9	3	10	4	11	5	12	6	13	7	1	8	2	9	3	10	4

Mequiztli	11
Mazatl	12
Tochtli	13
Atl	1
Itzcuintli	2

Ozomatli	12
Malinalli	13
Acatl	1
Ocelotl	2
Quauhtli	3