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THE DELINEATION OF THE DAY-SIGNS IN THE AZTEC MANUSCRIPTS

BY

T. T. WATERMAN

UNIVERSITY OF CALIFORNIA PRESS
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T. T. WATERMAN

CONTENTS

INTRODUCTION

A very noteworthy achievement of the ancient Aztecs was their peculiar calendar system. Even the Aztecs themselves seem to have looked upon this calendar as the central fact of their lives. It was not only of importance from a practical point of view, but it filled a very large place in the ceremonial life of the people. Thus "calendar" had a meaning for them which the word quite fails to carry for us. While their calendar system was in a sense peculiar, its peculiarity lay chiefly in one or two unusual features. In many ways the system was after all not unlike our own. This does not, of course, mean that the two systems, theirs and ours, had any historical connection. The development of the Aztec calendar was undoubtedly independent of any influence from the Old World. I am inclined to think that the Aztec system is not so mysterious, and the history of its development not nearly so abstruse, as the many commentaries written on it would lead us to suppose.

It is a well-established fact that the particular system identified with the Aztecs of Mexico was merely an outgrowth, a sort of special form, of one fundamental calendar concept which had a very wide vogue in Middle America. This system is undoubtedly more ancient, for example, in Honduras, than it is in the Mexican plateau. The Aztecs merely developed their own special nomenclature for the various elements of this calendar, and evolved certain special symbols. The system in its broad outlines is very much older than the Aztec civilization proper.

THE MANUSCRIPTS

Calendar symbols of one sort or another occur on a surprising variety of monuments, both of early and late periods. The most important of these monuments for the study of the workings of the calendar system in detail are certain remarkable picture-books or manuscripts, made on folded strips of deerskin, or on paper made of the fibre of the maguey (*Agave americana*). These manuscripts are usually spoken of as "codices." Only a few of these native manuscripts survived the introduction of European civilization into America. Those which were preserved were taken to Europe as curiosities, and often preserved through mere luck. The ones still extant have received a great deal of attention since the early part of the last century. All but a few of the originals are still in Europe, and are at the present time considered priceless.

The earliest effort at publishing or reproducing them on a large scale is a work by Lord Kingsborough, in nine magnificent volumes, called *Mexican Antiquities.*[1] The arrangement of the material in this work betrays almost complete ignorance of the composition of the original manuscripts; and more than that, the work of reproduction itself is, in a great many particulars, inexact. The nine volumes, however, imperfect as they are, have been the foundation of a great deal of later study. The American scholar Cyrus Thomas,[2] has written several papers on Aztec matters which are based largely on Kingsborough's work. The same might be said of at least one well-known monograph written by the Mexican archaeologist Antonio Peñafiel.[3] Reproductions very similar to Kingsborough's in general type, but rather better in details of execution, have been published from time to time in Mexico. Thus Peñafiel's enormous work (noteworthy at least in size and weight), called *Monumentos del arte mexicano antiguo,*[4] contains two Aztec manuscripts, namely, the "Book of Tributes," and the "Zapotec Codex," both reproduced in fac-

[1] For full titles of all works referred to, see bibliography at end of essay.

[2] See his "Numeral Systems of Mexico and Central America," 1893.

[3] Nombres geográficos, 1885.

[4] Berlin, 1890, two volumes of plates and one of text.

simile, including color. A more recent work, edited by Chavero, *Antigüedades mexicanas,*[5] contains several pictographic texts in color. Since the year 1883 there have become available, due principally to the Duke of Loubat, a number of very beautiful facsimiles of ancient texts, which reproduce, in every respect, the original picture manuscripts. A list of the facsimile texts on which the present study is based will be found in the bibliography below. A few "codices" like the Codex Borbonicus, edited by Hamy, have not been used in the present study simply because copies were not locally available. Moreover, those manuscripts are most interesting which seem to be purely Aztec, or which show few traces of Spanish influence. Hence such sources have been most emphasized in the following pages.

THE AZTEC CALENDAR SYSTEM

THE TIME-PERIODS

It seems necessary to begin a discussion of the treatment of the calendar in the manuscripts by pointing out the most essential features of the calendar system itself. That will accordingly be our first concern. A good deal of uncertainty has always existed concerning some of the details of the ancient Aztec calendar. Discussion about certain points began only a few years after the Conquest. Bernardino de Sahagun, for example, whose *Historia general de las cosas de Nueva España*[6] is perhaps the most valuable literary source for the study of conditions among the Aztecs, was already involved in the year 1539 in an acrimonious dispute with another monk concerning the question of whether or not there were "corrections" or "intercalations" in the Aztec system. Other features of the system have always been surrounded with mystery. Certain facts, on the other hand, are quite clear and have never been the subject of dispute. Prominent among them is the fact, which must never be lost sight of, that the basis of everything calendrical was the solar year of 365 days, representing (though the Aztecs,

[5] Mexico, 1892, one volume of plates and one of text.

[6] See bibliography.

of course, never dreamed of the celestial mechanics involved) approximately the period of the earth's revolution about the sun. This is the starting-point and basis for all the other features of their calendar.

Their calendrical computations seem, to be sure, to reflect knowledge of other periods, based not on the sun but on the stars. Seler,[7] and Förstemann[8] have said a great deal about a so-called "Venus year," a period of 584 days based on the movements of the second planet of our system. Seler has also discovered what seem to his own mind traces of a period based on the revolution of Mercury. It may readily be assumed that the Aztecs had considerable knowledge of the stars, and the recognition of star-periods is by no means impossible. It is a very notable fact in this connection that the ancient peoples of Mexico paid little regard to the most conspicuous body in the heavens, aside from the sun, namely the moon. This is especially interesting because the moon's phases are employed almost the world over, as marking off convenient periods of time. An important work of the middle seventeenth century, the *Manual de los ministros de las Indias,* by a Jesuit, Jacinto de la Serna,[9] states that certain month-periods were actually reckoned by the Aztecs, beginning with each new moon. These are said to have been used by women, especially in connection with the period of pregnancy. Periods based on the moon, however, do not appear in the manuscripts, and even moon symbols are noticeably infrequent.[10]

There was recognized in ancient Mexico, in addition to the year mentioned above, a period of twenty days, a *cempoalli,* employed as a subdivision of the year-period. Such twenty-day units were regularly employed in speaking of a lapse of time of less than a year's duration. Eighteen of these *cempoallis,* or twenty-day periods, with a group of five special days added at the end, made up the regular year of 365 days. The five days thus added to the eighteen "twenties" are the often-mentioned *nemontemi* referred to in every account of the Aztec calendar.

[7] 1898.

[8] 1893.

[9] Published in 1899. See bibliography.

[10] See Cyrus Thomas, 1897, p. 954.

Many of the statements made concerning these *nemontemi* by the older authors lead to confusion. The five days in question were considered unlucky, and the Aztec refrained, as far as possible, from all activity during the period. Considered collectively, they had no name, though each of the preceding eighteen periods had one. It is often said, therefore, that they "were not counted." Seler has shown[11] that this means that they were "of no account," since all activities were, as far as practicable, suspended until the five-day period was safely over. We know for a fact that the separate *nemontemi* days were duly reckoned in their regular places in all calendrical computations. The concensus of modern opinion is that they are not to be looked upon as intercalations or corrections. The Aztecs, then, in referring to the passage of time, employed (1) a period of 365 days, broken up into (2) subdivisions or *cempoallis* of twenty days each, each subdivision having a name. Besides the *cempoallis* there was a nameless five-day period. Such twenty-day periods are often called months. It is, I think, worthy of some reiteration that our English word "month" is philologically based on the word *moon,* just as, from the practical point of view, the month-period is approximately one "moon" of 29½ days. Obviously, therefore, the word *month* cannot be appropriately applied to these twenty-day Aztec periods.[12] Our best resource is to fall back, in mentioning these subdivision of the Aztec year, on the native word *cempoalli,* which means simply a "period of twenty." They were not of prime importance in calendrical computations.

METHOD OF DETERMINING THE TIME-PERIODS

A point to be re-emphasized is that the one fundamental element at the bottom of the Aztec calendar system is the 365-day solar year.

The question which next arises is: how did the Aztecs come to note so exactly the periods of revolution of certain of the heavenly bodies such as the sun, and perhaps of some of the planets? It seems that they had a simple but rather effective

[11] 1891.

[12] Seler, 1900–1901, p. 5, makes this point.

method of making observations. Mrs. Nuttall in the Boas Anniversary Volume refers to a picture showing how celestial movements were registered. A priest, to describe it briefly, sits inside a temple door and notes, with the aid of a notch on the lintel, the position of the rising or setting of a planet. The planet rises, of course, in a slightly different place day after day. By observing the rising of this planet until it got back to its original point, he could determine its "period." Probably the approximate length of the solar year was established in this way—by noting the variation of the point of sunrise, day by day, until the return of a summer or winter solstice marked the completion of a given period. The priest could meanwhile keep a tally of days by notching a stick, or in some other way. Apparatus for making more exact observations than this certainly never existed among the ancient Mexican peoples. The general situation as regards astronomy and their attitude towards it is brought out in a rather interesting way in an address reported to have been delivered to Montezuma on the occasion of his assumption of the office of principal war-chief. This exhortation is chronicled by Tezozomoc,[13] and is referred to by Seler.[14] The war-chief is urged "to rise at midnight and look at the stars; toward morning he must carefully observe the constellation Xonecuilli, St. Jacob's Cross; and he must carefully observe the morning star." Sahagun also, in the seventh book of *Historia general* gives an elaborate account of Aztec astronomy. They had therefore enough knowledge to realize the importance of the heavenly bodies for recording the passage of time. It seems quite natural that their time-periods should have a basis in the movements of certain celestial bodies.

SYSTEM OF DATING

The Aztecs seem to have recognized, then, a number of time-periods, the most important of which is the solar year. Now comes the question of how they wrote down dates.

Perhaps the simplest way of understanding the Aztec system of indicating dates within the year is to recall the salient fea-

[13] Crónica mexicana, chapter 82; see Kingsborough, 1831, vol. 9.
[14] 1898, p. 346.

tures of our own system. We recognize, first of all, our year of 365 days (disregarding for the moment leap-year and other "corrections"). We divide this year up into twelve unequal periods. These periods were, in the youth of our calendar, much more uniform than they are at present. A number of perfectly trifling considerations have from time to time been allowed to alter the length of certain months. Within each of our months the days are numbered in order, beginning with 1. We identify days, then, by using twelve *names,* each name in combination with twenty-eight, twenty-nine, thirty, or thirty-one numerals as the case may be. Considered from this point of view, our system offers many points of resemblance to the Aztec. The latter, however, employed not twelve but *twenty* names, and used each of these names in combination with *thirteen numerals.* They did not utilize the "months" or *cempoallis* for writing dates. It is best perhaps at this point to have these day-names used in dating and their symbols clearly in mind.

The Twenty Day-symbols

The Aztec words which were used as day-names are all names of actual animals, objects, or phenomena. In writing or recording these words the Aztec made use of pictures. This gives us a series of twenty "day-symbols," which are of fundamental importance in all calendar reckonings. It is very much as though we ourselves used our present names for the twelve divisions of the year, but represented them by pictures—perhaps a picture of *Janus* for the month of January, of *Mars* for March, and so on. The twenty day-names of the Aztecs, in the order in which they usually appear, are given in the following list. In this list the English equivalent of the Aztec word is given first, with the native term following it. The orthography used is that adopted by the Spanish on their first contact with the Aztecs, since that orthography has become classical, and is now a fixed tradition among Americanists. The pronunciation of the Aztec words here written is practically that of modern Spanish, except that x has the value of English sh, and z that of English ts. The double-l has more nearly the value of the symbol as used in English than in Spanish.

THE AZTEC DAY-NAMES

Water-monster	*Cipactli*
Wind	*Ehecatl*
House	*Calli*
Lizard	*Cuetzpalin*
Snake	*Coatl*
Death	*Miquiztli*
Deer	*Mazatl*
Rabbit	*Tochtli*
Water	*Atl*
Dog	*Itzcuintli*
Monkey	*Ozomatli*
Grass	*Malinalli*
Cane	*Acatl*
Ocelot ("Tiger")	*Ocelotl*
Eagle	*Quauhtli*
King-vulture	*Cozcaquauhtli*
Motion	*Olin*
Flint	*Tecpatl*
Rain	*Quiahuitl*
Flower	*Xochitl*

The graphic symbols corresponding to these names will be found in figure 1. The name of the sign is in each case written under it in English, with the original Aztec word in italics. The drawings used in this figure are taken from various Aztec manuscripts, as follows:

a, Nuttall (Zouche),[15] p. 46
b, Nuttall (Zouche), p. 83
c, Nuttall (Zouche), p. 47
d, Nuttall (Zouche), p. 42
e, Nuttall (Zouche), p. 44
f, Nuttall (Zouche), p. 48
g, Vatican B, p. 66
h, Nuttall (Zouche), p. 57
i, Fejervary, p. 28
j, Nuttall (Zouche), p. 72
k, Nuttall (Zouche), p. 72
l, Nuttall (Zouche), p. 48
m, Nuttall (Zouche), p. 46
n, Nuttall (Zouche), p. 72
o, Nuttall (Zouche), p. 1
p, Nuttall (Zouche), p. 54
q, Nuttall (Zouche), p. 47
r, Vatican B, p. 50
s, Nuttall (Zouche), p. 39
t, Nuttall (Zouche), p. 47

The effort has been made in this figure to exhibit a typical form of each of the signs. The drawing has been selected in each case, out of the large number available, as being perhaps the most characteristic form and the one most frequently encountered. Many of the graphic symbols in this figure are, as regards their meaning, self-explanatory. The symbols for House, Lizard,

[15] For the citations, consult the list of manuscripts in the first part of the bibliography.

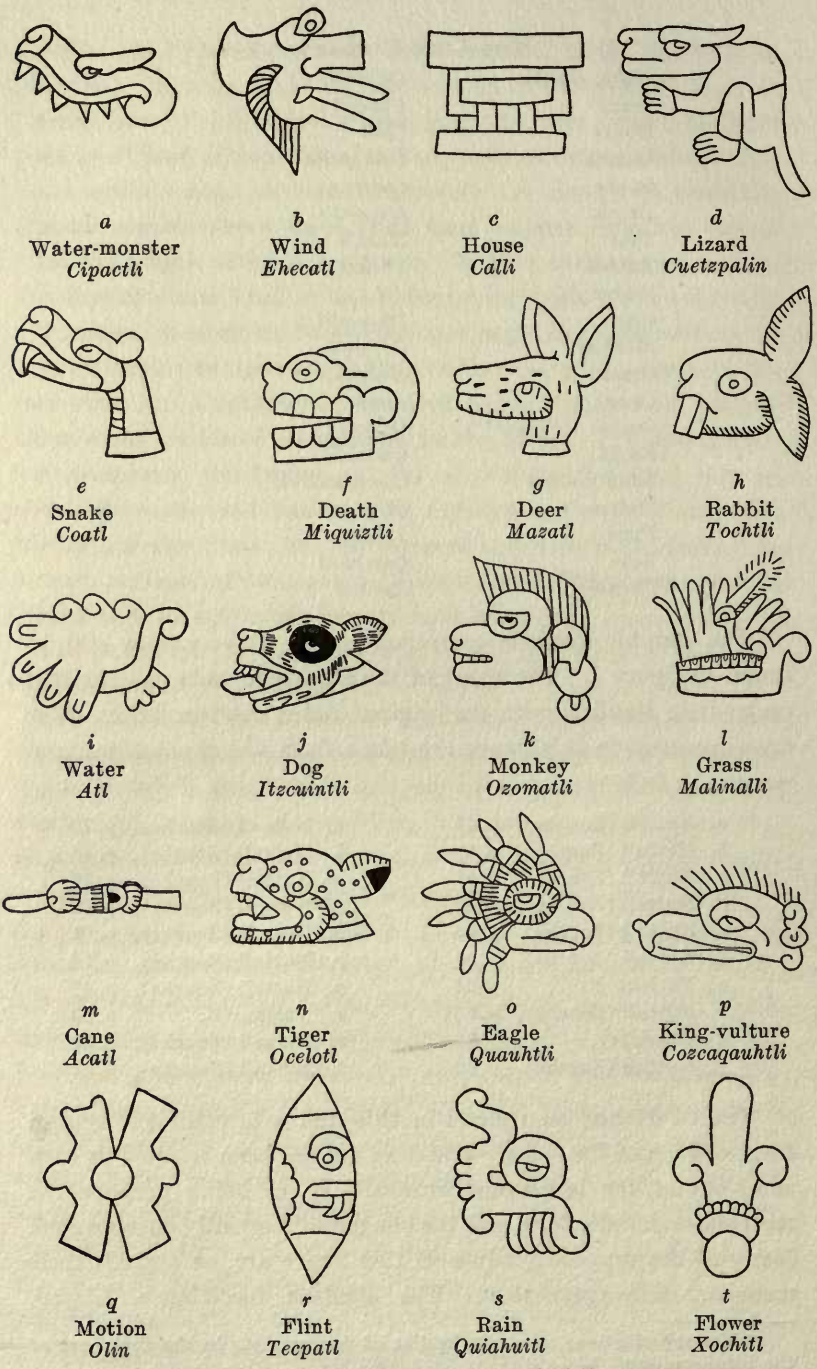


Fig. 1.—The Twenty Day-signs, Typical Forms

Snake, Deer, Rabbit, Water, Dog, Monkey, Ocelot, Eagle, Vulture, and Flower (*c, d, e, g, h, i, j, k, n, o, p,* and *t,* in the figure) are fairly realistic pictures in each case of the thing itself. The remainder are more or less puzzling. The first drawing (*a*) represents a head, probably that of the "cayman," either the alligator or the crocodile. Both animals are very common along the southern borders of the Gulf of Mexico. The second symbol in the figure (*b*), standing for the idea "wind" is a representation of the wind-god Quetzal-coatl, or "Feathered Serpent." In this drawing he is shown, as is often the case, in human form. The long beak shown in the figure is thought by some students to be connected in some way with the idea of blowing. The sixth sign (*f*), called "Death," is very appropriately drawn as a human skull. The twelfth sign (*l*), "Grass," possesses, as it is usually drawn, at least one curious feature. Underneath a very realistic representation of a bunch of grass, with a seed stalk in the center, there appears a human jawbone. The next symbol in the list, "cane" (*m*), is a representation of the cane shaft of an arrow or javelin, probably the latter. The appendages on this "cane" figure apparently represent the feathering and ornamentation of the missile. The cane-plant itself seems never to occur as a day-sign. The idea is always represented by the cane shaft. The seventeenth sign (*q*) is very much of a puzzle. It represents the idea "motion"; but why motion should be symbolized in this particular way seems impossible to say. Seler[16] does, to be sure, advance the notion that it represents, in one place, the sun between the sky and the earth (see p. —, below). For all the certain knowledge we have, it must be considered an arbitrary symbol. The eighteenth symbol (*r*) stands for the word "flint." It is quite a realistic picture of a double-pointed flint knife of the type found in use among nearly all uncivilized peoples. The design at the middle of the edge of this knife is the remnant of a picture of a human face.[17] The nineteenth symbol, Rain, represents the face of the rain-god (see page 385, below). More specific comment on the forms of these symbols will be found in another part of this paper.

[16] 1900–1901, p. 14.

[17] See figure 35, below.

The Numerals

The second principal factor in the calendar system is a series of thirteen numerals. There are a number of interesting opinions as to why the list of numerals should have been limited to thirteen. Some of these opinions are noticed and compared in another section of the present paper. The mere writing of these numerals is a very simple matter. The value is indicated in every case by a series of dots. Very little system is apparent in the placing of these dots. They seem to be placed around the day-sign according to the taste of the artist, in the position which gives the best artistic effect, or where there is convenient space (fig. 2). Other ways of indicating number than the rather

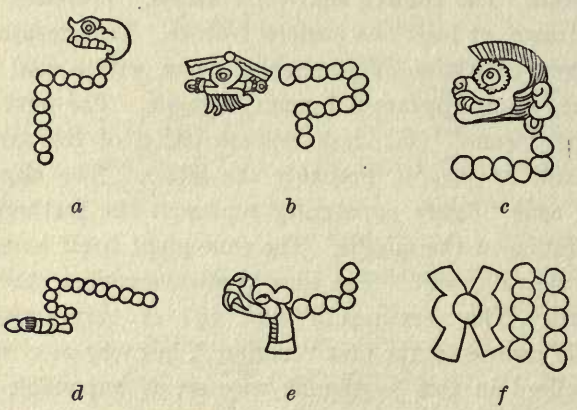


Fig. 2.—The Method of Writing Calendar Numerals

a, The day 12 Death (Nuttall (Zouche), p. 76); *b*, 13 Rain (Nuttall (Zouche), p. 46); *c*, 6 Monkey (Nuttall (Zouche), p. 44); *d*, 13 Cane (Nuttall (Zouche), p. 44); *e*, 6 Snake (Nuttall (Zouche), p. 44); *f*, Motion (Peñafiel, 1890, vol. 2, p. 288).

awkward method of writing down dots, were perfectly well known to the Aztecs.[18] In the "Book of Tributes" and other places where considerable quantities of commodities are to be enumerated, a number of devices are used. Thus "twenty" is represented by a picture of a *pantli*, or battle-flag. A picture apparently representing a feather stands for the quantity "two hundred." There are other symbols for larger quantities. In

[18] See Cyrus Thomas, 1897, pp. 945–948.

the Bologne Codex, "five" is indicated by a straight line, and ten by two parallel lines. Such short-cuts were not customarily applied to the writing of dates. We have in the two principal factors just discussed, then, the raw materials on which the whole writing-out of the calendar was founded: (1) a set of twenty symbols or "day-signs," used with (2) a set of thirteen numerals, indicated by dots.

The Method of Writing Dates

At this point there appears one of the curious features of the Aztec system, to the existence of which reference was made above. The Aztecs, in writing a series of consecutive dates, changed for every date in the series both the day-sign and the numeral. Moreover, as soon as they came to the end of either list, they at once began at the beginning, regardless of how far along they were in the other list. Certain remarkable results follow from this, as will be apparent when it is remembered that the list of numerals was very much shorter than the list of day-signs. Suppose the Aztec were writing our dates according to his own system. He would represent January first by a name and a numeral. For the next day, however, he would have written, not *January-two,* but *February-two.* Thus, he uses throughout the symbols and numerals in double progression. The twelfth day of our year, according to the Aztec system, would have been written *December-twelve,* and the thirteenth, *January-thirteen.* The fourteenth would, assuming that our names were to be used in the Aztec fashion, however be *February-one.* February would be the "sign," following January, and the given date would take the numeral "one" because after the thirteenth numeral has been used, it is necessary to begin again with the first. A good many different illustrations of the Aztec system have been brought forward from time to time.[19] As a matter of fact, there is nothing complicated about it, though it would be the last thing probably to suggest itself if one of us were inventing a calendar system. Its difficulty is entirely due to the fact that it is utterly different

[19] See Tylor, 1863. p, 239. Seler supplies complete tables of the dates written out in the order in which they occur (1891, p. 1).

from what we happen to do ourselves. No reason for the Aztec custom in regard to the numerals has so far been advanced.

The Tonalamatl, or "Book of Indexes"

Every day in the Aztec calendar, then, had what might be called an index, consisting of a symbol used in conjunction with a numeral. The twenty day-signs, every one of which could be written with one of the thirteen numerals, make up a series of 20×13, or two hundred and sixty indexes, all told. This series of compound terms for dates was known to the Aztecs as the *tonalamatl,* literally "Book of Days." It has become customary to use the native term *tonalamatl* in speaking of the series, since the Aztec word has no exact equivalent in any of the European tongues. This "Book of Indexes" is really the one important achievement of the Aztec and all related calendar systems. All the other features of the system (and many of them are both curious and interesting) really follow in a perfectly mechanical way from the application of these 260 day indexes, which is all the Aztec had or could supply, to the solar year of 365 days. The solar year is, in a sense, a "discovery," since it is based on the actual revolution of the earth about the sun, but the *tonalamatl* of 260 signs is apparently an artificial device. One point demands decided emphasis in this connection. The 260 date symbols mentioned above do not correspond to any period used in recording the passage of time. The time-periods are (first) the year, and (second) its subdivisions, the "twenties." One of the many things that make the literature on the Aztec calendar hard to follow is the habit which authors have of recognizing the point just emphasized, that the *tonalamatl* is not a time-period, but meanwhile referring to it in a loose and inconsistent way.[20] The *tonalamatl* represents merely the number of indexes or labels that the Aztec had at his disposal in writing dates. It is precisely from this fact—that the *tonalamatl* was not a period for reckoning time—that the most typical features of the calendar system follow.

[20] For example, Seler, 1901, p. 16, or Nuttall, 1904, p. 494.

The "Book of Indexes" Applied to the Time-periods

Let us suppose, for example, that we are at the beginning of an Aztec year. The dates, according to the Aztec custom, are to run in one continuous series. The division into months is of no significance as far as the writing of dates is concerned. The *tonalamatl* of 260 symbols, as a little reflection will show, reaches only two-thirds of the way through the year. At the end of 260 days we begin to use the *tonalamatl* over again. There is no help for this, as there are no additional indexes for dates beyond the 260th, on which the Aztec could draw. Certain indexes will occur twice, then, in any given year. The 261st date in each year, to go no further, will be exactly the same as the first. If the Aztec wanted to distinguish between the two, he had to adopt some indirect method.[21] If we began a year, then, with the beginning of the *tonalamatl,* at the end of that year we would find ourselves well embarked on our second voyage through the *tonalamatl.* The first turn through the *tonalamatl* would take us to September 17, and in the remainder of the year we would use 105 of the 260 indices over again. It is a point for immediate emphasis that at the end of the year the Aztec did not begin a new *tonalamatl,* but went right on in the new year with the remainder of the *tonalamatl* which he had already partly used. Eternity for the Aztec consisted of an endless series of dates, occurring in regular cycles of 260, irrespective of how these cycles conformed or failed to conform to the actual year-periods. We see, therefore, that the same principle is applied to the *tonalamatl* as a whole, that was applied in the case of the two factors mentioned above, the twenty symbols and the thirteen numerals.

It must be remembered that the list of day-symbols, and the numeral series, are used over and over again in two independent cycles, *ad infinitum.* It is obvious, therefore, that in a year of 365 days the list of twenty day-symbols will be used eighteen times, with the addition of five signs out of the nineteenth revolution ($365 = 20 \times 18$, plus 5). If a given year begins with the *first* day-symbol, then the next year will begin with

[21] See page 314 of the present paper, note 23.

the *sixth*. The next year after that must begin with the *eleventh*, and the year after that with the *sixteenth*. All this follows mathematically from our premises. The year after the one last mentioned (that is, the fifth year reckoning from a given point) begins with the sixth day-sign succeeding the one last mentioned, which is again the first of our series of twenty. It must be remembered that there is no twenty-first in the series. The sign following the twentieth is of necessity the first. Hence, no matter how often the *tonalamatl* is used, the only symbols which will appear on the initial days of years are the first, the sixth, the eleventh, and the sixteenth of our list. This follows as a mathematical result merely of applying a series of twenty day-signs in rotation to a year of 365 days. The Aztecs were accustomed to name the year after its initial day.[22] There were, therefore, only four of the twenty signs which could, in the nature of the calendar, stand at the beginning of the year and serve for year-names. It might be well to follow an established custom and call these four the *dominical* day-signs. As a matter of fact, the Aztecs named their years after the thirteenth, the eighteenth, the third, and the eighth symbols of the list as it is given above. Every year must begin either on the sign *Acatl* (cane), *Tecpatl* (flint), *Calli* (house), or *Tochtli* (rabbit). If we assume that the year begins with one of these signs, the other three follow mechanically. The reason for the shift from the use of the first, sixth, eleventh, and sixteenth day-signs as dominicals, to the third, eighth, thirteenth, and eighteenth is not known. The facts concerning the beginning or initial day-signs were first rendered absolutely certain, I believe, by Mrs. Nuttall at a meeting of the International Congress of Americanists at Huelva, Spain, in 1892. It must simply be admitted that the first sign in the list, according to the usage of the Aztecs at the time of the Discovery, never fell on the first day of the year.

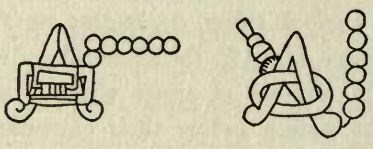
Applying to the numerals a procedure similar to the one we have just applied to the day-signs, it becomes evident that

[22] Nuttall, 1903, p. 13. Seler (1893, p. 142) advances the opinion that they named the year after the first day of the fifth month. Without discussing this point, it is a fact that in general the Aztecs called the year after the index of one particular day in that year. It seems altogether likely that they would select the first day for this purpose.

the whole series of thirteen numerals would be used twenty-eight times in a year and still have one day unaccounted for ($28 \times 13 = 364$, only, while there are 365 days in the year). Remembering the Aztec principle of reverting to the first as soon as a series is exhausted, it is evident that if the first day of a solar year had the numeral 1, the last day of that year would also have the numeral 1. The next year would therefore begin with the numeral 2. This second year, like the preceding one, would end on the same numeral as the one it began with; and hence the third year in the series would begin with the numeral 3. Thus the years in their flight begin with the various numerals in order—a very curious thing, depending on the fact that (1) the year has 365 days, and (2) the numeral series is contained in the year a certain number of times with a remainder of one. Assuming that the Aztecs, before their calendar system was invented, were familiar with the length of the year, it is almost conceivable that they chose thirteen numerals on account of the very consideration that every successive year would in that way begin with a different numeral. Fourteen numerals, however, would of course have served this particular purpose quite as well as thirteen. Such a reason for the selection of thirteen is about as good as any so far offered. To recapitulate: The Aztecs had for calendrical calculations twenty day-signs, thirteen numerals, and a certain number of year-signs, the latter consisting of the indexes which fall on the day on which the year begins. There are only four day-*signs* which fall on the beginning days of years, according to the Aztec system of revolving the calendar; but each of these four signs combines in regular order with one of their thirteen numerals. The total number of indexes which can fall on the initial days of years is therefore four times thirteen, or fifty-two.

It might be well to take some definite examples of the working of this system. Let us assume that the first year of a period begins with the date 1 Cane; the next must begin with the date 2 Flint; the next with the date 3 House; and the next with the date 4 Rabbit; and so on, until every one of the four signs has occurred with each of the thirteen numerals. It will be remembered that the Aztecs named the year after its initial date (see

page 312, above). The Aztecs could with propriety speak of the *day* 3 House, in the *year* beginning with 4 Rabbit. Such a combination "3 House, 4 Rabbit" could not occur again until a whole series of fifty-two years was passed over.[23] As a matter of fact, the Aztec dates were written in precisely this manner, naming both the day-index and the year in which it occurred. The index falling on the beginning day of a year is regularly found associated with a peculiar "year" sign, looking like a monogram composed on an incomplete A and O (fig. 3). It is obvious that at the end of fifty-two years there are no new "year" signs to



a *b*

Fig. 3.—The Year-symbol or Year-sign
a, 7 House (Nuttall (Zouche), p. 52); *b*, 6 Cane (Nuttall (Zouche), p. 44).

be employed, since all the possible initial day-signs have combined with all thirteen numerals. It becomes necessary after fifty-two years to begin with the first again. At the end of such a fifty-two year period the Aztecs celebrated what is called a "tying of the years." The priests kindled new, clean fire with the fire-drill, which was distributed broadcast, and a fresh start in reckoning was taken. Such a fifty-two year period is called a "cycle" (in the Maya calendar of Central America, a "calendar round"). There seems to have been no way known to the Aztecs of distinguishing the dates in a given cycle from those in other cycles. The Aztecs, then, had no fixed point from which they reckoned, and every fifty-two years really represented a new calendar. Their records could hardly be said to cover a longer period than this. Tradition or legend might go back enormously further, but a point never to be too much insisted upon is that

[23] Bearing always in mind the proviso that there might, in certain cases, be two dates "3 House" in the same year. If the Aztec had wanted to be specific in such a case, he could do so only by stating how much time had elapsed since the beginning of the year, or by putting with the day-index a picture of the special divinity who ruled over that day and no other (Seler, 1891, p. 18).

when the Aztec chronicler spoke of what had happened a couple of centuries before his own time, he was imparting essentially mythological information, and was not dealing with historical or chronological facts. In spite of their complex calendar system, the Aztecs, at the time of the Conquest, were a people without a history.[24] It seems entirely probable that the archaeologist will, within the course of the next few years, know vastly more about the history and antecedents of the peoples and tribes known collectively as the Aztecs, than they ever knew themselves. This history will be reconstructed from their archaeological remains, not from their writings.

This calendar system would, therefore, seem in a sense to be a failure. In justice to the Aztecs, however, it must be remarked that their calendar was not devised for the purpose of keeping chronological records. If an Aztec knew in a general way that a given event happened in the time of his grandfather, he seems to have considered himself amply informed. Their calendar was a matter, not of the past, but entirely for the present and the future. Certain combinations of signs used in dating were held, for reasons we can no longer fathom, to imply good fortune. Certain other combinations spelled disaster and woe. The calendar was very generally employed, in accordance with this notion, as a means of soothsaying or divination. Every date had a meaning of its own, irrespective of its relation to other dates. It was in this aspect of the calendar that the Aztec found himself most vitally interested. Their attitude is brought out very nicely by the fact that they gave a man, for his personal name, the index of the day of his birth.[25] This date served him for a name until he won so much distinction and honor that he deserved a better one—an attitude that in general is quite in line with the customs of the American Indians in other parts of the New World. The 260 indexes of the *tonalamatl,* then, appear quite commonly in the Aztec manuscripts as the personal names of heroes. So far as I know, however, they kept no record of how old any individual was. The fact that he was born under certain auspices was important. Nobody cared about his actual age. The calendrical

[24] Brinton in his various works insists on this point.

[25] Codex Magliabecchi (Nuttall, 1903), p. 12.

achievements of the Aztecs, then, are not to be measured by their success in writing chronological history. There are certainly not to be adjudged as having made a failure of something which they after all rarely dreamed of attempting.

CORRECTIONS OF THE CALENDAR

We saw above that the Aztec year had a length of 365 days. The actual length of our solar year is appreciably greater than that—365 days, 5 hours, 48 minutes and 46 seconds, to be exact. The ancient Mexicans, then, made the mistake every year of beginning the new year more than five hours too soon. Such a habit as this leads in the long run to some confusion. In the course of four years the accumulated error makes a difference of practically a full day. At the end of a century of such continual and unrectified miscalculation, the New Year's festival, assuming that one exists, will be celebrated almost a month before the proper time. Such matters take on an appearance of some importance when we reflect that the Aztecs were, above everything, an agricultural people. If conditions found to-day among the agricultural Indians of the United States (for example, in the Southwest) are any criterion, it seems rather likely that the ancient Aztecs took a fanatical interest in the maturing of certain crops. To the sedentary Indian of the United States the center of everything is his cornfield. That the attitude of the ancient peoples of middle America was, as a matter of fact, not essentially different is shown by a passage in the famous "Franciscan Chronicle"[26] referring to the Cakchiquels of Guatemala:

> If one looks closely at these Indians, he will find that everything they do and say has something to do with maize. A little more, and they would make a god of it. There is so much conjuring and fussing about their cornfields that for them they will forget wives and children, and any other pleasure, as if the only end and aim in life was to secure a crop of corn.[27]

It seems entirely probable that the most important religious festivals in Mexico, as among the recent agricultural Indians in

[26] Crónica de la S. Provincia de Guattemala, etc. See bibliography at end of this paper.

[27] *Op. cit.*, chapter VII, quoted by Brinton, 1885, p. 14.

eastern and southwestern North America, were connected with the crops.[28] The religious symbolism of the ancient Aztecs is almost as thoroughly pervaded with references to corn-deities and rain-gods, as are the rituals of the modern Pueblo Indians. The festivals of a people so interested in crops must necessarily have reference to certain fixed seasons of the year. It seems likely, therefore, with regard to the Aztecs, that very serious discrepancies arose at a very early period between the time for the ceremonies, as shown by the progress of the calendar, and the occasion for these observances, as indicated by the state of the crops. The calendar system, it must be remembered, in the form in which we know it, has a history of many centuries behind it. Its symbols occur on some very ancient monuments. Time enough had elapsed, therefore, by the period when our record opens, for such discrepancies to have become acute. The Aztecs, owing to this "precession" of their calendar, might well have found themselves at times celebrating harvest-home festivals before the crops were so much as put into the ground. Each generation must have discovered, from its own experience, that their year of 365 even days was too short. From what we know of Aztec life, then, we should expect to find some provision in their calendar for corrections of some sort or other.

No marked success, however, has met the numerous efforts which have been made to prove that a system of periodic corrections or "intercalations" really existed. The present writer, moreover, cannot but feel that all the theories so far advanced concerning the Aztec system of correction have been founded more or less frankly on the knowledge which civilized students have of what the correction ought to have been. Our system of adding a day every four years produces a calendar very nearly correct. The error between the time of Julius Caesar and the year 1752 amounted to only eleven days all told. We can say at once, however, that the probabilities are all against the Aztecs having made this correction of one day in every four years, or any equivalent interpolation. Lacking instruments of precision and chronometric appliances, and being also without real written records,

[28] See, for example, the Codex Magliabecchi (Nuttall, 1903), pp. 63, 79, etc.

such an interpolation on their part would have been a most surprising accident.

All the theories and commentaries written by modern scholars on the question of Aztec intercalation are based on relatively few original sources. By an original source is meant, in this connection, accounts obtained by people who were actually in contact with the Aztecs before their calendar lore was lost. The following list represent a few of the most frequently quoted of these "original" authorities (page 319, upper half).

On the soil afforded by the sources named, a number of curious and interesting theories have blossomed. The theories concerning intercalation are distinguished, first, by their variety, and secondly, by their ingenuity. No one of them seems to my mind, under the conditions given, to be plausible. It is only fair to state that the most ancient accounts exhibit about as much diversity as the most recent critiques. In the case of Sahagun, for example, we find the original author virtually contradicting himself.[29] The variety of the modern opinions in the matter of intercalation is brought out quite clearly by putting them side by side in the form of a tabulation (page 319, lower half).

So much for the evidence of intercalation on the positive side. There is certain evidence, however, that seems to indicate that the Aztecs must have been unacquainted with the whole principle of calendar correction. Of first importance is the curious fact mentioned by Seler[31] that when Sahagun talked with certain "old men, the most skilful possible," at Tlaltelolco, forty years after the Conquest, their reckoning of the events of that Conquest were already ten days in error. It seems impossible to over-emphasize the importance of such evidence as this. It is of vastly more significance than any number of statements from the Indians as to what their custom was or was not. The hard facts in the case seem to partake of the nature of a demonstration, either that they had no intercalation, or, if any such principle was employed, that they applied it only to periods of over forty years duration. Another bit of negative evidence

[29] Compare the doubtful statements in the second book, chapter 19, with the vigorous ones contained in the Appendix to the fourth book.

[31] 1891, p. 19.

SOME OF THE MORE IMPORTANT ORIGINAL SOURCES FOR THE STUDY OF THE AZTEC CALENDAR
(OTHER THAN NATIVE MANUSCRIPTS)

Author	*Principal Work*	*Date of Composition*	*Date of Publication*
Fernando de Alva Ixtlilxochitl	Historia Chichimeca	1608–1616	*In* Kingsborough, London, 1831; *also in* Ternaux-Compans, 1838.
Toribio de Benevente, called "Motolinia"	Historia de los Indios de Nueva España	1541	Paris, edited by Bertrand, 1840; Mexico, edited by Chavero, 1891.
Bernardino de Sahagun	Historia general de las cosas de Nueva España	1546–1569	Mexico, edited by Bustamente, 1829; Paris, edited by Jourdanet and Siméon, 1880; *also in* Kingsborough, London, 1831, *and in* Icazbalceta, Mexico, 1858.
Jacinto de la Serna	Manual de los Ministros de las Indias	1656	*In* Anales del Museo Nacional, Mexico, 1899.
Juan de Torquemada	Monarquía Indiana	1589–1609	Sevilla (Madrid?), 1615. Ed. 2, edited by Gonzalez-Barcia, Madrid, 1873.
An Unknown Friar	Crónica de la S. Provincia del Santísimo Nombre de Jesus de Guattemala	1683	

VARIOUS AUTHORITIES ON INTERCALATION

Author	*Theory of Correction*	*Reference*	*Based on*
Zelia Nuttall	13 days added every 52 years	1904, p. 486	Serna, Sahagun.
Carlos Siguenza (followed by Clavigero, 1870)	13 days added every 52 years	Ciclografia Mexicana (work lost, 17th century)	Supposed to be based on certain Ixtlilxochitl manuscripts.
Antonio Leon y Gama (followed by Troncoso)	25 days added every 104 years	1792, p. 52	Hypothetical reconstruction of the calendar.
Manuel Orozco y Berra	12 and 13 days added alternately every 52 years	1880, vol. 2, p. 60	Codex Borgia (which he undoubtedly misinterpreted).
Jose Fabrega (followed by Von Humboldt)	7 days suppressed every 1040 years	1899, p. 146	Misinterpretation of Codex Borgia, pp. 62–66.
Eduard Seler	10 days added every 40 years	1903, p. 49	Sahagun.
Various authors[30]	1 day added every four years		
Eduard Seler	No intercalation employed	1891 translation, p. 21	Sahagun, Motolinia, Torquemada, Franciscan Chronicle.

[30] Referred to by Preuss, in the Cyclopaedia of Religion and Ethics, article "Calendar: Mexican."

is of an equally uncompromising nature: None of the ancient manuscripts show any trace of intercalation, though some of them involve rather longer periods of time. This latter statement applies with particular force to the Vatican manuscript 3738 (Vatican Codex A).[32]

All the arguments for intercalation seem to involve one fundamentally wrong conception. There exists a school of thought which sets up, in this part of the New World, a strong centralized government, with a king at its head, whereas there existed in all probability merely a weak confederation of utterly democratic Indian pueblos, directed by a war-chief who was elected to supervise military operations merely. Some of the ideas expressed concerning the calendar seem to hinge on this misconception. Not enough attention has been paid in this connection to Bandelier's papers.[33] The works of many European writers on American institutions still involves thrones and principalities, crowns and scepters, very much as though Bandelier had never written. The usual assumption is that, granted the existence of an empire, there must have been in ancient Mexico some one universal system of calendar correction, and that it is our duty to find out what this system was. There is, as a matter of fact, some reason to believe that there was in the last analysis no fixed, authoritative calendar, to say nothing of an official system for correcting it. Considerable evidence is available that the whole Mexican system was in a formative and somewhat chaotic condition. It may be well to enumerate some of the points that would suggest this conclusion

Sahagun tells us, for example, that the beginning of the Aztec year differed greatly in different places. When he himself wished to find out with what day the year began, he had to call a conference of "old men" and "scholars," and they disputed over the matter "for many days." Finally, apparently as a compromise, they decided on February 2.[34] In other words, the required date was not a matter of fact; it was a matter of

[32] Consult Seler, in the passage just mentioned.

[33] "On the art of war and mode of warfare of the ancient Mexicans"; "On the distribution and tenure of lands and the customs with respect to inheritance among the ancient Mexicans"; "On the social organization and mode of government of the ancient Mexicans." 1880.

[34] 1831, p. 192.

opinion, and involved the reconciliation of conflicting reckonings. In this connection it is furthermore worth noting that even the names for the day-signs varied apparently from pueblo to pueblo. A very interesting list of day-signs from Mezitlan, quoted by Seler,[35] has a sign "Earth Goddess" in the place usually occupied by Water-monster. This same list differs from that of Mexico City in having "Young Maize Ear" in place of Lizard; "Milling-stone" in place of Vulture, and "Tooth" instead of Grass. It seems probable that additional lists from independent localities, or from a number of different pueblos, would reflect even greater variety in the names for the separate days. In view of these facts, it does not seem proven that there was any universal or regular system of calendar reckoning among the Aztecs. We must remember, also, that intercalation is hardly more than a novelty in Europe. Until the time of Julius Caesar, our own European calendar was a very helter-skelter institution. The pontiffs of republican Rome "squared" the calendar with the seasons as the emergency arose, and as opportunity seemed to offer. From what we know of Mexican civilization in general, with its independent towns and distinct linguistic areas, it seems highly unlikely that the ancient peoples there had any better arrangement than the Roman one. The evidence and the probabilities are vastly in favor of the idea that no regular system of calendar correction existed in ancient Mexico.[36]

ORIGIN OF THE CALENDAR SYSTEM

It remains to discuss the origin and basis of this series of calendar symbols. Concerning the actual evolution of the signs, nothing is known. To discuss the matter with any degree of profit, access to considerable collections of the more ancient Mexican monuments would be necessary. Perhaps with a study of such monuments it would be possible to establish the evolution of the system in a general way. It is also impossible to say why the particular twenty objects which appear in the ordinary

[35] 1900–1901, p. 7.

[36] Compare Preuss, in the Cyclopaedia of Religion and Ethics, article "Calendar: Mexican," where similar conclusions are briefly expressed.

tonalamatl were chosen. Resemblances of a rather striking sort exist between the calendars of Mexico and, for example, China. The analogy embraces not only the arrangement of dates in cycles, and the method of combining signs with numerals, but in some cases even identity of the signs employed. For that matter, there are undoubted points of analogy between the Aztec signs and certain of the signs of our own zodiac. However, to put forward the claim, which is occasionally heard, that such resemblances are proof of contact, or of a migration from China, is to run counter to the entire trend of the evidence of Mexican archaeology as a whole. It becomes constantly more obvious that the civilization of Middle America was really an autochthonous development, though discussion on the matter is still heard. It may be taken for granted, therefore, that we must look for the development of the Middle American calendar system on the spot. So far as I know, however, no one has tried to treat the subject historically. The effort so far has been to account for the development of the calendar, especially its numerical elements, on a psychological basis.

The Reason for Twenty as a Factor

The one solitary point on which students of the Aztec calendar agree concerns the reason for the selection of *twenty* day-signs. This factor twenty is assumed to have its foundation in the Aztec numeral system. The Aztecs, that is to say, like many nations of ancient and modern times, had a system of numbers based on twenty instead of on ten. A very interesting discussion of this system may be found in Cyrus Thomas' paper "Numeral systems of Mexico and Central America."[37] It stands quite to reason that their numeral system must have developed much earlier than their peculiar calendar. No further explanation is needed, therefore, in the opinion of many scholars, for the fact that they chose twenty day-signs. It seems, on first glance, to be just what would have been expected from a knowledge of their arithmetic.

[37] 1897–1898, *b*.

The Reason for Thirteen as a Factor

When we consider the fact, however, that the twenty day-signs were combined with thirteen numerals we are confronted by a genuine puzzle. Opinions about the reason for the existence of a series of thirteen numerals are almost as numerous as the authors who have discussed the subject. If, as a matter of fact, the existence of a vigesimal numeral system led to a selection of twenty symbols, we should certainly expect it to lead to the selection of twenty calendar numerals. Why do we find only thirteen? The artificial character of most of the hypotheses concerning this point is made evident by merely putting them side by side.

VARIOUS SUGGESTIONS TO ACCOUNT FOR THE ELEMENT THIRTEEN IN THE CALENDAR

1. The factor thirteen appears because the most important parts of the body are thirteen in number: namely, the ten fingers, *one* ear, *one* eye, and the mouth. (Förstemann.)[38]
2. Thirteen represents the period of the moon's waxing, or waning.[39]
3. Thirteen was chosen because the ancient Mexicans had a conception of thirteen heavens. (Förstemann.)[40]
4. The title-page of the Tro-Cortesian codex has a representation of the four cardinal points, counting in both directions, followed by the symbols for the zenith and nadir, and another one unfortunately obliterated. Above these are written the numbers one to thirteen. Does this account for the thirteen of the calendar? (Cyrus Thomas.)[41]
5. The Aztecs established a year of 364 days, because they needed for the year a quantity divisible by 4. The quantity (364) factors into 4×91, also into 28×13. Hence 13. (Förstemann).[42]
6. Thirteen is derived from the fact that 8 solar years are equivalent to 5 "Venus" years. The Aztecs, in devising their calendar, chose a unit consisting of a combination of 8 and 5. Hence 13. (Seler.)[43]

[38] 1893, p. 494.

[39] This suggestion is mentioned by Preuss in his article on the Calendar to which reference was made above (footnote 37), and by Bowditch (1912, p. 266).

[40] 1893, p. 494.

[41] 1897–1898 *b*, p. 954.

[42] 1893, p. 494.

[43] 1900–1901, p. 17 (following Troncoso).

These suggestions, while more or less ingenious, are rather obviously artificial. The points involved in the first suggestion, for example, would, if logically carried out, have resulted not in the selection of thirteen numerals, but of some other number. If, in making up a list of the most important parts of the body, they were to count all ten fingers, half at least of which are exactly like the other half, and which are not individually organs of supreme importance, they would certainly have counted both eyes. As regards the second suggestion, considerations of fact thrust themselves forward. The actual period of the moon's waxing is not thirteen days. Besides, if the moon had had any effect on the evolution of the Aztec calendar, we would certainly look for some traces of a lunar month. Nothing is simpler than to count from one full moon to the next. The Aztecs would hardly have made half of the moon's period an element in their calendar and ignored the full period. The next two suggestions in the list involve what is probably a logical inversion. It seems likely that if the Aztecs conceived of thirteen heavens, or thirteen gods of the day, it was because, for calendric or other reasons, the number thirteen was already uppermost in their consciousness. The number thirteen seems, as a matter of fact, to be rather important in their institutions. Thus there were thirteen divisions in the Mayan armies; there are thirteen serpents in the Tzental mythology; and to the Cakchiquel the thirteenth day was sacred.[44] It is, however, as plausible to consider these ideas a derivative from the calendar as to turn the proposition the other way about.

The most abstruse theory is that of Förstemann (number 5 in the list just given). He assumes that the Middle American peoples began by having a year of 360 days. Finding it too short, they increased its length not to 365 days, but to 364, because for personal (and it must be added, quite mysterious) reasons they wished the number of days in the year to be divisible by four. But a year of 364 days naturally divides itself into subdivisions of twenty-eight days, and there are thirteen of these subdivisions. Hence the thirteen of the calendar. Aside from its highly elaborate character, this theory does not account for

[44] Cyrus Thomas, 1897–1898 *b*, p. 953.

the fact that the Aztecs selected the thirteen rather than the twenty-eight, or for that matter, rather than ninety-one, which is as much a factor of 364 as are the other two quantities.

If Förstemann's theory is the most abstruse, the one advanced by Seler enjoys the distinction of being the most complicated. His hypothesis involves his favorite idea that the Mexicans laid stress on a "Venus" year of 584 days. He is struck with the fact, which is in a sense a curious one, that five of these Venus years make up a period exactly equivalent to eight solar years. He then makes the assumption that the Aztecs chose, as the basis of their calendar, a period consisting of these two periods taken together, or 949 days. The greatest common divisor of 365 and 584 is 73; the solar year is five times, the Venus year eight times, and the "basic" period thirteen times this factor. Hence the element thirteen. If Seler's theory is true, it must be borne in mind that while these computations were being carried out in the mind of the ancient inventor of the calendar, the days were still nameless. They derive their names by the combination of certain signs with these very thirteen numerals whose origin we are discussing. Seler assumes therefore that the Aztec dealt with such large numbers of days as 949, and traded such groups of days about in their minds, before they had names for any of them. In other words, he assumes that the Aztecs became skilled mathematicians, noted carefully the length of solar and planetary periods, and only after that sat down to invent names for their days. There is no evidence in the whole of human history that institutions develop in this way. The probabilities of such a development having occurred with the calendar of the Aztecs are, it seems to me, too remote to make the theory worth elaborating.[45]

Some scholars try to explain, not the occurrence of thirteen as an element in the calendar, but the occurrence of the *tonalamatl* of 260 units. If for the first step the Aztecs recognized 260 as a fundamental quantity, and for the second step selected twenty day-signs because the vigesimal character of their numerals suggested such a course, they would derive the third

[45] It is only fair to remark that Seler, judging from his phraseology, seems to feel somewhat the same way about it himself.

element by dividing 260 by 20, thus getting 13. Several explanations, as a matter of fact, have been advanced which account for the element 260 directly. Someone has suggested that nine was a sacred number, and that 260 represents the total number of days in *nine* lunations. This hypothesis has been mentioned favorably by Mrs. Nuttall.[46] Aside from other objections, nine lunar months give, as a matter of fact, not 260 but approximately 265½ days. Another hypothesis, which dates from very early times (possibly from Motolinia)[47] is based on the idea that 260 days represented the period of visibility of Venus. This hypothesis might at least be discussed if Venus really were visible for 260 days. Unfortunately, nothing of the sort is the case. As remarked by Beuchat,[48] the 260-day period does not correspond to the duration of any known astronomical phenomenon. Still another hypothesis derives the importance of 260 days, and the use of that period in the calendar, from the fact that pregnancy occupies that time. This last suggestion would perhaps be the most plausible of the lot if pregnancy lasted for that period. It has been advanced by Mrs. Nuttall,[49] before her by Förstemann,[50] and before him by Torquemada. Aside from its relative simplicity, it seems to have little in its favor.

Goodman, whose monograph was probably the most important single contribution to the subject,[51] holds the opinion that the 260 is not necessarily based on the combination of twenty and thirteen, but that it became established because it was a unit that divided up very conveniently in a number of ways.

Everything considered, I am inclined to advance the conviction that the factors thirteen and twenty are the original elements in the *tonalamatl.* It would seem most plausible, other things being equal, to suppose that these two simple factors evolved in some way, and that the *tonalamatl* is the product of them. Very likely there was a simple and practical reason which led to the selection of these two factors in the first place. It may

[46] 1904, p. 495.
[47] See Seler, 1900–1901, p. 16; Nuttall, 1904, p. 495.
[48] 1912, p. 334.
[49] 1904, p. 495.
[50] 1895, p. 532.
[51] 1897, p. 29.

safely be said, however, that this reason is not obvious at the present time.

Derivation of the Calendar Symbols

Reference has been already made to the fact that the calendars of all the more highly civilized peoples of Middle America have many points in common, and are constructed along practically the same lines. It is obvious at once, therefore, that there is opportunity offered for the most interesting comparative study. Such investigations have been carried out with gratifying results by Professor Seler. Two of his works are of especial interest from this point of view, namely, his "Mexican chronology with especial reference to the Zapotec calendar,"[52] and his monograph on "The *tonalamatl* of the Aubin collection."[53] Discussion as to the probable place of origin of the calendar, and the derivation of its signs, is therefore unnecessary here. Of the two papers mentioned, the latter in particular contains a systematic presentation of the affiliations of the whole series of symbols, in order.[54] The matter may be dismissed in the present connection with the remark merely that Professor Seler's evidence in these two papers is almost entirely of a linguistic character. Archaeological evidence has never been applied to this question.

Probable Line of Evolution

There are really two types of explanation possible for the existence of this complex calendar—gradual evolution or sudden creation. Of the two hypotheses I vastly prefer the first, on general principles. Discussion will be out of place, however, until we have some actual data to discuss. Some of the most distinguished Americanists, on the other hand, seem to regard the calendar as a sudden invention. Seler, as quoted above, views the calendar in its entirety as the product of some one author or set of authors, working consciously toward the elaboration of a system. Mrs Nuttall[55] also voices the belief that the

[52] 1891.
[53] 1900–1901.
[54] *Op. cit.*, pp. 9–16.
[55] 1904, p. 494.

system had an inventor (not to describe him more definitely) who actually had in view, and provided for, an epoch of 1040 years. He is supposed to have made provision in his calculations for 260 Venus periods, rectified by 260 separate five-day corrections, and to have provided for twenty intercalations. She seems to regard the twenty day-symbols, the *tonalamatl*, the whole complex institution, as the product of one tremendous cerebration. Though I profess myself unable to discuss the evolution of the system in definite terms, I wish to register my profound unbelief that it took any such line as this. The chances are, it seems to me, that the calendar has an actual history—a history of gradual accretion, change, and elaboration. I am inclined to think that the Aztec calendar system frequently suffers from being considered apart from its setting. It is important to remember that it was the work of Indian tribes who had hardly passed beyond the threshold of civilization. While elaborate, it is, like many primitive achievements, rather awkward and inefficient even in its perfected form. The operation of the Mexican calendar system recalls the faults of their method of picture-writing. Both institutions impress one with a sense of their futile ingenuity. Any writer who treats of the Aztec calendar ought, I think, to preserve in his mind a very lively picture of the Indian pueblos in which it developed. It is certainly absurd to put the Mexican calendar on a plane of equality with the calendar systems of those nations of the Old World who had written records, and at least the beginnings of science. Further than to insist that the calendar probably has a history, it seems impossible to go.

THE DELINEATION OF THE CALENDAR SYMBOLS IN THE MANUSCRIPTS

We have seen that the various calendar symbols represent, at bottom, actual objects or phenomena. A possible exception occurs in the case of the "Motion" or *Olin* symbol, in which the graphic element seems to be obscured, if it ever had one. A good many tendencies operate in the case of most Aztec calendrical signs to change their original character. The simplest

of these tendencies is perhaps the mere desire for ornamentation or decoration. The native artist at times seems to regard the calendar signs as an admirable field for the expression of artistic taste. This is illustrated very well by the treatment of the serpent's head, used as the day-sign Snake or *Coatl*. Figure 4 represents the various manners in which this design is elaborated. In the drawings shown in the figure the general outline has not been seriously modified. The various artists do, however, show considerable discrimination in the choice of different styles of ornament which they apply.

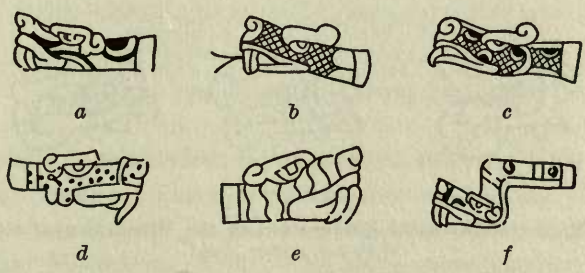


Fig. 4—Different Styles of Ornamentation applied to the Serpent Head

a, Vatican B, p. 4; *b*, Nuttall (Zouche), p. 4; c, Nuttall (Zouche), p. 61; *d*, Vatican B, p. 4; *e*, Vatican B, p. 5; *f*, Vatican B, p. 81.[56]

The same point is brought out very clearly in the case of the different representations of Water-monster (*Cipactli*). This is illustrated in figure 5. The head in every case is reptilian in contour, possesses a prominent eye-plate, and is characterized by the presence of a row of enormous triangular teeth. The surface of the head is elaborated into spots, vertical lines, bars and dots in a variety of arrangements.

The first point in the study of the day-signs, as they are delineated in the manuscripts, is therefore that there is evident considerable play of the artistic impulse. As a result, many fanciful modifications of the original idea are in each case to be looked for.

Another point deserving emphasis is this: that the native artists, in delineating day-signs, were dealing with subjects per-

[56] See note 15, p. 305.

fectly familiar to themselves and their audience. They were at liberty therefore to reduce their pictures to the most naked symbols without danger of being misunderstood. Moreover, the signs in many manuscripts occur in a regularly established sequence, and in many cases the identity of a symbol may be

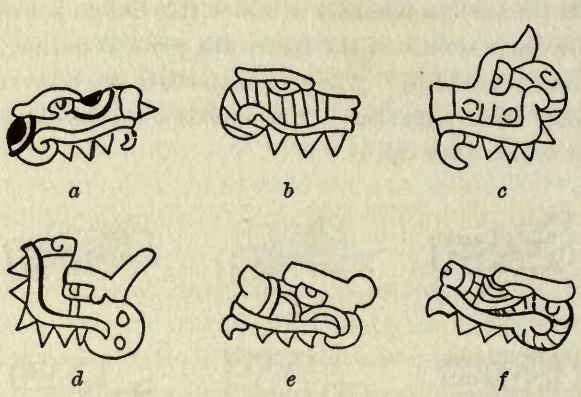


Fig. 5.—Ornamental Elaboration in the Decoration of the Water-monster Head

a, Vatican B, p. 4; *b*, Vatican B, p. 7; *c*, Vatican B, p. 67; *d*, Vatican B, p. 71; *e*, Vatican B, p. 1; *f*, Vatican B, p. 2.

determined as readily by its place in the series as by its appearance. In many cases, accordingly, we encounter symbolism run rampant. The symbols occur, in fact, in all stages of denudation. It would be easily possible, on the basis of the material in the manuscripts, to "trace the development" of the more simple and conventionalized designs from the more complicated and realistic ones, by the old device of putting the realistic at one end of a series and the conventional at the other. It is, however, worthy of note in this connection that we often encounter a highly complex form of a sign and a highly simplified one, side by side, on the same page (see fig. 6). In other words, the native artist apparently had complete forms of these day-signs always in his mind. Sometimes in writing down a given sign he would choose one or two features only, and in other cases would put them all down, with elaborate ornament in addition, if the space permitted and the humor struck him. One thing is perfectly evident from

a study of the available manuscripts: that in the execution of the day-signs, a considerable part is played by caprice.

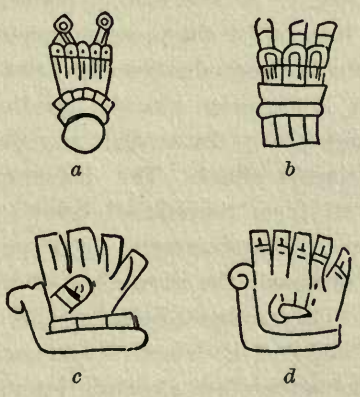
These conditions permit almost unlimited convergence in the various designs, making it practically impossible in some cases

a *b*

Fig. 6.—Two Forms of the Day-sign Rain (*Quiahuitl*), representing the Rain-god, *Tlaloc*

a, Human face with a goggle eye and long teeth; *b*, the same simplified. (Both from Nuttall (Zouche), p. 9.)

to identify a symbol when taken from its context. This is illustrated in figure 7. There is general similarity between the first two drawings (*a* and *b*), yet they represent quite independent day-signs, Flower and Cane. An even more extreme case is shown in *c* and *d* of this figure. *c* represents a human jawbone surmounted by an eye, and the whole accompanied by a tuft of grass. The whole composite figure represents the day-sign Grass.



a *b*

c *d*

Fig. 7.—Drawings Similar to Each Other but Standing for Distinct Ideas

a, Flower (*Xochitl*), Vatican B, p. 7; *b*, Cane (*Acatl*), Vatican B, p. 11; *c*, Grass (*Malinalli*), Vatican B, p. 18; d, Water (*Atl*), Vatican B, p. 82.

d is a conventionalized representation of a vessel of water with a shell in it (see figs. 20 and 25) and stands for the day-sign Water. Yet the two symbols *c* and *d* certainly look as though they were intended to represent the same idea. This variability and convergence may be best discussed in connection with individual studies of each of the day-signs, and the various forms assumed by them. The tendencies just pointed out will be found to operate in the case of each of the day-signs taken up in the remainder of the paper.

THE TWENTY DAY-SIGNS: THEIR CHARACTERISTICS AND VARIATIONS

The effort has been in the following pages to collect the most divergent examples possible of the twenty day-symbols and to put them side by side for comparison. A good many Mexican manuscripts have been omitted from the returns submitted in this paper because they contained drawings of Europeans and European objects, and were therefore obviously late. Prominent among the manuscripts of this class which have not been considered are the Vatican Codex A (3738), and the manuscripts mentioned above, published in facsimile by the Junta Colombina in Mexico City[57] (the Codex Porfirio Diaz, the Codex Baranda, the Codex Dehesa, etc.). A good deal of material has thus been passed over as too inexact for the present purpose. Conspicuous in this category are the reproductions in Lord Kingsborough's enormous *Mexican Antiquities* already mentioned. Here the day-signs are so imperfectly drawn that any discussion of their forms would be wasted effort. The drawings in the Aubin manuscript, some of them reproduced below, are much worse than any of those in Kingsborough. The peculiarities of the day-signs in it are obviously the mere effect of ignorance and bad draughtsmanship. The Loubat edition of this manuscript constitutes a perfect copy of a defective specimen. The variant forms it contains have therefore a certain interest.

Wherever possible, the day-signs illustrated below have been compared with realistic drawings of corresponding objects. Study of these graphic drawings throws considerable light on

[57] See Chavero, Antigüedades mexicanas, 1892.

features of the day-signs which might otherwise be obscure. It is only fair to assume that the day-sign, where it is not realistic, is a simplified and conventional version of the graphic representation. It will in some cases be seen that the drawings which appear as day-signs are curious, not purely because they are day-signs, but because the Aztec artist had limitations even where he tried to be realistic. The realistic drawings which appear below are selected in every case from the list of original manuscripts which supplied the day-signs illustrated.

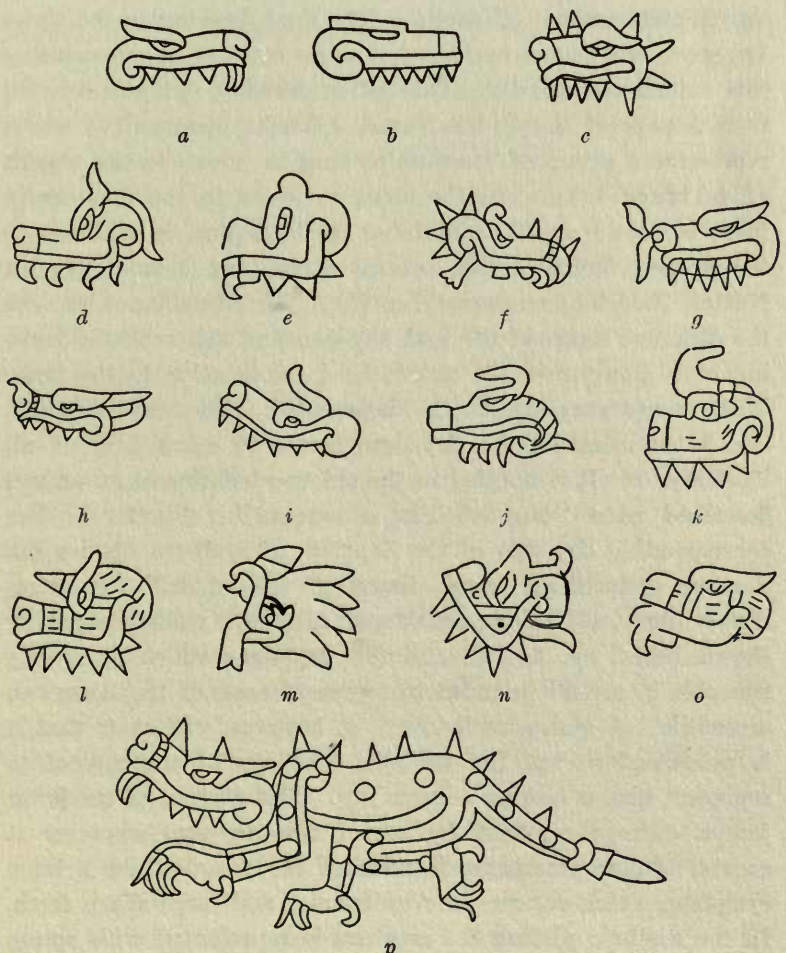


Fig. 8.—*a–o*, The Day-sign Water-monster (*Cipactli*);

Water-monster (Cipactli)

Sources of drawings (fig. 8):

a, Nuttall (Zouche),	p. 76	*i*, Nuttall (Zouche),	p. 47
b, Vatican B,	p. 47	*j*, Vatican B,	p. 80
c, Nuttall (Zouche),	p. 35	*k*, Vatican B,	p. 50
d, Vatican B,	p. 87	*l*, Vatican B,	p. 59
e, Vatican B,	p. 73	*m*, Aubin,	p. 13
f, Bologne,	p. 3	*n*, Vatican B,	p. 58
g, Nuttall (Zouche),	p. 4	*o*, Vatican B,	p. 5
h, Fejervary,	p. 28	*p*, Nuttall (Zouche),	p. 75

The drawings in figure 8 represent various forms of the day-sign Water-monster (*Cipactli*). The final drawing in the series (*p*) gives what must be regarded as an attempt at representing this animal realistically. This latter drawing (*p*) was selected from a page of the Codex Nuttall (Zouche manuscript) which represents a group of warriors moving in canoes to the assault of an island town. In the scene as given in the manuscript there is drawn a lake, containing in its depths, in addition to the present figure, a fish, several shells, and a snail (Codex Nuttall (Zouche manuscript), p. 75). The resemblance between the different forms of the first day-sign and this realistic drawing of a monster in the water, lend ample color to the name Water-monster applied to the day-symbol. The word *Cipactli*, the Aztec name of the day-sign, seems to mean first of all "prickly."[58] It is applied in the old vocabularies to an animal described as a "big fish like a cayman" (alligator). The corresponding day-sign of the Zapotecs of southern Mexico has a name defined as "great lizard of the water." It seems rather likely, all things considered, that the realistic drawing shown below (*p*, fig. 8) and the day-signs which so closely resemble it, are all intended to represent some of the American crocodilia. A glance at figure 8, *p*, however, will show that it is possible for even the realistic drawings of the animal to represent him as lacking a lower jaw. This absence of the lower jaw is quite a constant feature of this day-sign wherever it occurs. Other prominent features of the day-sign are a large eye-plate, which occurs quite uniformly, and large sharp teeth. In the realistic picture the creature is represented with spines

[58] Seler, 1900–1901, p. 9.

along his back, and on top of his snout. The spines along the backbone are a counterpart of those which occur on the actual animal. Those along the nose and head, however, are artificial additions. A study of figures *c*, *f*, and *p* of figure 6 makes it seem rather likely that these latter "spines" are in their origin merely additional teeth which have wandered up from the lower part or mouth part proper. On the other hand, they may be additions suggested to the Mexicans by their familiarity with horned lizards or "horned toads," which, barring size, are animals somewhat like the alligator but possessing horny or spiny heads.

The teeth shown in the different forms of this day-sign are worthy of remark in a general way. Figure 8, *d*, comes nearest to representing realistically true crocodilian dentition. The triangular teeth shown in *b*, a more usual type in the manuscripts than the others, seem to be merely conventionalized forms. The Water-monster signs have in their outlines at least a family resemblance to the sign Snake, or *Coatl* (see fig. 13). This resemblance has apparently affected the dentition given to the Water-monster, who is often provided not only with teeth, but with serpent fangs. The distinction between the two types of teeth is clearly made in the drawings lettered *a*, *e*, *f*, figure 8, and is perhaps suggested in *p*. In *m* we see not only a snake-like fang, but the forked tongue of the serpent as well. These points, suggested by or accompanied by an approximation in general form to the serpent type, seem to be purely a case of borrowing.

In a few of the drawings a nose-plug is exhibited (*g* and *m*). This is a purely human article of adornment, and one that is seen in many warrior and priestly figures in the manuscripts. In figure 8, *l*, the combination of a spine and an eye-plate looks almost like a sort of cap. The tail in figure 8, *p*, terminates in a flint knife, or a figure very much like the flint knives illustrated in figure 35.

In connection with the symbol Water-monster, Seler makes a remark which is in my opinion a sample of what ought to be avoided. He observes that the spikes on the top of the Water-monster's head are intended to represent stone knives. He "proves" that this is their original meaning by referring to a

page in the Codex Borbonicus, in which the spikes have the form of stone knives. There is a logical weakness here. In some manuscripts we find the Eagle's feathers also taking the form of flint knives (fig. 32, *g*). That does not prove that the feathers were originally drawn as flint knives. There is in general so much arbitrary simplification and elaboration in the representation of all the signs, that to light on any one variant and call it the original form is a waste of time. The only means we have of judging what the original form may have been is to find a representation of a given object which is evidently intended to be graphic. When, for example, the artist in the case of the *Cipactli* sign, which we are discussing, draws a monster in the midst of a lake surrounded with realistic representations of fish, snails, and bivalve shells, as in the case with the original of figure 8, *p*, it is only a fair guess that he intends his drawing to be realistic; and such a drawing probably represents his idea of what the animal really looks like. It is at least plausible to refer to the features of such drawings as the original ones. Even this is not really conclusive. The characteristics of the graphic representation may be affected by features borrowed from the familiar day-symbols. It would certainly be more plausible in the case of Seler's flint knives to make an assumption directly the contrary of Seler's, and say that his flint knives of the Codex Borbonicus are elaborated and re-interpreted teeth or spikes. It is hard to believe that the day-sign Water-monster could have begun its career in a form so peculiar as that of an animal set about with stone knives.

Seler's papers show another tendency which deserves comment. He often refers categorically to certain traits as characteristic of a given day-symbol. If one deliberately collects as many variant forms as possible of one day-sign, it is hard indeed to find any one feature which occurs in all of them. To give a specific example, Seler says that in representations of *Cipactli* "a row of spikes runs . . . along the vertical line of the head."[59] The drawings *a*, *b*, *e*, *g*, *h*, and *i* in the present figure, all six of them very beautifully drawn, are without this feature. The

[59] 1900–1901, p. 9.

absence of hard and fast rules of this sort will be emphasized in discussing others of the signs below.

One other feature of the Water-monster designs is worth mentioning. I refer to the artistic value of most of the heads as decorative objects. Most of these heads present a thoroughly picturesque appearance. The eye-plate is nearly always more or less flamboyant, as is, in many cases, the figure as a whole. Figure 8, *a–i*, are more typical in this respect than are the others.

Wind (Ehecatl)

Sources of drawings (fig. 9):

a,	Vatican B,	p. 52	*j*,	Nuttall (Zouche),	p. 1
b,	Vatican B,	p. 7	*k*,	Vatican B,	p. 71
c,	Bologne,	p. 1	*l*,	Nuttall (Zouche),	p. 16
d,	Vatican B,	p. 71	*m*,	Nuttall (Zouche),	p. 16
e,	Nuttall (Zouche),	p. 5	*n*,	Nuttall (Zouche),	p. 18
f,	Vatican B,	p. 3	*o*,	Fejervary,	p. 35
g,	Vatican B,	p. 1	*p*,	Nuttall (Zouche),	p. 3
h,	Nuttall (Zouche),	p. 62	*q*,	Nuttall (Zouche),	p. 65
i,	Vatican B,	p. 87			

The various forms of this day-sign represent the wind-god, *Quetzalcoatl*, a name meaning literally, "Feathered Serpent." The symbol is associated however with the word *ehecatl*, or "breeze." Figure 7, *q*, gives an idea of the way in which the deity is represented realistically. He has here the form of a human being, running, and carries on his left arm a shield, with javelins, and in his right hand the *atlatl*,[60] or spear-thrower. His straight hair and a full beard are shown in the picture. His nose is prodigiously elongated, and the parts of his face around the mouth have the form of a bird's beak. It is rather hard to tell by inspection whether these two features are supposed to represent the actual facial peculiarities of the god, or simply a mask worn by him. On his head is a pointed cap, represented in many places as made of tiger skin, and at the back of his neck is a very characteristic fan-shaped ornament. The remainder of his

[60] Consult Nuttall, 1892.

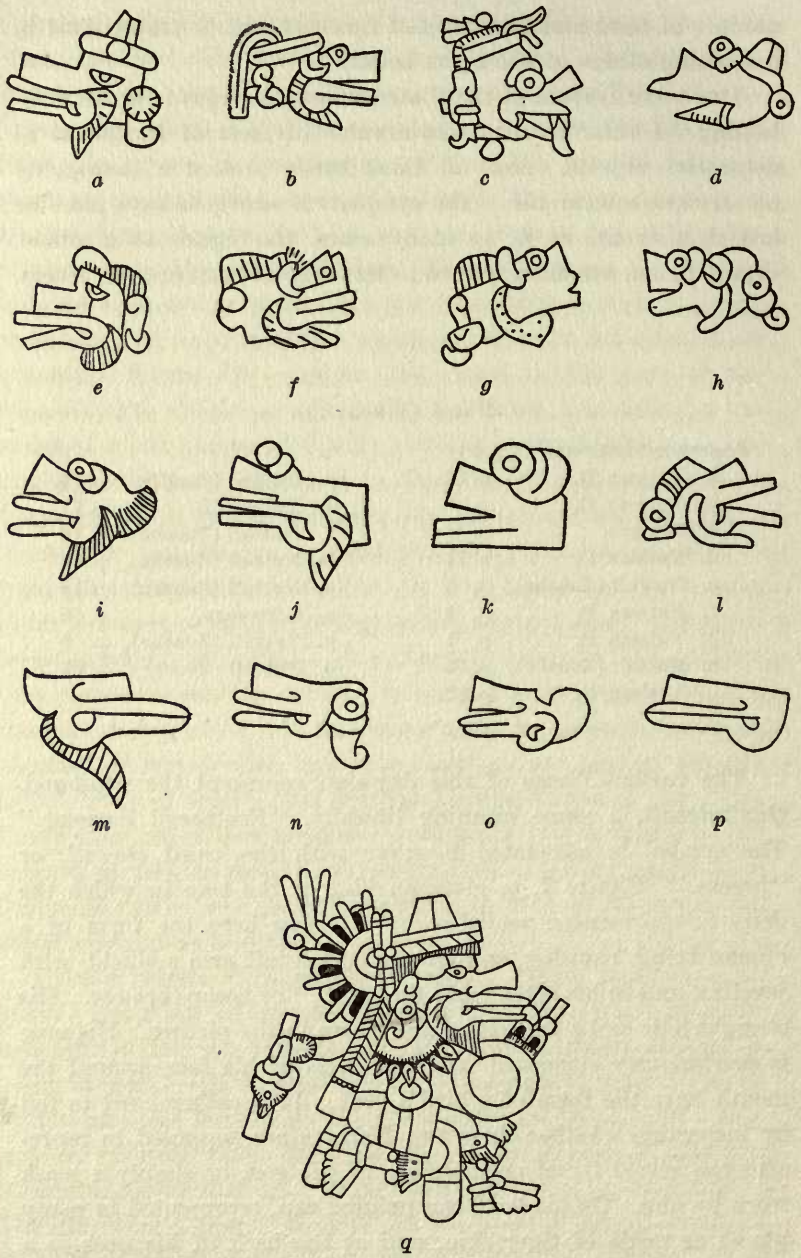


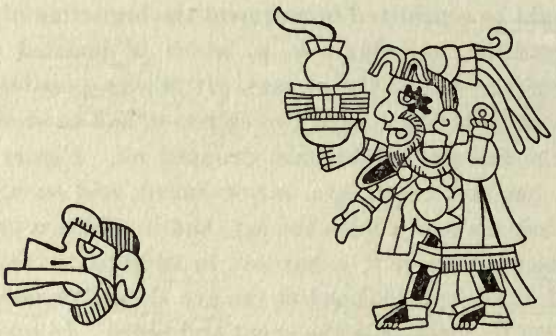
Fig. 9.—*a–p*, The Day-sign Wind (*Ehecatl*); *q*, Realistic Drawing of the Wind-god

costume is of the usual Aztec sort, consisting of a breech-cloth and sandals. The present drawing, however, shows in addition a necklace and a conspicuous ear-ornament. When we turn to the day-symbols shown in this figure, it is noticeable that they represent only the head of the divinity. A good many of the day-symbols in the manuscripts represent the head as described, with the hair, beard, cap, and mask or snout. Some of the manuscript drawings, on the other hand, are very much simplified. It would be quite easy to see in the present figure a "descending series" of drawings. Figure 9, *a*, for example which is a complete representation of the god with all the features, might be considered to represent the beginning of a process of degeneration, and figure 9, *p*, which is denuded of almost everything, the end of the process. It is even possible to fill in all of the steps between these two extremes, and to show how one by one the features might have dropped off. Figure 9, *a*, for example, has cap, beard, eye, ear-ornament, and snout. Figure 9, *e*, has lost the cap; *i* lacks the cap, and in addition has lost the ear-ornament. Figure 9, *g*, has lost, in addition to the foregoing the pupil of the eye; *m* has lost the eye altogether, retaining, of the original features, only the snout and beard. In *o* and *p* even the beard vanishes, and of the whole god nothing but the snout is left. The mouth of *a* degenerates in *p* to a mere line.

Such a series has, however, very little real meaning. The elaborate head shown in *e* was drawn by the artist who drew the simplified form shown in *p*, and the two drawings are on adjacent pages of the original text. Our text-figures therefore do not represent actual genetic series. It does seem possible, however, to interpret certain of the features present in the signs by a process of comparison. For example, some of the realistic drawings of the god represent him with a fang at the corner of his mouth. It seems likely that the fang is elaborated from a notch, which often occurs in exactly the same place and has very much the same appearance. If an "original" form is to be looked for, the notch might be interpreted as the down-curved mouth, which is the usual sign of old age, shown for example in figure 10, *b*. The fang form is especially clear in figure 9, *c*, *d*, and *l*. It seems rather likely that the notched disk below the corner of the

mouth in figure 9, *o*, represents this mouth-notch or fang, which has in this drawing wandered out of its proper place.

The eye in these representations of the Wind symbol does some curious things. In *b*, figure 9, it wanders out on the beak, and in *d* mounts up on a stalk. In drawings *f* and *h* this stalk becomes much elongated. The beard, too, shares in these changes. In figure 9, *f*, it loses its likeness to hair, retaining however its outline. In *g* the hair is replaced by speckles, and in *h* and *k* the whole beard degenerates into a mere sausage-shaped tag. Such series as are shown in figure 9, whether they represent



a *b*

Fig. 10.—*a*, The Face of the Wind-god, showing down-curved mouth (Nuttall); *b*, a face with a curved mouth, a feature signifying old age

accurately the origin of the simpler forms of the day signs or not, at least enable us to recognize in the simpler forms many of the elements which make up the more complicated ones. A person, for example, who in examining a text encounters a form like *q*, figure 9, would certainly have some trouble in recognizing it as a form of the wind-god. Yet, by comparison with the more complicated figures it is possible to recognize in the simpler drawing the various elements which stand for the hair, the snout, and the beard. The proportions and the positions of the various parts merely are changed, while the identity of the figure remains unmistakable.

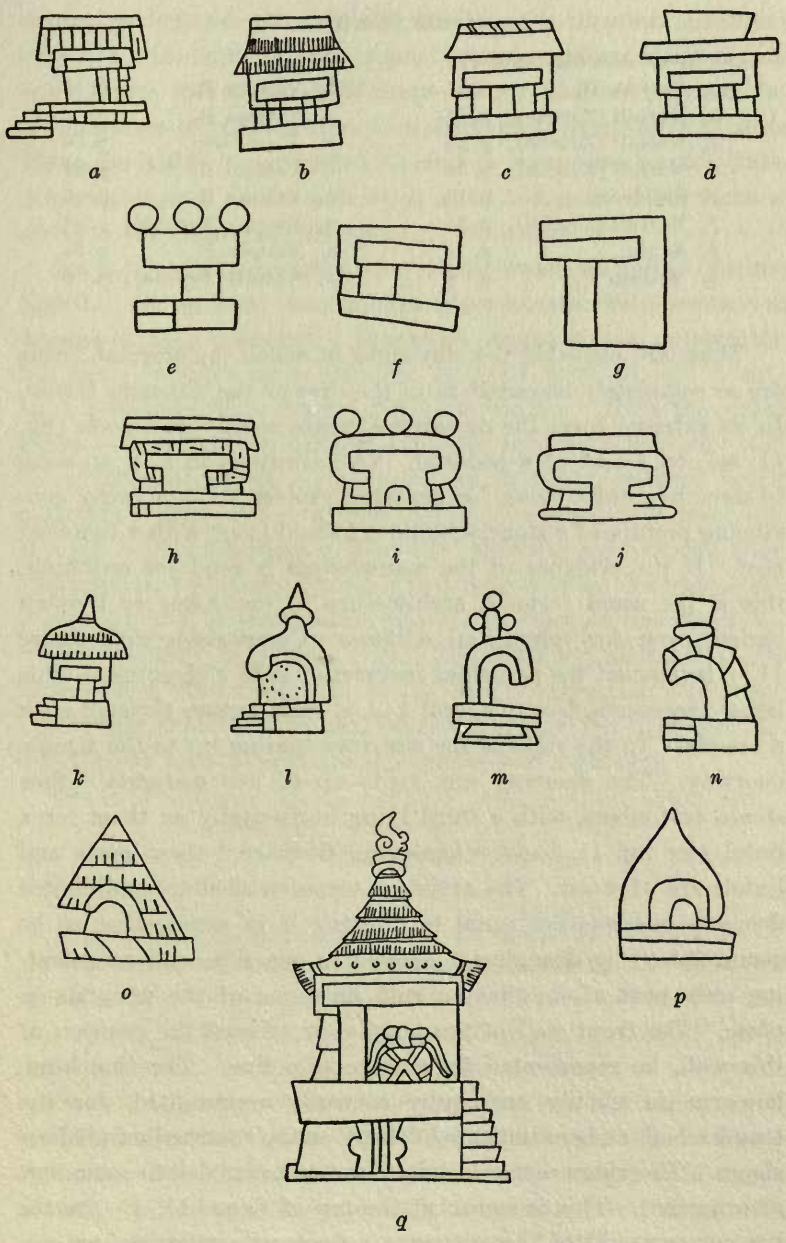


Fig. 11.—*a–p*, The Day-sign House (*Calli*); *q*, Realistic Drawing of a House

House (Calli)

Sources of drawings (fig. 11):

a, Vatican B,	p. 87	*i*, Vatican B,	p. 5
b, Nuttall (Zouche),	p. 56	*j*, Vatican B,	p. 4
c, Nuttall (Zouche),	p. 20	*k*, Fejervary	p. 30
d, Nuttall (Zouche),	p. 34	*l*, Vatican B,	p. 64
e, Fejervary,	p. 18	*m*, Vatican B,	p. 3
f, Nuttall (Zouche),	p. 31	*n*, Nuttall (Zouche),	p. 84
g, Aubin,	p. 1	*o*, Vatican B,	p. 71
h, Vatican B,	p. 8	*p*, Nuttall (Zouche),	p. 6

There are probably few day-signs in which the original forms are so completely obscured as in the case of the day-sign House. In its extreme form the day-sign appears merely as a hook (fig. 11, *m*), on a sort of a pedestal. The drawings in *k*, *l*, *m*, seem to show how this "hook" appearance evolves. *k* is a fairly convincing picture of a stone structure, I should say, with a thatched roof. If the evidence of the manuscripts is good for anything, this is the usual form of architecture in the Aztec or Plateau region, even for ceremonial edifices. Comparison with figure 11, *q*, brings out the principal features of such a structure. This latter represents, like *a*, *e*, and *k–p*, a cross-section through such a temple. To the right is the stairway leading up to the temple doorway. The doorway was made up of two uprights, either stones or timbers, with a third lying horizontally on them for a lintel (see fig. 11, *b–d*). According to Seler,[61] these posts and lintels are of wood. The artist, it seems, wished to exhibit this doorway but was not equal to drawing it in perspective, so he compromised by dragging it around to one side, and representing only part of it; that is, with only one of the uprights in place. The front wall of the temple, or at least the position of this wall, he represented by a mere thin line. The thatching, however, is plainly and quite correctly represented, for the temples had, as here indicated, "hip" roofs, thatched on all four slopes. The ridge seems to have been elaborated into some sort of ornament. This is shown at the top of figure 11, *q*. On the base or pyramid of the structure we see an earthquake or *olin* symbol (for which see fig. 34). In figure 11, *k*, the roof is rather

[61] 1900–1901, p. 10.

bulging or convex. In *l* the "peak" effect is reduced to a rudiment, and the drawing as a whole is more cursive in style. In figure 11, *m* and *n*, the artist seems to have had in mind not the original idea of a house, but such degenerate symbols of it as *l*, figure 11, which he permitted himself to reproduce in still more cursive fashion. In fact, in *m*, *l*, *n*, *o*, and *p* the likeness to a house is almost or entirely lost.

In *b*, figure 11, the front view of the house, or *calli*, is represented. We see here the thatched hip-roof, and the doorway of dressed stones or timbers. The artist, however, was apparently not equal to drawing a stairway in front view, so left it out. In *d* this doorway is drawn still more plainly. Here the artist seems to have tried to draw at the same time both the front and the gable ends of the roof, giving up, however, without being successful. In *g* the structure has been reduced to a remnant. We see here apparently a side view showing half of the door construction (compare *a*) and a line representing the back wall. Figure 11, *h–j*, represent this same front view of the structure, drawn, however, in cursive lines. The T-shaped inclosure seems to represent the outside line of the door construction, the opening having vanished. In this case, a study of the more complicated forms readily explains the simple ones such as *g*.

Lizard (*Cuetzpalin*)

Sources of drawings (fig. 12):

a, Nuttall (Zouche),	p. 56	*g*, Vatican B,	p 16
b, Nuttall (Zouche),	p. 49	*h*, Fejervary,	p. 37
c, Nuttall (Zouche),	p. 13	*i*, Vatican B,	p. 7
d, Vatican B,	p. 3	*j*, Bologne,	p. 2
e, Nuttall (Zouche),	p. 5	*k*, Aubin,	p. 19
f, Vatican B,	p. 64	*l*, Vatican B,	p. 70

This is probably the least interesting of all the day-symbols, for the reason that it is nearly always carelessly drawn, and does not exhibit much variety at best. It is usually a sprawling figure with an uncertain number of legs straggling about, and a tail. I should say that the most characteristic thing in the drawing of the lizard is the loose-jointed way in which it sprawls on the page. One feature is noticeable in the drawings of lizard when

they can be examined in color. Half of the animal is normally red, the other half a sky blue. The division into two colors is represented by the line across the lizard's body in figure 12, *a, b, c, e,* and *g*. Seler's statement[62] that "the lizard symbol is

Fig. 12.—The Day-sign Lizard (*Cuetzpalin*)

normally blue" does not apply to all the manuscripts. The arrangement of colors would possibly indicate that one of those species is intended whose under-surface is bright blue. To economize time, perhaps, the artists painted the animal half reddish and half blue, without bothering to be more realistic. At least this is a possible explanation of the curious arrangement of colors.

[62] 1900–1901, p. 10.

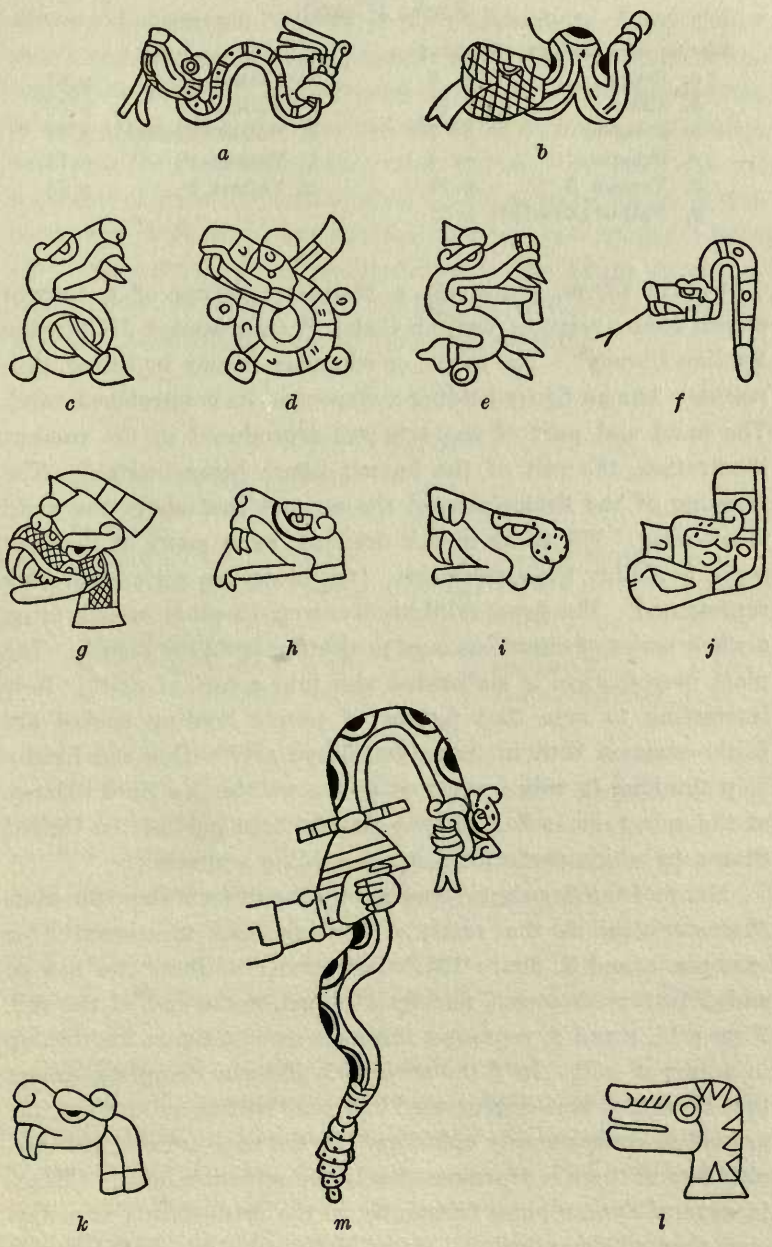


Fig. 13.—*a–l*, The Day-sign Snake (*Coatl*); *m*, Realistic Drawing of a Snake

Snake (Coatl)

Sources of drawings (fig. 13):

a, Borgia,	p. 5	*h*, Vatican B,	p. 67
b, Aubin,	p. 18	*i*, Vatican B,	p. 66
c, Bologne,	p. 7	*k*, Nuttall (Zouche),	p. 77
e, Bologne,	p. 4	*l*, Vatican B,	p. 71
f, Vatican B,	p. 74	*m*, Vatican B,	p. 45
g, Nuttall (Zouche),	p. 75		

Figure 13, *m*, represents a realistic drawing of a serpent chosen from a page in Vatican Codex B (manuscript 3773 in the Vatican library). The scene, or whatever it may be called, represents a human figure holding a serpent in its outstretched hand. The hand and part of the arm are reproduced in the present illustration, the rest of the human figure being omitted. The meaning of the device around the serpent just above the hand is not clear. The snake in this drawing, as in many of the day-signs, is plainly the rattlesnake. It is moreover quite accurately represented. The head exhibits, however, in place of one fang, a whole series of enormous ones projecting from the mouth. The plate over the eye is elaborated also into a sort of crest. It is interesting to note that figures of people holding snakes are fairly common both in Aztec and Maya art.[63] One can hardly help thinking in this connection of the well-known Snake Dance of the sedentary Indians of the southwestern part of the United States, in which performers dance holding serpents.

Many of the day-signs representing the serpent show the same characteristics as the realistic drawing just mentioned (for example, *a* and *b*, figure 13). The former of these two has an added feature, however, namely a plume at the end of the tail. Figure 13, *c* and *d*, represent the same serpent-figure knotted up in a sort of coil. In *f* the serpent is likewise complete, except that his rattles have degenerated to a mere button, and his outlines are not so conspicuously ophidian. In the remainder of the day-sign figures there is represented only the serpent's head. (Heads in general appear more frequently in the manuscripts as a day-sign than whole animals.) Many of these heads are thoroughly

[63] For the latter see Maudslay, 1889–1902, for example, vol. 4, pl. 33; Spinden, 1913, p. 49.

serpent in character. In one of them however (*g*, figure 13), we find a human nose ornament consisting of a "plug" with a flowing plume attached. In a few of the drawings the serpent head is very much debased. The one shown in *h*, for example, might well pass for the head of some other animal. In *j* we have only a jumble of lines, so formless that it is hard to recognize in them even such parts as the eye and the mouth. As a special instance of "debasement," attention is drawn to the figure shown in *l* which lacks the fang, though the fang is perhaps the most characteristic feature in the other serpent drawings.

Death (Miquiztli)

Sources of drawings (fig. 15):

a, Nuttall (Zouche),	p. 79	*i*, Vatican B,	p. 3
b, Borgia,	p. 4	*j*, Fejervary,	p. 33
c, Vatican B,	p. 25	*k*, Nuttall (Zouche),	p. 31
d, Vatican B,	p. 96	*l*, Vatican B,	p. 54
e, Nuttall (Zouche),	p. 75	*m*, Bologne,	p. 4
f, Vatican B,	p. 52	*n*, Bologne,	p. 2
g, Nuttall (Zouche),	p. 13	*o*, Vatican B,	p. 63
h, Nuttall (Zouche),	p. 13	*p*, Nuttall (Zouche),	p. 82

As already mentioned, the sign for death is a human skull. This is drawn in many cases with some degree of fidelity to the facts. It is, on the other hand, one of the symbols showing most marked distortion. Figure 15 shows its principal variations. *p* of this figure shows a realistic scene from an Aztec funeral ceremony. The practice seems to have been to expose the body until only the bones were left, which were then gathered and burned. We have here the representation of such a cremation scene. Piled upon a circular mat are the long bones tied up in a faggot, and surmounted by the skull. Sticking up on each side are decorated slats of wood. To one side stands the figure of a priest, with black face and black body-paint, usual in the case of people taking part in religious ceremonials. In his hands he holds a torch with which he ignites the pyre. The fire may be seen spreading to right and left in the drawing, and in the center there mounts a thick column of smoke. The drawing of the skull is the point of particular interest for us. There is con-

siderable realism in the sketch. The staring eye-orbit, the teeth and jaw, and the zygomatic arch are shown, though not perfectly. This type of drawing seems to have been the original model for the day-symbol Death.

I should like to emphasize some curious points in the Aztec artist's treatment of the lower jaw of the skull. Perhaps we can discuss this best by calling to mind the outlines of the jaw as it really is (fig. 14, *a*). We notice the teeth and chin on the one hand, and on the other the ascending "ramus" with the sigmoid notch at the top. On one side of this notch (to the left in the sketch) rises the coronoid process, and on the other, the hinge of the jaw, or "condyle." The Aztecs represent all of these features in their jaw-bones, especially the sigmoid notch and the hinge. The hinge itself they expand into a sort of circular tag, very prominent in all jaw figures. We can discuss the features of their jaw drawings to best advantage by citing places where the jawbone is drawn alone. For this we can turn to the "Grass" symbols (fig. 28, below), in which a human jawbone plays a conspicuous part. This is also shown in figure 14, *b*. Here especial attention is drawn to the conspicuous "hinge" portion.

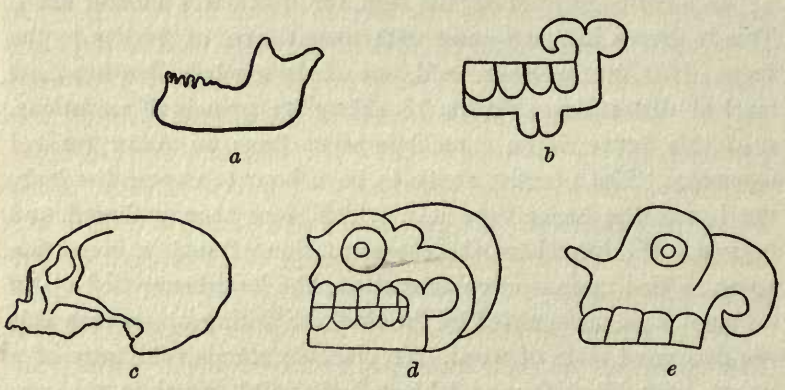


Fig. 14.—Curious Features of the Drawings representing the Skull, and a possible explanation of them

a, Drawing of an actual jaw-bone; *b*, a jaw-bone from a day-sign, Nuttall, p. 79; *c*, drawing of an actual skull (Chinook Indian, artificially flattened); *d*, Nuttall, p. 82, and *e*, Nuttall, p. 13, the skull as drawn in day-signs.

When we turn to the representations of the whole skull, with brain-case and jaw, we find the delineation very much affected by this fondness for emphasizing the hinge of the jaw. Figure 14, *c*, shows a sketch of an actual skull. An artificially flattened Chinook (Columbia River) cranium was chosen for the sketch, because it most nearly corresponds in outline to the Aztec drawing. We have around the eye a bony ridge which fuses below into the zygomatic arch, running across the sketch horizontally. All of these features can be recognized in the corresponding Aztec design (fig. 14, *d*), though rudely drawn in. I should like to emphasize in this latter figure (*d*) the fact that when the jaw is fitted by the artist into the skull, as shown in the dotted lines (actually following the original drawing), the flamboyant treatment of the maxillary condyle, or hinge process, leaves only the back part of the cranium showing. The occipital part of the cranium runs around the jawbone in the form of a hook. When the artist draws a skull without the jaw he preserves this hook, which leaves a space or socket where the jaw hinge would fit if it were present. This hook in skulls which are drawn without jaws becomes rudimentary and apparently loses its original meaning. I am otherwise at a loss to account for the curious hook which appears at the rear of many skull drawings (such as *e*, fig. 14). In the collection of skull drawings used as day-signs (fig. 15) many will be found (*h, o*) where the hook is quite meaningless. On the other hand, in some of them (*f, l*) the skull is in perfect shape for the reception of a jaw with an expanded hinge. We have in the drawings standing for the idea "Death" a case where, it seems to me, a very curious and puzzling feature of a day-sign is really explained by reference to an original graphic style of delineation.

Many minor variations will be noticed in the skull symbols. For one thing, the skull often has, as an ornament, a flint knife stuck in the nostril (fig. 15, *d, i*). This flint knife seems to degenerate in other cases to a mere point or lobe (*g, j, l*). The eye also becomes less realistic in certain drawings (*g, j*). In *k* we find a jaw with the usual hinge, but there is no corresponding notch in the skull. On several of the skulls are found lines suggesting a cap, possibly representing a painted design (*f, k*).

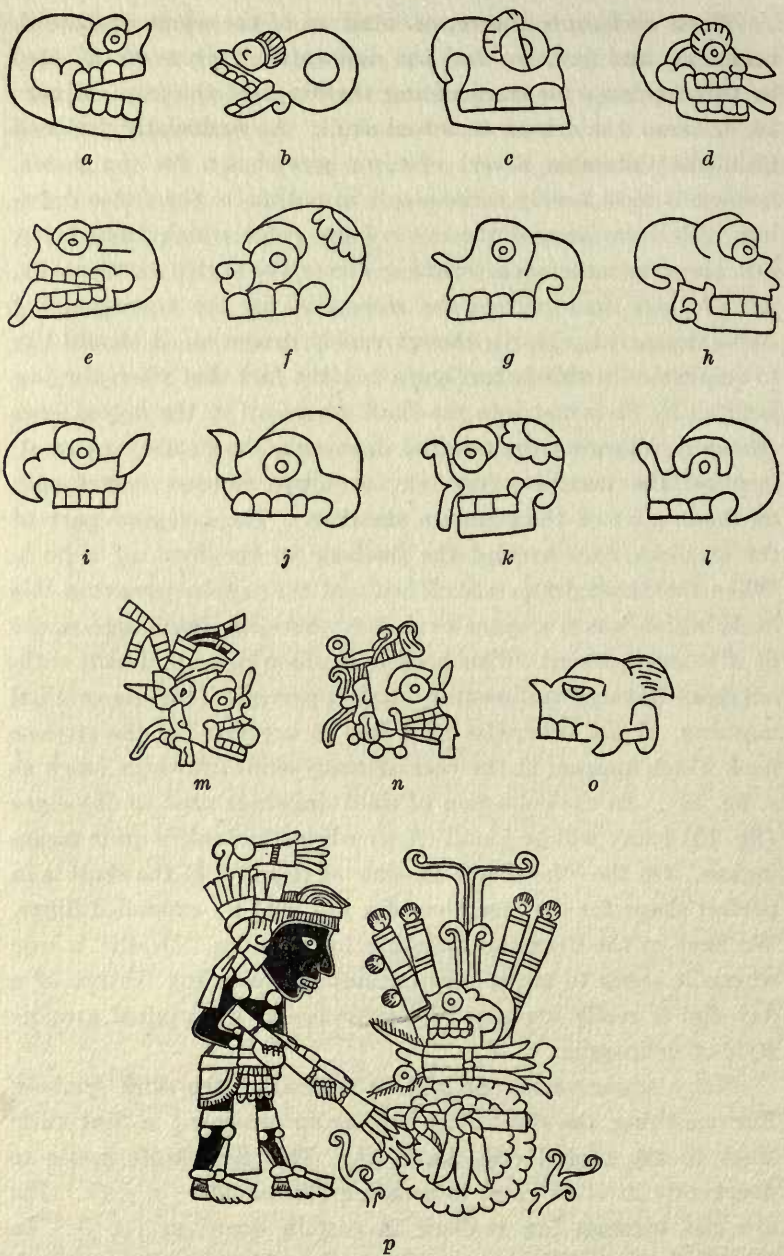


Fig. 15.—*a–o*, The Day-sign Death (*Miquiztli*); *p*, Realistic Drawing of a Skull

The three last figures show a skull with ornament attached, prominent among them in each case an ear-ornament. The absurdity of an ear-ornament where there are no ears does not seem to strike the artist. The meaning of the curious tuft on the top of *o* is unknown.

Deer (*Mazatl*)

Sources of drawings (fig. 16):

a, Vatican B,	p. 64	*h*, Bologne,	p. 3
b, Nuttall (Zouche),	p. 26	*i*, Nuttall (Zouche),	p. 45
c, Nuttall (Zouche),	p. 49	*j*, Nuttall (Zouche),	p. 51
d, Vatican B,	p. 1	*k*, Fejervary,	p. 20
e, Nuttall (Zouche),	p. 48	*l*, Fejervary,	p. 36
f, Vatican B,	p. 67	*m*, Fejervary,	p. 13
g, Vatican B,	p. 89	*n*, Fejervary,	p. 26

Before discussing the illustrations which show the various forms of this day-sign (fig. 16), it will be well to get certain characteristics of the deer in mind. It is possible to form a conclusion as to which of the characteristics were most conspicuous in the minds of the native artists by considering which are most frequently in evidence in the delineations. The most important one is the long, slender muzzle (fig. 16, *a*, *b*, *c*, *d*, *e*, *g*, *i*, *j*, *n*). The next in importance is the antler. Another point which is emphasized in many drawings is the deer's large incisor teeth in the lower jaw, a trait which deer has, of course, in common with many other ungulates. The cloven hoof is also very strongly emphasized in some drawings. The realistic drawing at the bottom of the figure (fig. 16, *n*) exhibits most of the deer's actual peculiarities—muzzle, long ears, cloven hoofs, and short tail. Neither teeth nor antlers are represented in *n*. The former occur, however, very well drawn, in *b*, *c*, *d*, and *h*. I think the deer's antlers would be considered by ourselves his most distinctive possession. These antlers appear in *a*, *b*, *c*, and *d*. The illustrations are here arranged in descending order, exhibiting a successive deterioration of the antler. A series like this, whether it accounts for the development of the simpler forms or not (and it probably does not), enables us, at any rate, to identify these simpler forms. The little excrescence in *d* can, for example, be

identified as an antler by looking at the more fully delineated drawings in *a* and *b*. Perhaps the next drawing worthy of remark is *h*. Like many of the figures in the Bologne Codex from which it is taken, it represents a well-drawn head, with a tiny leg

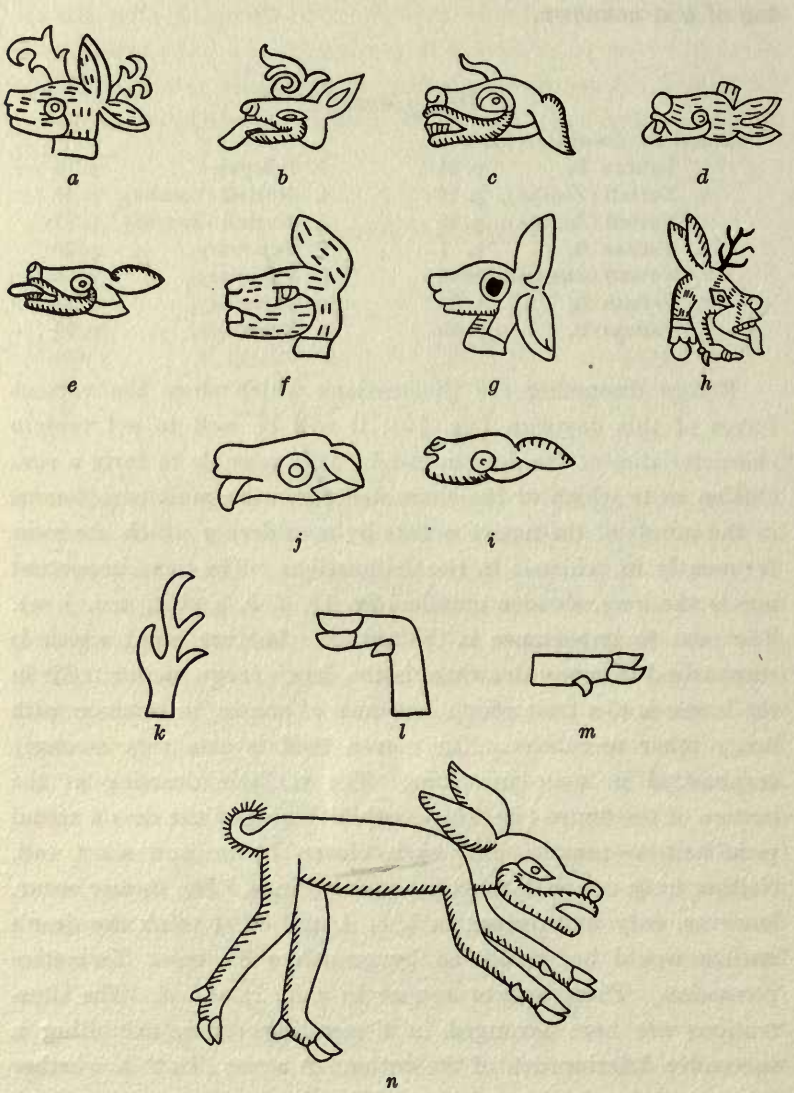


Fig. 16.—*a–m*, The Day-sign Deer (*Mazatl*); *n*, Realistic Drawing of a Deer

attached. In this case the head has teeth in the *upper* jaw, and there might be some difficulty involved in identifying it as deer, if it were not for the presence of the antler. It will be noted that in the drawings of the deer the ears assume all sorts of shapes and configurations, from erect to drooping (fig. 16, *i*). We shall revert to this point in a moment. In *k* the artist drew not a deer but merely an antler, which passes as a symbol for the whole animal. In *l* and *m* he drew the cloven hoof merely.

Rabbit (*Tochtli*)

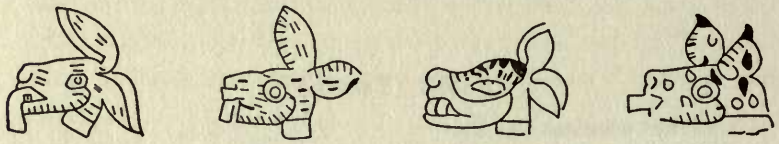
Sources of drawings (fig. 21):

a, Vatican B,	p. 61	*g*, Aubin,	p. 18
b, Fejervary,	p. 42	*h*, Vatican B,	p. 27
c, Vatican B,	p. 96	*i*, Vatican B,	p. 60
d, Nuttall (Zouche),	p. 80	*j*, Bologne,	p. 2
e, Vatican B,	p. 68	*k*, Borgia,	p. 8
f, Vatican B,	p. 49		

The Mexican artist, if he set about the task seriously, found no difficulty in drawing the rabbit in a very realistic fashion (witness figure 21, *k*). Here the animal is given a characteristic rabbit-posture—sitting on its haunches. The drawing moreover shows the elongated ears, the abbreviated tail, and the large and prominent incisors so characteristic of the rabbit in life. It is worth noting that the rabbit's big incisors are drawn in the upper jaw, in this respect offering a contrast to the drawings of the deer. In figure 21, *g*, teeth are entirely omitted. Certain curious tendencies, however, show themselves in the delineation of these teeth. In *a* they are conspicuous, but more like fangs than is really necessary. In *c* and *d* they are unduly prominent; in the latter figure, indeed, notably exaggerated. In *e* the two teeth have been fused into a sort of ribbon hanging out of the mouth. In *f* this ribbon takes on the appearance of a tongue, and may have been so interpreted by the artist. In *h* we have a tongue plainly shown, but it comes out over the upper teeth. How the artist reconciled this drawing with his knowledge of the facts cannot be explained. Figure 21, *j*, is another figure from the Bologne manuscript—a head with tiny legs attached. It might be worth

mentioning in connection with these two plates that some of the drawings of the deer are hardly to be distinguished from some of the pictures of the rabbit. Compare, for example, *g* of figure 16 with *f* of figure 21. The many points of identity between different drawings of these two figures deserves some further illustration.

We have said already that the most characteristic (or at least the most constant) thing in the deer drawings is the represen-



a *b* *c* *d*

Fig. 17.—Day-signs representing Four Different Animals, all resembling the Deer

a, Deer, Vatican, p. 52; *b*, Rabbit, Vatican, p. 52; *c*, Dog, Vatican, p. 55; *d*, Ocelot, Vatican p. 71.

tation of the deer's long muzzle. Stated baldly, the top line of the deer's head is, in the pictures, concave. The rabbit, on the contrary, has a short, rounded snout, and the top line of his head is usually rounded over toward the nose. These traits are brought out clearly in the realistic pictures (fig. 16, *n;* fig. 21, *k*). It is now important to recognize that even such a constant distinction is often forgotten by the native artist. Figure 17, *a*, for example, represents the deer, but *b* of the same figure, with entirely similar outlines, represents not the deer but the rabbit. For the sake of comparison a picture of dog (*c*) and ocelot (*d*) are added, which, from the general outline, might be taken just as readily for rabbit or deer. In other words, there is no type to which the drawings of one animal necessarily conform.

a *b* *c* *d*

Fig. 18.—Day-signs representing Four Distinct Animals, all resembling the Rabbit

a, Rabbit, Nuttall, p. 47; *b*, Deer, Vatican, p. 61; *c*, Dog, Vatican, p. 6; *d*, Ocelot, Nuttall, p. 23.

It is quite as easy to pick out a series of animals all drawn on the model of the rabbit. Figure 18 shows such a series. Here the same four animals, rabbit, deer, dog, and ocelot ("tiger") are represented, but they all have the form of the rabbit. The drawing of the deer in *b*, figure 18, would certainly be interpreted as the rabbit, except for the horns. If the deer's horns were always delineated in representations of the deer, there could, of course, be no confusion, but as often as not they are omitted.

The same point might be made about the ears of the two animals. The deer's ears are often erect, while the rabbit's often cling close to the head, or drop down. Figure 19, *a*, shows what

a *b* *c*

Fig. 19.—Day-signs representing the Deer and the Rabbit, showing the commingling of traits
a, Rabbit, Nuttall, p. 53; *b*, Deer, Vatican, p. 3; *c*, Rabbit, Vatican, p. 57.

might be regarded as a very characteristic drawing of the rabbit. Figure 19, *b*, however, represents the deer, though the ears droop. On the other hand, *c* in this same figure, though the ears are erect, represents not the deer but the rabbit. In other words, I should like to make the point that statements such as those made by Seler,[64] to the effect that absolute critera can be set up by which each figure can be recognized, are not borne out by a study of the manuscripts. If it were not for the occurrence of the day-signs in regular series, it would be quite impossible in many cases to distinguish one from another.

Fig. 20.—Day-sign Deer drawn with the Incisor Teeth belonging to the Rabbit
Vatican, p. 4.

To the zoologist the point most worthy of emphasis would be, I think, the fact already referred to, that the rabbit has large

[64] 1900–1901, pp. 9–16.

incisor teeth in his upper jaw, while the deer has them only in his lower jaw. This is associated, of course, with the distinction

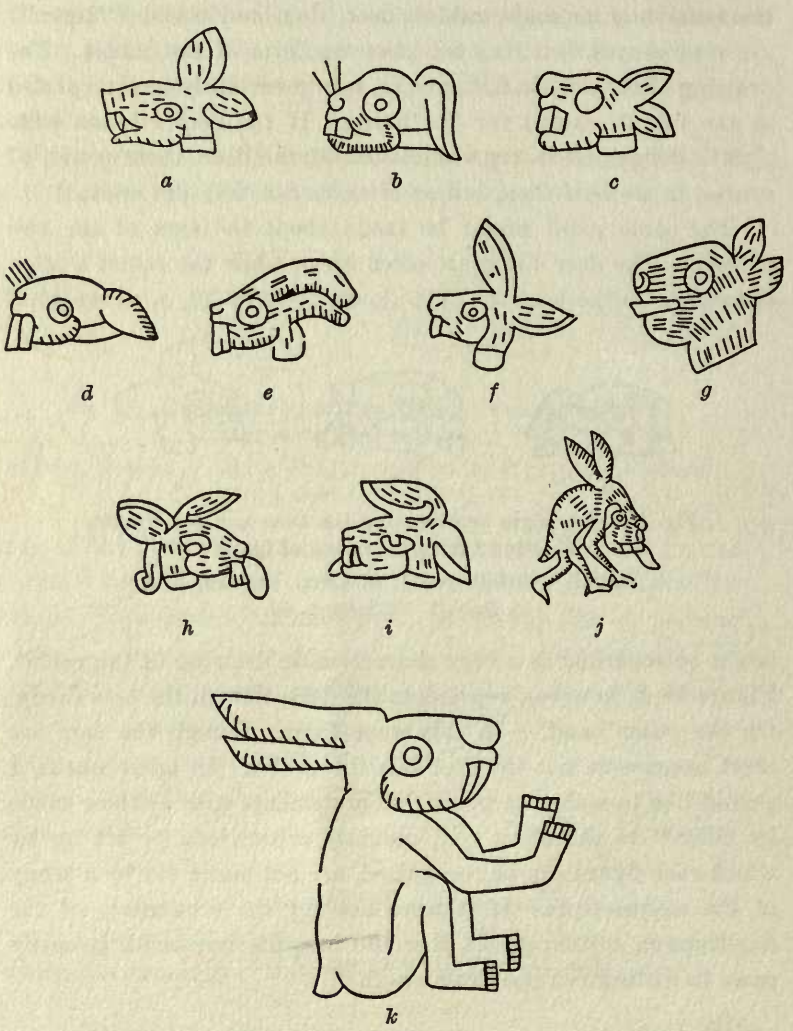


Fig. 21.—*a–j*, The Day-sign Rabbit (*Tochtli*); *k*, Realistic Drawing of a Rabbit

between rodents and ungulates. While this difference is noted by the artists in most of the figures, we find occasional breaches of the rule. For example, in figure 20 we find a representation

of the deer, with the large upper incisors proper to the rabbit. The point here discussed will come up again in connection with some of the other day-signs.

Fig. 22.—*a–s*, The Day-sign Water (*Atl*)

Water (Atl)

Sources of drawings (fig. 22):

a,	Nuttall (Zouche),	p. 44	*k*,	Fejervary,	p. 40
b,	Nuttall (Zouche),	p. 25	*l*,	Vatican B,	p. 6
c,	Nuttall (Zouche),	p. 35	*m*,	Fejervary,	p. 17
d,	Nuttall (Zouche),	p. 53	*n*,	Nuttall (Zouche),	p. 44
e,	Nuttall (Zouche),	p. 66	*o*,	Nuttall (Zouche),	p. 9
f,	Bologne,	p. 6	*p*,	Nuttall (Zouche),	p. 76
g,	Fejervary,	p. 42	*q*,	Nuttall (Zouche),	p. 81
h,	Nuttall (Zouche),	p. 18	*r*,	Nuttall (Zouche),	p. 8
i,	Aubin	p. 20	*s*,	Nuttall (Zouche),	p. 32
j,	Vatican B,	p. 24			

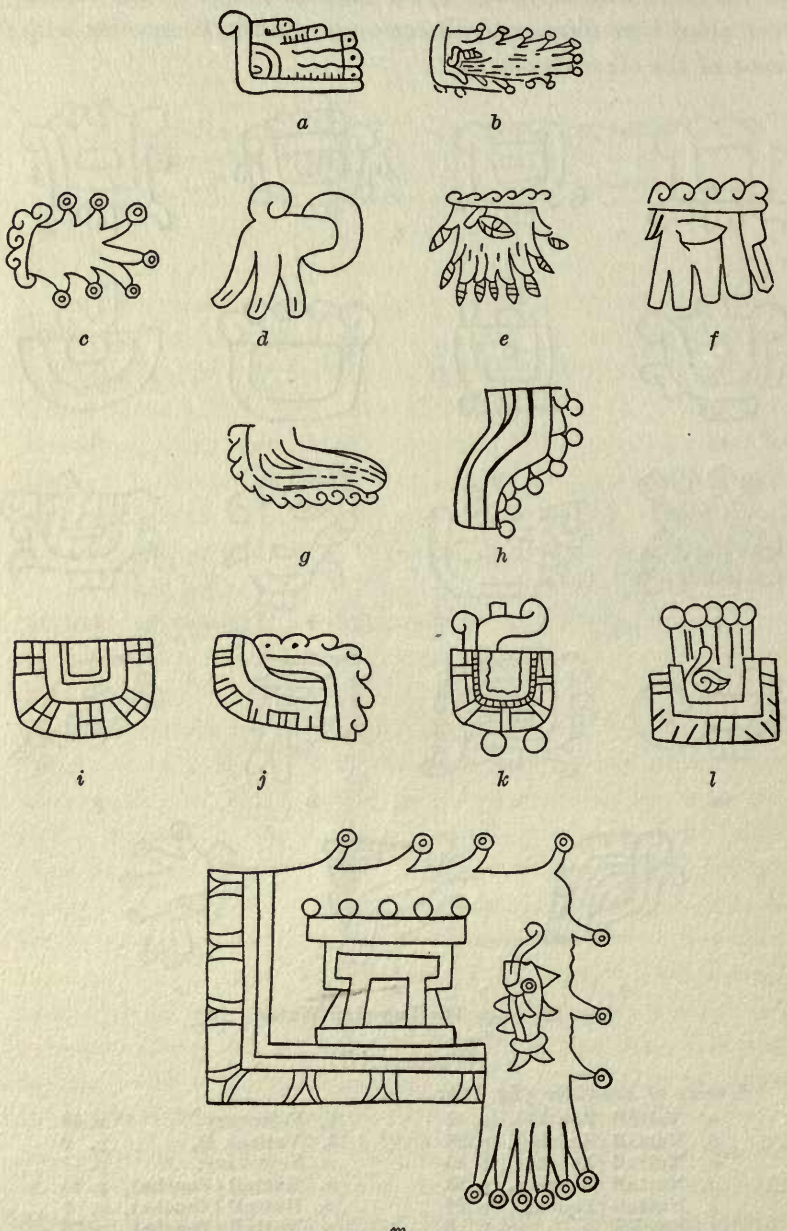


Fig. 23.—*a–l*, The Day-sign Water (*Atl*), additional forms; *m*, Realistic Drawing of a Lake

Sources of drawings (fig. 23):

a, Vatican B,	p. 71	*h*, Vatican B,	p. 54
b, Vatican B,	p. 47	*i*, Nuttall (Zouche),	p. 58
c, Nuttall (Zouche),	p. 72	*j*, Nuttall (Zouche),	p. 13
d, Fejervary,	p. 35	*k*, Bologne,	p. 30
e, Vatican B,	p. 49	*l*, Vatican B,	p. 70
f, Vatican B,	p. 25	*m*, Nuttall (Zouche),	p. 74
g, Vatican B,	p. 4		

There is a rather greater variety of forms of the symbol "Water" than is the case with most day-signs (figs. 22 and 23). The most graphic of these represents a dish of some sort, full of water, with foam or waves on the surface and a shell in the center. For such a drawing the reader is referred to figure 22, *a*. The same details come out in the scene or landscape at the bottom of figure 23 (*m*). The principal thing in this latter representation is a lake with waves on top, a river flowing out of it, a fish in its depths, and on the shore a temple. The scrolls representing the ripple or foamy surface of water are a very common feature of the drawings.

Turning now to some of the variations of the water drawing, we find a good deal of shifting and lack of uniformity of design. In some of the designs, as might be expected, the waves are lacking, others lack the shell, and others lack the containing vessel mentioned above as very common. The drawings in the figure are arranged in order according to the degree of completeness with which these vessels or containers are delineated. This method of arrangement, as before, serves merely for convenience in identifying the simpler drawings. It is interesting to see how rude and merely suggestive of the original elements some of the figures are. Figure 22, *r*, for example, has lost all external resemblance to a dish full of water; the dish has been reduced to a rudiment, and the water has taken on the appearance of a solid object of some sort. Comparison with the more perfect representations (figure 22, *a–r*) will show, nevertheless, that all the essential features of the graphic drawing are present. In figure 23, *c*, the containing dish, which no longer actually "contains" the water, is itself bordered with water or wave symbols. In the case of some symbols we see the whole drawing turned upside down. This has happened in figure 23, *e*, in which the

water seems to stream down from a sky. Figure 23, *f*, is a still more extreme case of the same thing. Even in this latter case, however, the original dish and shell may be recognized. We have finally, in the water symbol as shown in figure 23, *h*, merely a formless collection of lines.

A few curiosities come to light in making such a collection of water-symbols. For example, the dish and the escaping water take in figure 22, *p*, almost exactly the form of an animal's head with an eye, a fang (the leg of the pot or dish originally), and two ears. The scroll designs representing the wavy or foamy surface of water take on at times the forms of other objects. Thus in figure 22, *e*, we have springing up on the surface of the water a semi-circular knob. In figure 22, *f*, this excrescence takes on the appearance of the "Flower" symbol (see fig. 32, below). In figure 22, *h*, it assumes another and very different form, but one unlike any object the present writer can name. In figure 23, *k*, the excrescence becomes almost exactly like the Aztec symbol for smoke. In figure 23, *l*, finally, we have the vessel under the shell clearly drawn, but the water has shot up out of this vessel and hangs in the form of disks above it.

The form shown in figure 23, *i*, is something of a puzzle. There is scarcely any resemblance to water left, but the curious patterns around the edge correspond to the marks around the margin of the water in the realistic picture illustrated in *m*, figure 23. Identification of the various water-symbols is made easier by the fact that in the manuscripts the part representing the water itself is normally painted blue. This aid to identification is of service only in the case of colored reproductions of the original manuscripts.

Dog (Itzcuintli)

Sources of drawings (fig. 24):

a, Nuttall (Zouche),	p. 57	*i*, Vatican B,	p. 90
b, Bologne,	p. 1	*j*, Fejervary,	p. 44
c, Nuttall (Zouche),	p. 79	*k*, Fejervary,	p. 36
d, Nuttall (Zouche),	p. 82	*l*, Bologne,	p. 8
e, Nuttall (Zouche),	p. 3	*m*, Vatican B,	p. 68
f, Vatican B,	p. 66	*n*, Bologne,	p. 3
g, Vatican B,	p. 51	*o*, Nuttall (Zouche),	p. 72
h, Fejervary,	p. 41		

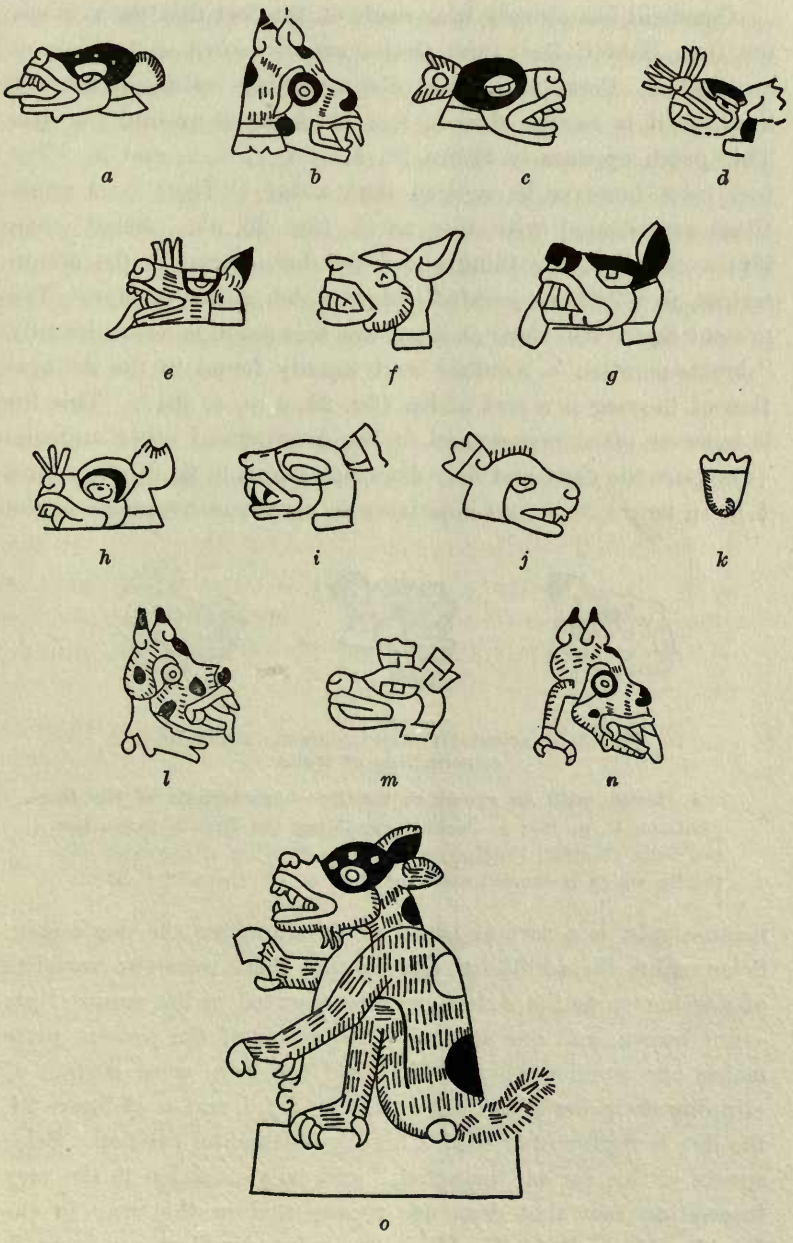


Fig. 24.—*a–n*, The Day-sign Dog (*Itzcuintli*); *o*, Realistic Drawing of a Dog

Comment has already been made on the fact that the symbols for Dog, Rabbit, Deer, and Ocelot are so drawn as to be very much alike. Perhaps the most distinguishing feature of the dog head, as it is usually drawn, is a black patch around the eye. This patch appears in figure 24, *b, c, d, e, h, n,* and *o.* The fact must however be noticed that *ocelot* ("Tiger") is sometimes represented with this patch (fig. 25, *a*). Seler[65] says that a characteristic thing about the dog, drawn in the manuscripts, is a "*double-pointed*" black patch about the eye. The present figure will show at least that this patch is not uniformly "double-pointed." Another trait usually found in the delineation of the dog is a sort of lip (fig. 24, *a, n, o,* etc.). This lip is however often represented in the drawings of other animals. (Compare the tiger and deer drawings shown in figure 25, *a,* and *b.*) In figure 24, *o,* and appearing in a good many places in the

a *b* *c*

Fig. 25.—Various Day-signs, showing confusion or commingling of traits

a, Ocelot, with an eye-patch usually characteristic of the Dog (Vatican B, p. 66); *b,* Ocelot, resembling the Dog in teeth, lips, and form (Nuttall (Zoche), p. 80); *c,* a drawing of the Deer with the lip which is characteristic of the Dog (Vatican B, p. 69).

manuscripts, is a sort of beard or fringe under the dog's chin. Seler makes the additional remark that there were two varieties of dog known to the Aztecs, and represented in the manuscripts —one brown, and one spotted. Inspection of the present plate makes one wonder whether they did not have some custom of clipping their dog's ears. In *c, d, g, h, i, j, l,* and *m* of figure 24, the dog is represented with a highly ornamental ear-flap. Seler speaks of this ear as "mangled," and calls attention to the very interesting fact that dogs are represented in this way in the Dresden Maya Codex.[66] He is the only animal so represented.

[65] 1900–1901, p. 11.

[66] *Loc. cit.*

In *k* of figure 24, we have nothing left of the dog, except this highly ornamented ear. Figure 24, *n*, is another of the Bologne Codex figures, with a tiny leg attached. It will be seen that the artist in *o*, figure 24, was unable to draw a dog's hind limb properly. The animal has a leg quite like that of a human being. This is true of most of the animals the Aztecs and the Mayas tried to draw.[67] The drawings of the dog supply interesting cases of convergence in the representation of animals. The prominent and sharp teeth usually shown in the dog figures are often represented in drawings of the rabbit.

Monkey (*Ozomatli*)

Sources of drawings (fig. 27):

a, Nuttall (Zouche),	p. 72	*h*, Vatican B,	p. 8
b, Nuttall (Zouche),	p. 79	*i*, Nuttall (Zouche),	p. 8
c, Nuttall (Zouche),	p. 44	*j*, Fejervary,	p. 42
d, Borgia,	p. 3	*k*, Vatican B,	p. 66
e, Nuttall (Zouche),	p. 4	*l*, Fejervary,	p. 20
f, Nuttall (Zouche),	p. 38	*m*, Fejervary,	p. 20
g, Vatican B,	p. 3	*n*, Nuttall (Zouche),	p. 76

The most nearly characteristic features of the drawings of the monkey are: (1) a face with an elongated snout; (2) a stiff crest of hair; and (3) a conspicuous ear-ornament. The first two are elements derived from the actual characteristics of the Central and South American monkeys. The presence of the ear-ornament can be explained, as is the case with many other features of the day-signs, on the ground that they are borrowings from human articles of dress or adornment. Probably such borrowings are due, at least in part, to the vague feeling which is quite common among savages that all animals are human beings essentially, with a power which enables them, for their own purposes, to assume a different likeness externally. Other creatures in the day-signs are represented with ear-ornaments similar to the one exhibited on Monkey. Compare, for example, with the present designs, the drawings representing King-vulture (fig.

[67] See Water-monster, Deer, Rabbit, and Ocelot in the present paper, and, for example, the splendid figure of a jaguar from Chichen Itza in Spinden, 1913, pl. 29, fig. 7.

26 and fig. 33, *a, b, c, f, h, k*) and Wind (fig. 9). In view of this fact, it is somewhat surprising to find that in one or two places (see fig. 27, *l* and *m*) the monkey is represented vicariously by his ear-ornament, and nothing else. This ornament, although it stands for the day-sign Monkey, is in nowise to be distinguished from the ornament worn by the King-vulture (fig. 26). If it were not for its position in a series, then, there would be no way of telling whether the drawning shown in figure 27, *l*, should be interpreted as Monkey or as something else.

Fig. 26.—Drawing of a Day-sign representing the King-Vulture wearing an ear-ornament, the latter not to be distinguished from those which represent or typify the Day-sign Monkey.

(Fejervary, p. 37.)

The crest of the monkey in the present figure assumes several different forms. Compare, for example, *a* with *j*. In some cases the crest looks quite like the tuft of feathers surmounting the head of the eagle (see figure 32). The realistic drawing of the monkey (fig. 27, *n*) shows that all of these symbols representing the monkey follow the original idea very closely.

Grass (Malinalli)

Sources of drawings (fig. 28):

a, Nuttall (Zouche),	p. 79	*j*, Borgia,	p. 26
b, Nuttall (Zouche),	p. 79	*k*, Borgia,	p. 67
c, Nuttall (Zouche),	p. 19	*l*, Aubin,	p. 17
d, Vatican B,	p. 78	*m*, Aubin,	p. 12
e, Nuttall (Zouche),	p. 40	*n*, Bologne,	p. 6
f, Vatican B,	p. 68	*r*, Borgia,	p. 50
g, Nuttall (Zouche),	p. 24	*o*, Bologne,	p. 3
h, Vatican B,	p. 16	*p*, Nuttall (Zouche),	p. 71
i, Borgia,	p. 6		

This is, in certain respects, the most curious of all the Aztec day-symbols, for the reason that it is, in its usual form, a combination of three elements that seem to have no logical connection with each other—a human jawbone, an eye, and a clump of

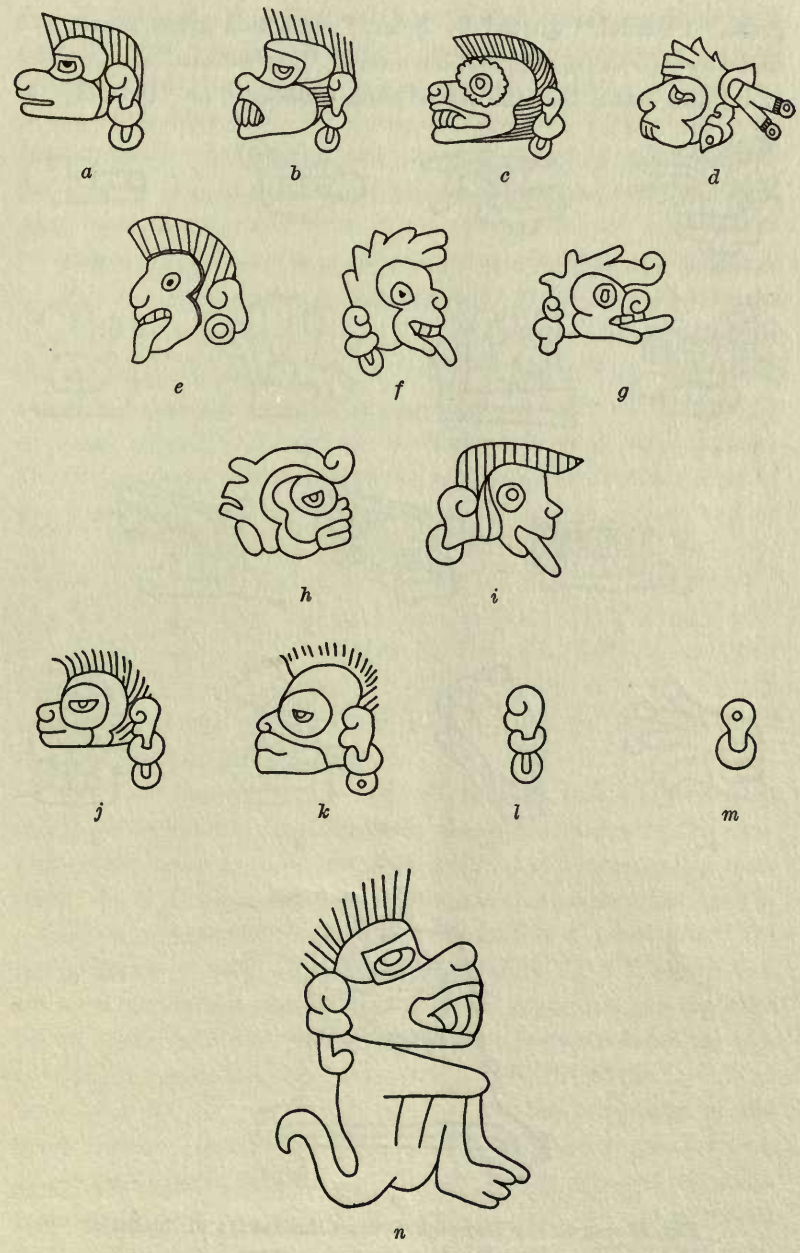


Fig. 27.—*a–m*, The Day-sign Monkey (*Ozomatli*); *n*, Realistic Drawing of a Monkey

grass. Peñafiel,[68] quoted by Seler,[69] calls this grass *zacate del carbonero* (because charcoal-burners or "carboneros" make sacks of it) and states that the Aztec name *malinalli,* or "twisted," is

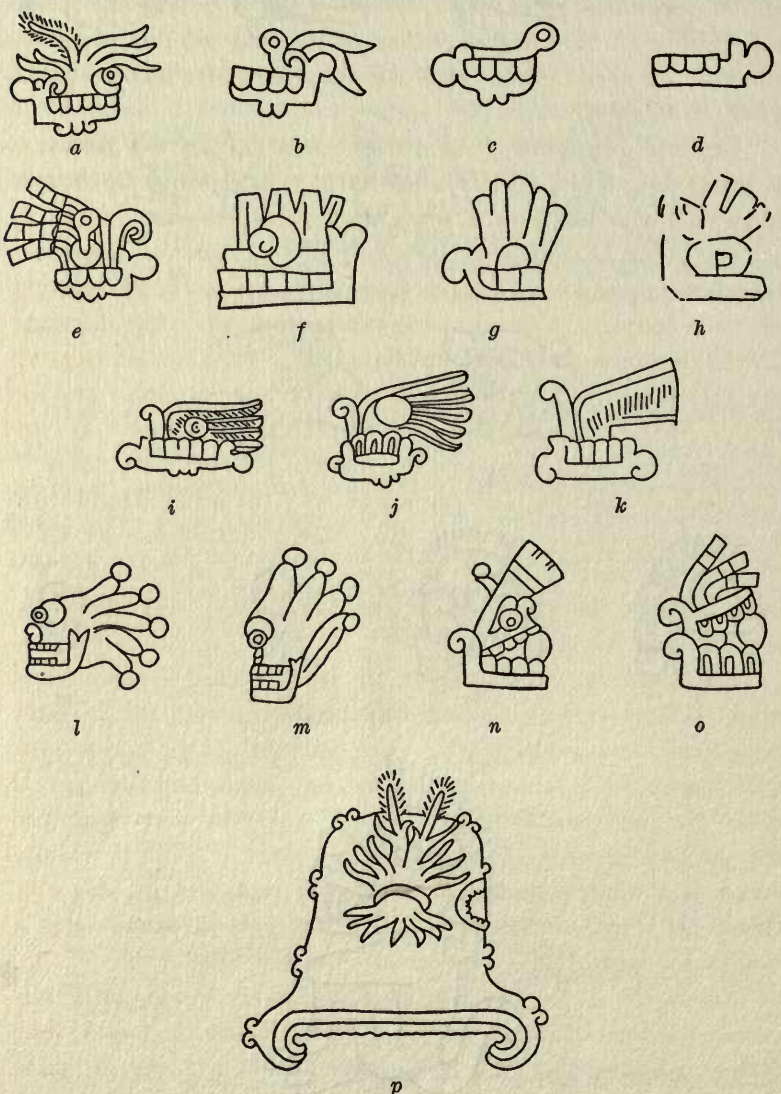


Fig. 28.—*a–o,* The Day-sign Grass (*Malinalli*); *p,* Realistic Drawing of a Clump of Grass

[68] 1886.

[69] 1900–1901, p. 12

derived from the fact that the Aztecs were accustomed, as they are still, to "twist" it into ropes and pack-straps. Such etymologies are, of course, always open to suspicion. What the specific botanical name of the *zacate* grass is, I have not been able to learn. A realistic picture of a clump of this grass on the side of a mountain, with leaves, seed-stalks, and roots, is given in figure 28, *p*.

The first-mentioned element in the combination, the jawbone, is usually quite realistically represented. It is ordinarily drawn in profile, with the teeth in place, and with the sigmoid notch at the top of the ascending ramus easily distinguishable. There is, however, a peculiar and exaggerated representation of the condyle or hinge already referred to in connection with the day-sign Death (see page 349). Along the middle of the bottom edge of the bone there is a curious collection of humps, either two or three. Mrs. Nuttall says somewhere that these humps were put wherever the artist wishes to express the idea of "roughness." The basis of this idea, and the reason why the artist should wish to indicate roughness on the bottom edge of a jawbone, are alike uncertain. Seler[70] suggests a "reason" (such as it is) for the association of the grass with a jawbone, namely, that the bone signifies that the grass is dry.

The first four drawings (fig. 28, *a*, *b*, *c*, and *d*) give what might be considered four stages in the degeneration of the complete sign. In *a* we have jaw, eye, a clump of leaves, and a seed-stalk. In *b* we have, besides the jaw, two leaves and the eye; in *c*, the jaw and eye with no grass at all; and in *d*, plain jaw. Yet the position of each of the last three signs in different series makes it absolutely certain that they all represent the day-sign Grass. It is rather curious to find a bare jawbone standing as a symbol for vegetation, even vegetation of the driest kind.

Figure 28, *e*, *f*, *g*, and *h*, show a curious treatment of the grass element. In the latter (*h*) all resemblance to grass is lost. It is worth observing that in *e*, figure 28, the eye and eye-stalk together take on an appearance identical with the ear-ornament in the preceding figure (fig. 27). In the four figures just men-

[70] 1900–1901, p. 12.

tioned (*e*, *f*, *g*, and *h*, figure 28), there is progressive degeneration of the eye-stalk, which in the last figure named is only an empty bulb.

Figure 28, *i*, *j*, *k*, show the jaw in front view. The grass in each of these cases receives a curious treatment, reaching a climax in *k*, where it looks more like a phonograph horn than anything else that could be readily named. The eye, which is quite realistic in figure *j*, vanishes completely in *k*.

In *l*, *m*, *n*, *o*, the eyes are represented in combination with an additional feature, an upper jaw. In *n* we have a curious thing. The whole drawing assumes the form of a complete face with all its features, holding a ball in its gaping jaws. Flourishing around above this face we see the original eye and eye-stalk, with which we started in *a* of figure 28. The meaning of the pair of jaws biting on an object is a complete puzzle to the present writer.

Cane (Acatl)

Sources of drawings (fig. 29):

a, Nuttall (Zouche),	p. 9	*j*, Nuttall (Zouche),	p. 14
b, Nuttall (Zouche),	p. 62	*k*, Vatican B,	p. 47
c, Nuttall (Zouche),	p. 1	*l*, Vatican B,	p. 5
d, Nuttall (Zouche),	p. 5	*m*, Nuttall (Zouche),	p. 56
e, Vatican B,	p. 65	*n*, Vatican B,	p. 62
f, Vatican B,	p. 51	*o*, Aubin,	p. 8
g, Vatican B,	p. 49	*p*, Vatican B,	p. 60
h, Nuttall (Zouche),	p. 32	*q*, Vatican B,	p. 3
i, Nuttall (Zouche),	p. 40	*r*, *Borgia*,	p. 50

The symbols for the idea Cane (fig. 29) all represent, as remarked in connection with figure 1, the cane shafts of javelins. The first ten represent single missiles, the remaining seven represent bunches of several at once. Seler[71] calls the object in question an arrow. I am inclined to think that in most cases the object is a javelin (see fig. 29, *r*). It occurs universally in the hands of persons who in the other hand brandish the spear-thrower, or *atlatl*[72] as in the present figure. Examples of this combination are too numerous to quote. A device exactly similar

[71] 1900–1901, p. 12.
[72] Consult Nuttall, 1891.

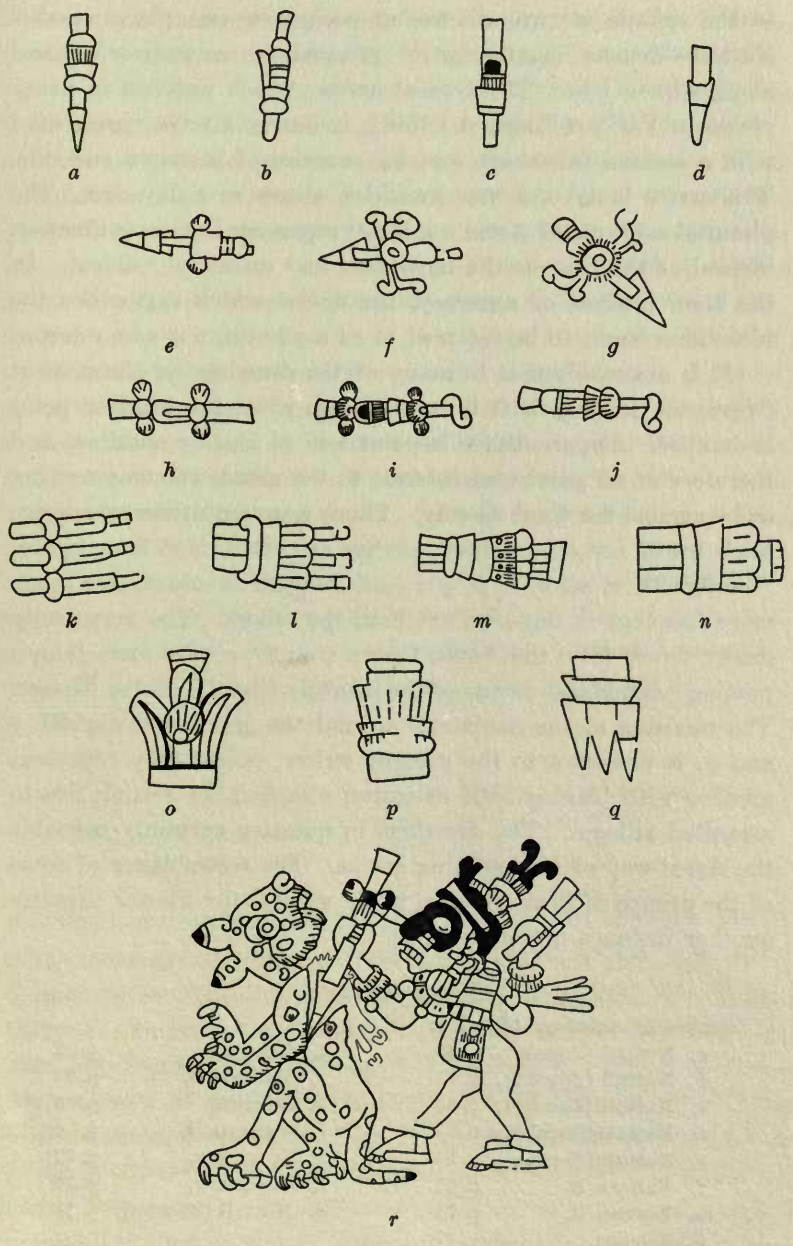


Fig. 29.—*a–q*, The Day-sign Cane (*Acatl*); *r*, Realistic Drawing of a Cane-shafted Javelin

to the missile we are discussing occurs in one place (Codex Nuttall—Zouche manuscript)[73] grasped in a warrior's hand along with a bow. The typical arrow, which appears in many places in Vatican Codex A (3738), is nearly always represented with a wooden fore-shaft, and has a series of barbs on one side. This arrow is not the weapon which occurs as a day-sign. The pictured accounts of Aztec combats[74] represent the spear-thrower, instead of the bow, as the important and universal weapon. In the mere interest of accuracy, the device which symbolizes the idea Cane ought to be referred to as a javelin, not as an arrow.

It is noticeable that in many of the drawings of the present figure, the javelin shaft is represented, while the head or point is omitted. Apparently, this point was of flint or obsidian, and therefore of no particular interest to the artist who was writing out a symbol for Cane merely. Those representations which are made up of several javelins together are often hard to recognize (see fig. 29, *e, m, n, o, p, q*), and, it must be added, are much more frequent in day-sign art than the others. The very badly drawn figure from the Aubin Codex (fig. 29, *o*) has more than a passing resemblance to one of the symbols (fig. 37, *d*) for Flower. The meaning of the sunbursts around the javelins in fig. 29, *f* and *g*, is unknown to the present writer, unless they represent missiles with blazing balls of cotton attached for setting fire to assaulted villages. The drawings in question certainly resemble the Aztec way of representing smoke. The resemblance of some of the groups of these javelins to the symbol for Flower supplies another instance of convergence.

Ocelot (Ocelotl)

Sources of drawings (fig. 31):

a, Nuttall (Zouche),	p. 48	*i*, Bologne,	p. 2
b, Nuttall (Zouche),	p. 71	*j*, Vatican B,	p. 80
c, Nuttall (Zouche),	p. 53	*k*, Bologne,	p. 8
d, Nuttall (Zouche),	p. 54	*l*, Vatican B,	p. 4
e, Nuttall (Zouche),	p. 51	*m*, Fejervary,	p. 32
f, Vatican B,	p. 51	*n*, Fejervary,	p. 36
g, Vatican B,	p. 74	*o*, Nuttall (Zouche),	p. 82
h, Bologne,	p. 7		

[73] P. 10.

[74] See Bandelier, 1892 *a*, for description, and references to the literature.

A certain impropriety is involved in applying to this Aztec day-sign, as is usually done, the name "tiger," an animal unknown in the New World. The use of the term has become, in a way, a tradition. The animal in question is the ocelot, in Aztec *ocelotl,* misnamed, like many American institutions, by the Spaniards. These latter called the creature *el tigre* as a mere convenience. He is characterized in the drawings by a cat-like form, with talons and sharp teeth, and a handsomely spotted skin. It might be supposed that the spots of the skin would be the most characteristic feature in the delineation of this animal. As a matter of fact, this trait is often represented in a very spirited fashion (fig. 31, *o*). These spots occur not only on the realistic drawings but on many of the day-signs: for example, in *a* of figure 31. Like all other characteristics, however, they do not appear consistently by any means. Thus in *b* the number of spots has been reduced to two; in *c* of the same figure, but one is left; in *d,* the spots have vanished entirely, and the animal head there represented is hardly to be distinguished from that of the dog, or even the rabbit as represented elsewhere. Curiously enough, there is at least one case in the manuscripts where the day-sign Rabbit is actually represented with spots (fig. 30). We have here

Fig. 30.—The Day-sign Rabbit represented with the Spots characteristic of the Ocelot (Nuttall, p. 77)

still another illustration of the rule that a given animal's most conspicuous characteristic may, in day-sign art, be lost or loaned to some other creature. It is perhaps worth noting that in *g,* figure 31, we have a drawing which, though really representing the tiger, has an outline that might serve with equal propriety for the deer. It is considerably more like the deer than are some of the deer figures (see fig. 16). The drawing appearing in *j* of figure 31 (reproduced from fig. 24, *b*), looks, on the other hand, like the drawings of the dog.

Another feature of the "tiger" drawings which is apparently realistic, is the black tip of the ear (see fig. 31, *o*). It appears not only in the realistic drawing but in many of the day-signs

as well (fig. 31, *c, d, e, g, h, i, j, k*). The drawing lettered *h* in this figure is one of the peculiar heads with tiny legs appended to it which is characteristic of the Bologne Codex. In addition to the legs, the animal in this drawing is provided with a nose-

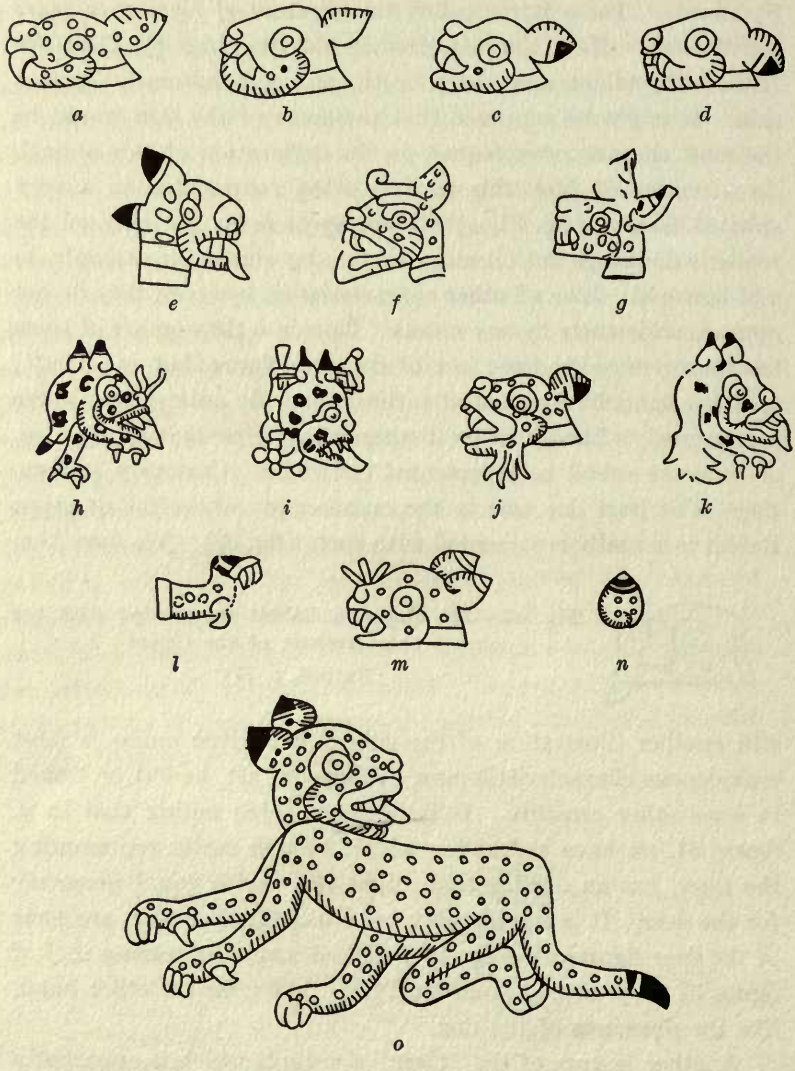


Fig. 31.—*a–n*, The Day-sign Ocelot (*Ocelotl*); *o*, Realistic Drawing of an Ocelot

plug. In *i* of figure 31 the animal is represented with two erect ears in the proper place, but hanging down the back of his head is pictured a very complicated ear-ornament. The animal appears also to have some sort of a head-dress. The nose ornament appears also in figure 31, *m*. In *l* the idea "Ocelot" is symbolized by the drawing of an ocelot's paw merely, and in *n* by an object which comparison with the other drawings will show to be an ocelot's ear.

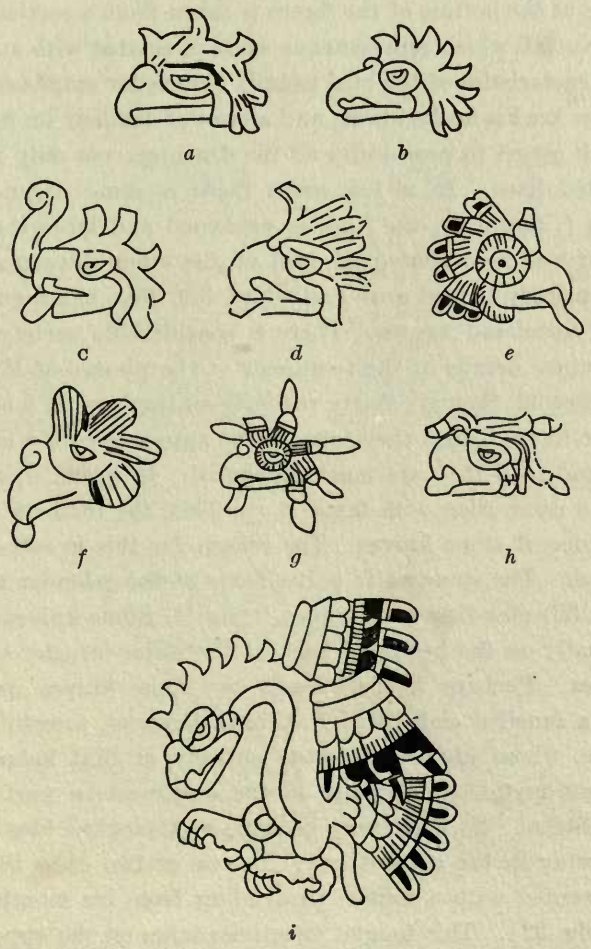


Fig. 32.—*a–h*, The Day-sign Eagle (*Quauhtli*); *i*, Realistic Drawing of an Eagle

Eagle (Quauhtli)

Sources of drawings (fig. 32):

a, Vatican B, p. 92
b, Nuttall (Zouche), p. 47
c, Vatican B, p. 50
d, Vatican B, p. 62
e, Nuttall (Zouche), p. 6
f, Nuttall (Zouche), p. 23
g, Nuttall (Zouche), p. 32
h, Vatican B, p. 2
i, Nuttall (Zouche), p. 69

The various drawings of the eagle are markedly realistic. The drawing at the bottom of the figure is taken from a section of the Codex Nuttall which represents an eagle in combat with an ocelot. The characteristics of the bird usually chosen for emphasis in the day-signs are his hooked beak, and a crest of feathers on his head. The beak occurs in practically all the drawings, not only in those illustrated here. In a few cases there is some degeneration. Thus in *f*, figure 32, the beak is weakened and lacks the sharp curve so well represented in most of the other drawings. The crest is usually barred gray and white, but these barrings do not show in uncolored figures. There is considerable variety shown in the minor details of the treatment of the plumes of the crest. In *i*, figure 32, they are fairly realistic, as they are in *b* and *e* of the same figure. In *a* they take on the appearance of a series of hooks, and in *d* they are much elongated. In *g* and *h*, as mentioned in connection with figure 8 (p. 336), the feathers take on appearance of stone knives. The reason for this is rather hard to fathom. The stone knife is itself one of the calendar symbols (see fig. 35) standing for the idea "flint." Stone knives appear occasionally on the head and back of the water-monster in place of spikes. Perhaps in both cases the stone knives represent merely a fanciful elaboration. A bird, however, something like an eagle, whose plumage consists entirely of flint knives, is a prominent mythological figure in the southwestern part of the United States. So there may be some mythological idea behind the drawing in the present case. In one or two cases the eagle is represented with a tongue protruding from his mouth (*c*, *d*, *e*, *g*, *h*, fig. 32). This tongue sometimes takes on the appearance of a long scroll, as in figure 32, *c*.

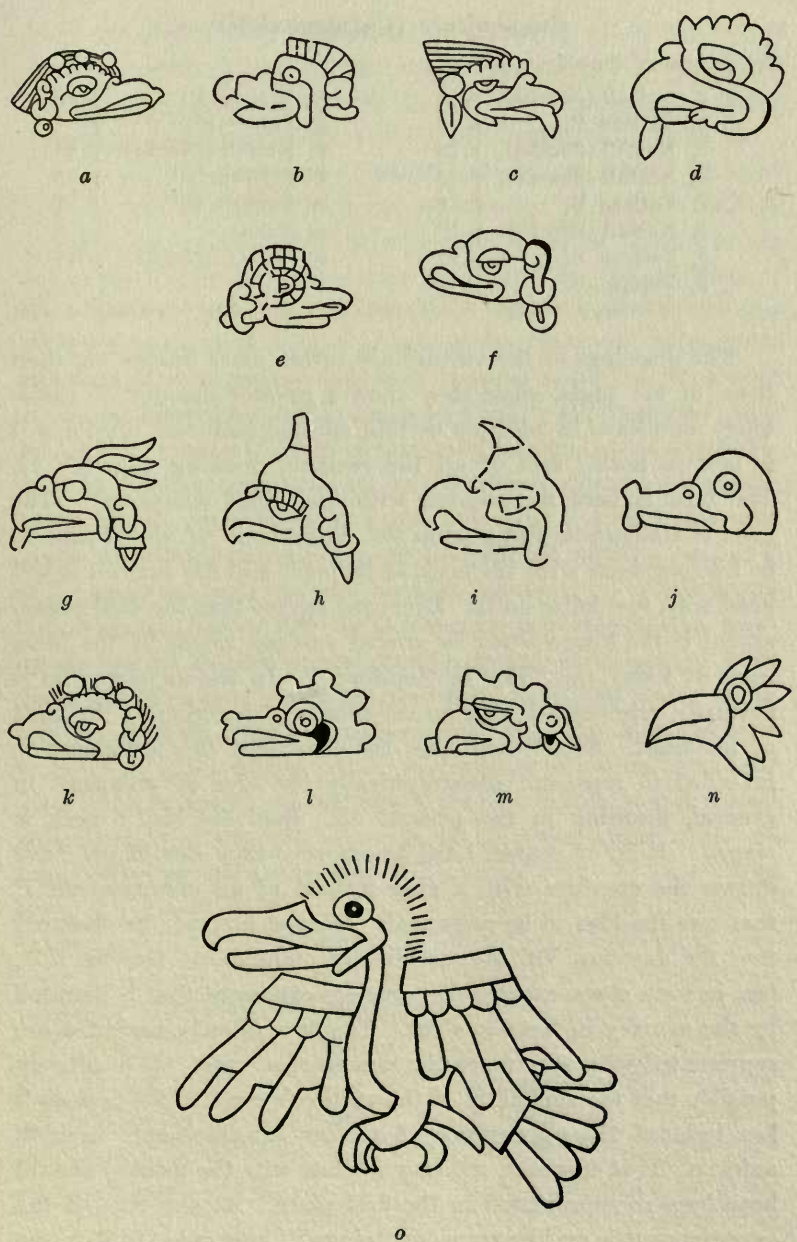


Fig. 33.—*a–n*, The Day-sign King-vulture (*Cozcaquauhtli*); *o*, Realistic Drawing of a Vulture

King-vulture (Cozcaquauhtli)

Sources of drawings (fig. 33):

a, Nuttall (Zouche), p. 54
b, Vatican B, p. 2
c, Nuttall (Zouche), p. 28
d, Nuttall (Zouche), p. 13
e, Vatican B, p. 6
f, Nuttall (Zouche), p. 59
g, Vatican B, p. 92
h, Vatican B, p. 78
i, Vatican B, p. 62
j, Fejervary, p. 1
k, Nuttall (Zouche), p. 45
l, Fejervary, p. 40
m, Vatican B, p. 1
n, Aubin, p. 3
o, Nuttall (Zouche), p. 74

The drawings of the vulture are rather more interesting than those of the eagle, since they show a greater amount of variability, and have in addition certain curious features. Perhaps it is best to notice first of all the realistic drawing (fig. 33, *o*). The bird is here represented with his wings outspread. The most characteristic thing from the Aztec point of view seems to be his long beak with the hook at the end, and his curious naked head with fine hairs on it. Everyone agrees that the bird represented is the king-vulture or ringed vulture, called by the Mexicans of today the "Rey de Zopilotes." In the day-signs he is normally represented with an ear-ornament hanging at the back of his head. Seler[75] advances the idea that this ornament is intended to represent ideographically the idea of ornament in general, meaning in the present case that the bird's neck is *ringed*. It is, of course, hard to see why they should not have drawn the creature with a ring instead of an ear-ornament if that was the idea to be presented. It must however be observed that the day-sign Vulture, as already pointed out (see fig. 26), has, in some cases, exactly the same ear-ornament that is flaunted by the monkey in the day-signs. The two animals moreover are represented with very much the same sort of crest. It is entirely possible that the similarity of the vulture's crest to the monkey's has induced the appearance of similar ear-ornaments in both animals. It is, however, not easy to state why the monkey should have been so represented in the first place. At any rate, if the ear-ornament is an ideogram for "ringed" here, what is it in the case of the monkey symbol? The ear-ornament in connection

[75] 1900–1901–p. 13.

with the present day-sign takes on a variety of forms, but it might be noticed that in each case it is readily distinguishable from the ear-ornament worn by *Quetzalcoatl* (see fig. 9), another important figure commonly wearing this article of adornment.

The vulture's head is in actual fact almost bare. The few hairs or pin feathers which are represented in realistic fashion in figure 31, *o*, take on quite elaborate forms in certain of the day-signs. They are sometimes elaborated by the addition of small disks or balls (fig. 33, *a* and *k*). Sometimes they are connected by a continuous line, as in *b* and *c*. In *e* they take on the appearance of rectangles or scales. In *g* we see a bare head with a sort of aigrette or plume, which in *h* and *i* solidifies into a sort of peak. It seems that the artist must have had some such form as *g* vaguely in mind before he was able to produce such a form as *i*. On the other hand, it would seem that the custom of representing the vulture's crest with ornamental balls on top, as in *k*, probably explains the curious drawing shown in *l*, where they have become mere knobs. In *m*, from another manuscript, these, or similar knobs, are represented in still more simplified form. In *n* we have one of the degenerate forms from the Aubin manuscript, which is simply unrecognizable. In *j* we have an absolutely bare head, without even pin-feathers or the ear-ornament. In *d*, on the other hand, we have a vulture head which is elaborated until it is scarcely, if at all, to be distinguished from the head of Eagle (see fig. 32).

Motion (*Olin*)

Sources of drawings (fig. 34):

a, Bologne,	p. 1	*h*, Vatican B,	p. 8
b, Aubin,	p. 19	*i*, Nuttall (Zouche),	p. 51
c, Aubin,	p. 8	*j*, Nuttall (Zouche),	p. 45
d, Borgia,	p. 6	*k*, Vatican B,	p. 70
e, Nuttall (Zouche),	p. 36	*l*, Vatican B,	p. 93
f, Vatican B,	p. 46	*m*, Nuttall (Zouche),	p. 35
g, Nuttall (Zouche),	p. 20	*n*, Nuttall (Zouche),	p. 44

Figure 34, *b*, represents what is probably the "normal" form of this sign. This, at any rate is the form which is of most frequent occurrence on the monuments. It consists of two figures

side by side which meet in the center and are, so to speak, bent away from each other at the ends. At the middle of the outer edge of these two sides there are a couple of "handles," or rings. In the center of the whole there is a circular figure which, in the present case, has taken on the appearance of an eye. In the

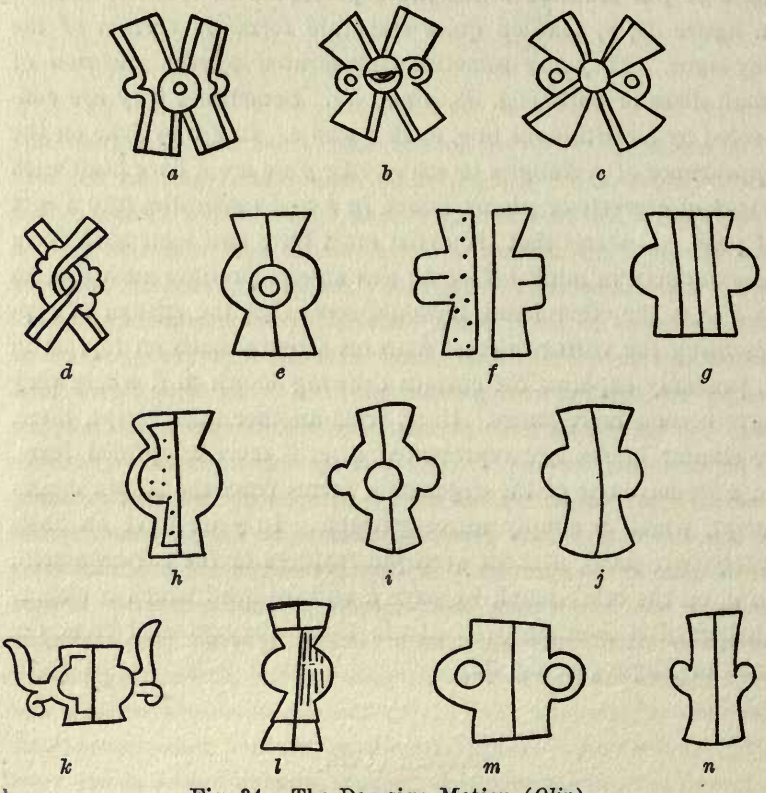


Fig. 34.—The Day-sign Motion (*Olin*)

famous highly elaborated altar stone in the Mexican National Museum, which usually goes by the name of the Aztec Calendar,[76] this central figure is filled with a great face which represents the sun. The meaning of this "motion" or *olin* design (fig. 34, *b*) is more or less of a puzzle. It sometimes occurs in the form shown in *d*, consisting of two angled figures fitted together or

[76] Leon y Gama, 1790; Chavero, 1876; Peñafiel, 1890, plates, vol. 2, p. 312, and corresponding portions of the text; Nuttall, 1901, p. 5; Maccurdy, 1910, p. 481 ff.

interlocked. It would be entirely possible to derive the forms like *b,* figure 34, from these simpler interlocked forms; but we know nothing at all about the real origin of these latter, and so we would be no nearer to a true explanation. It is worthy of remark that, in a general way, the normal form of this sign has something of the form of an X. It is moreover true that while the symbol stands for the word "motion," it is also associated with the sun. This fact may very likely be founded on a curious myth. The Aztecs, like a good many other peoples, have a myth which tells of a series of universal cataclysms. The first sun that was created came to an end in one of these cataclysms on the day Four-Wind. It was therefore named the "Wind" sun. After it was broken up another one was created which, at the close of the epoch, disappeared on the day Four-Tiger. This sun is therefore spoken of as the "Tiger" sun. Two more suns, disappearing on the days Four-Water, and Four-Rain, followed in series before our present sun came on the scene. In some mysterious way it is known that the present sun will disappear on the day Four-Motion, in which the sky will be broken up by an earthquake. It is therefore called the "Earthquake" or "Motion" sun, or *olin-tonatiuh.* The present writer is inclined to see in this myth[77] the real explanation of the association of this *olin* sign with the sun. It is of course possible to assume that the design stands for or directly represents the sun in some way, and that the myth was invented to explain that fact. The myth gives us, however, one definite reason why the sign should stand for the sun, and it seems a waste of time to go further afield, until there is more evidence. It would be easy to imagine half a dozen ways in which a graphic symbol for the sun might have degenerated into this sign. Imagine if you like that the original symbol for the sun was a disk with rays, and that these rays were gradually omitted until only four were left. These four, if skewed, would give the *olin* sign. Such theories represent mere mental gymnastics, unless a series of forms derived from a study of the monuments can be advanced to support them. The idea has

[77] See Maccurdy, 1901, for a most interesting paper on these myths and their representation on the monuments. Some of the most famous monuments of Mexican antiquity are connected with this story. Maccurdy's paper supplies a number of references to the literature.

actually been advanced that the *olin* sign represents the "four motions of the sun," that is, it stands for the four main points established by the sun in his yearly journey—the points of sunrise and sunset at the summer and winter solstices. If these points were plotted and connected diagonally by lines, we would have something approaching the *olin* symbol. It is worth noting, however, that the figure naturally produced would be a parallelogram, not an X. The sun moves not from the point in the southeast to the point in the northwest, but from the southeast to the southwest. We mentioned just above that the normal appearance of this sign represents an X. It is of some interest that the *kin* sign among the Mayas, which is also an X, is associated with the sun. Possibly a careful examination of the Maya mythologies would unearth some legend there corresponding to the Aztec story just mentioned.

If we take the sign shown in *b* as the complete or normal form, an idea for which there is some support in the fact that it is the most usual on the monuments, it is interesting to see which of its features are the most persistent in its career as a day-sign. It is obvious at once that its X-form readily becomes obscured. In *e*, figure 34, we have the two sides coalescing into a single figure with a straight line down the center. Seler[78] is inclined to see in this a picture of the sun disappearing into a cleft of the earth, the circle in the center being the sun, and the two sides day and night. This idea is based apparently on the fact that in figures of this type the two sides are often differently colored. It is somewhat hard to follow his reasoning here. It is in the first place quite unnecessary to make this assumption, as the figure can be plausibly explained in another way, and it leaves us, moreover, in more of a predicament than ever to account for the use of the sign to mean "earthquake" or "motion," which is certainly its literal meaning. The division of the sign into two differently colored surfaces is shown very nicely in figure 34, *f*. It will be seen in this figure (*b*) that of the original symbol we have the exterior outline, the circle in the center and the handles still remaining. It is a point of some

[78] 1900–1901, p. 14.

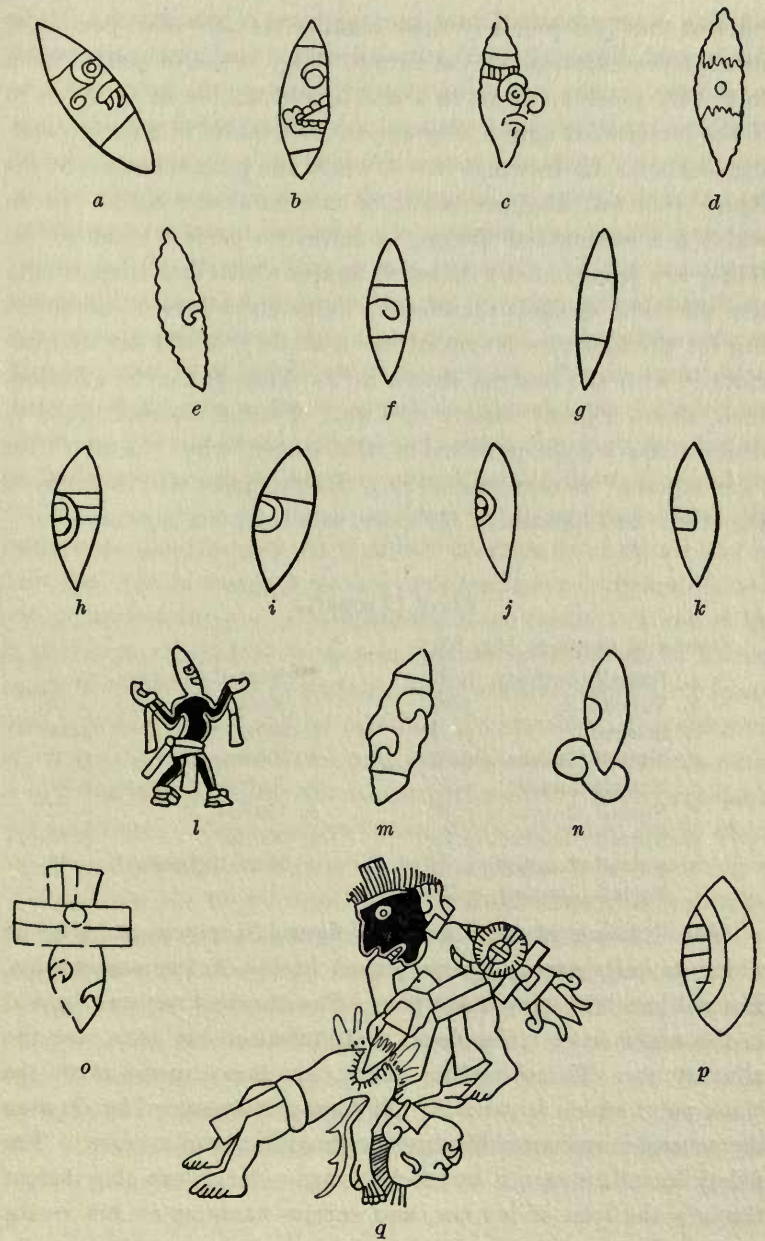


Fig. 35.—*a–p*, The Day-sign Flint (*Tecpatl*); *q*, Realistic Drawing of a Sacrifice, showing the Flint Knife in use

interest that it is precisely these handles that are most persistent in all representations of the figure. They occur in simple form in *a*, very much enlarged in *e* and *h*, and double in *f*. Even in *d*, the interlocked figure, they appear as crinkles in a corresponding location. In drawings like *n*, where the proper outline of the figure even has disappeared, these two handles remain. In *m*, which is a rectangular design, we have two perfect handles. In *k* they are ornamented with scroll figures which look surprisingly like the Aztec symbols for smoke. Certainly a person encountering for the first time a symbol like *l*, *m*, or *f*, would hardly associate it with the designs shown in *b*. The symbol in question, then, shows a great variety of form. I think we shall have to dismiss the whole question of the reason why "motion" or "earthquake" is represented by a double figure with a circle in the center and handles at the sides, as a complete mystery.

Flint (Tecpatl)

Sources of drawings (fig. 35):

a, Nuttall (Zouche), p. 53
b, Vatican B, p. 98
c, Bologne, p. 1
d, Nuttall (Zouche), p. 62
e, Nuttall (Zouche), p. 56
f, Nuttall (Zouche), p. 32
g, Nuttall (Zouche), p. 39
h, Nuttall (Zouche), p. 34
i, Nuttall (Zouche), p. 32
j, Nuttall (Zouche), p. 7
k, Nuttall (Zouche), p. 16
l, Bologne, p. 4
m, Vatican B, p. 1
n, Nuttall (Zouche), p. 24
o, Vatican B, p. 74
p, Aubin, p. 16
q, Nuttall (Zouche), p. 69

The drawing at the bottom of figure 35 represents a scene which is quite commonly portrayed in the Aztec manuscripts. The subject is a human sacrifice. The barefoot victim, dressed in the usual Aztec waist-cloth, is stretched on his back over the altar stone. The officiating priest, his face covered with the black paint which is usual in religious performances, bends over the prisoner and cuts his heart out with a stone knife. The priest himself wears a waist-cloth, has a large ear-plug thrust through the lobe of his ear, and carries hanging on his arm a pouch. In general, it must be said, pouches are quite usually represented in connection with priestly rites. The scene here represented is one of the best examples of Aztec draughtsman-

ship. The victim's posture, his glazed, closing eyes, and the blood streaming from the incision are all realistically presented.[79]

The object of particular interest for the present purpose is the stone knife in the priest's hands. A few of these sacrificial knives for removing the heart in human sacrifices have been preserved to the present day. The best known specimen is the one inlaid with mosaic work which is preserved in the Christy Collection of the British Museum—a specimen which is a favorite subject for illustration by writers on Mexican archaeology.[80] A sacrifice scene similar to the one represented in the present figure is figured in the Magliobecchi manuscript.[81] The sacrificial knife as actually used consists of a double-pointed blade chipped out of flint, with one of the pointed ends fitted into a wooden handle. A knife of the same pattern was selected by the authors of the calendar to stand for the idea "flint." It was apparently the most commonplace or most familiar object made of that material.

The various forms of the day-sign are shown in figure 35, *a–n*. The first drawing, *a*, is perhaps the most typical. I am of the opinion that the other forms are derived from this one. At any rate, we find all the gradations from a knife with this appearance to one with merely a few simple lines where the elaborate design ought to be. The various drawings fit so well into a series that it is hard to resist the temptation to regard them as steps in an evolution. The most noticeable thing about *a*, figure 35, is that we have there a flint knife with a human face, consisting of eye, mouth, and teeth, represented along one edge. More peculiar still, the face seems to represent that of the rain-god *Tlaloc* (see figure 36 for the various forms). We have in the case of the present figure the goggle eye and the mouth full of long teeth which are so characteristic of the rain-god. As to why the rain-god's features should be represented on the day-sign "Flint," I have never heard a suggestion.

I have said that *a*, figure 35, represents the usual form of this face on the Flint day-signs. In figure 35, *b*, however, we have

[79] One of the most realistic and picturesque descriptions of such a place of sacrifice is the one by Juan Diaz (the chaplain of the explorer Juan de Cordova), quoted by Mrs. Nuttall. 1910, pp. 256–259.

[80] Peñafiel, 1890, vol. 1, p. 123; Tylor, 1861, p. 101; Joyce, 1914, p. 194.

[81] Nuttall, 1903, 58.

another and quite different form. Here we see the goggle eye, but instead of the *Tlaloc* face, in which the lower jaw is uniformly missing, and the upper jaw armed with long, fang-like teeth, we have a skeleton jaw with normal human dentition. It seems at least conceivable that the Aztecs represented these teeth on the edge of the flint-knife to symbolize the fact that the flint-knife cuts or bites. On the other hand, the drawing may symbolize especially the sacrificial knife, and the instrument may have been represented with teeth because the Aztecs thought of it as eating the heart of the victim. Figure 35, *c*, represents a degenerate form of this same drawing. In figure 35, *d*, we have still the knife, and we have the two lines across it transversely as in *a*. Nothing else is present, however, except a round dot in the center. It would seem almost necessary to conclude that this dot stands for the face as shown in *a*. It would be most plausible to assume that it is a remnant of the eye, all the rest of the face having dropped off. In similar fashion, the curl in *e*, and the still simpler curl in *f*, would seem to be the remnant of the mouth shown in *a*. In *g* all the facial features have disappeared, and we have nothing left but the two transverse lines. In *h*, *i*, *j*, *k*, *n* we have a series of simple designs which occupy the place that the face occupies in *a*, and which might easily be interpreted as degenerate forms of the face. There has, however, been more or less arbitrary elaboration and simplification of these designs. Perhaps the simplest is *k*. At the bottom of *n*, we see a curious curved design that possibly represents part of a haft or handle.

Figure 35, *l*, is another of the fanciful drawings which are rather usual in the Bologne manuscript. We have here the flint-knife with its face, but in this case a mannikin body has been fitted to it, and we have a complete person in a curious attitude, with both hands raised. The mannikin is dressed in waist-cloth and sandals, with long ornaments of a flexible sort attached to his wrists, and his body is painted black like that of the priest in sacrifices. We spoke a moment ago of the curious curl design which seems (fig. 35, *e*, *f*) to represent the mouth of our first original drawing. It is worth noting that if this is the real meaning of it, the artist in the case of *m*, figure 35, forgot that original meaning. He has drawn two of them, one on each side of the

blade. These two curls appear again in the case of *o*, although this latter is a realistic drawing of a flint-knife, with its handle and hilt plainly shown.

I should like to draw special attention to *p*, figure 35. This design represents the idea "Flint." There is no question about its identity, which can be determined from a consideration of the original series in which it occurs. Moreover, it is only a comparatively slight variation from some of the designs which represent the knife quite realistically (see *h*, *i*, etc.). The curved design at the edge of the blade has simply been expanded rather unduly. However, the drawing in *p* has gone so far from the original that it approaches very close to the Aztec representation of the ear of maize.

Rain (Quiahuitl)

Sources of drawings (fig. 36):

a, Nuttall (Zouche),	p. 37	*i*, Vatican B,	p. 20
b, Nuttall (Zouche),	p. 39	*j*, Borgia,	p. 50
c, Nuttall (Zouche),	p. 38	*k*, Vatican B,	p. 75
d, Vatican B,	p. 96	*l*, Bologne,	p. 2
e, Vatican B,	p. 1	*m*, Aubin,	p. 3
f, Nuttall (Zouche),	p. 46	*n*, Vatican B,	p. 94
g, Vatican B,	p. 58	*o*, Vatican B,	p. 71
h, Vatican B,	p. 1	*p*, Nuttall (Zouche),	p. 37

As already noted in several places, the day-sign Rain is represented by the face of the rain-god. This divinity was called by the Aztecs *Tlaloc*. A figure of the god is shown in *p*, figure 36. There are several things in his appearance and costume in this drawing that deserve special notice. In the first place he is very elaborately dressed. He wears not only the customary sandals and waist-cloth, but also a belt with some elaborate ornament behind, and on his breast a necklace with a large circular pendant. At the back of his head there seems to be an additional ornament. Around his wrists are bracelets, and in his hand he holds what may perhaps be considered a stalk of maize and a ceremonial pouch. The head of this divinity, however, is the part of most importance for our purpose, since the head only appears as a

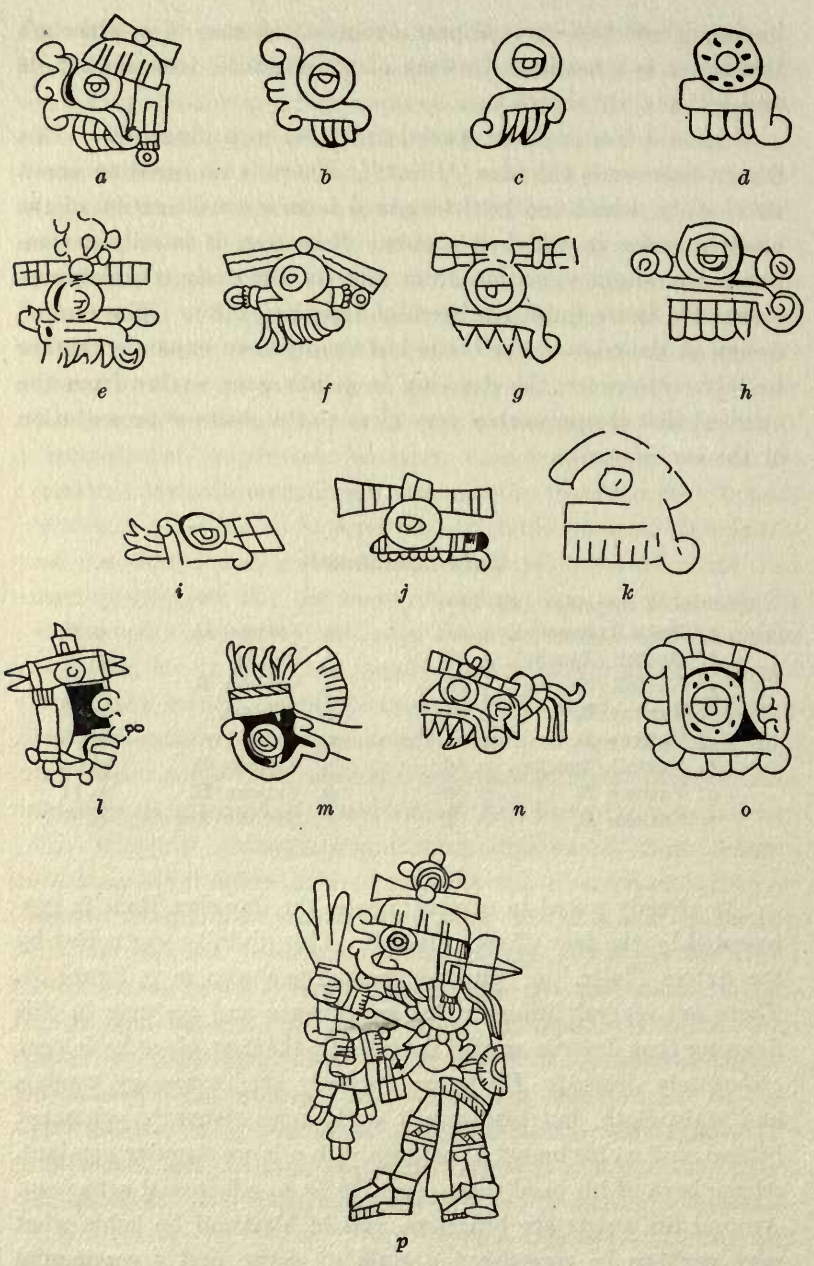


Fig. 36.—*a*–*o*, The Day-sign Rain (*Quiahuitl*); *p*, Realistic Drawing of the Rain-god, *Tlaloc*

day-sign. The figure we are discussing seems to represent a human being impersonating the god. We see in the drawing a human face, with hair coming down to the ear, and in this ear a complex ear-ornament. Part of the nose also is clearly visible. The facial features, however, are in large part obscured by something suggesting a mask. The eye is covered by a sort of goggle, and from this goggle a strip twists down over the face, running along the upper lip. From this strip over the mouth there depends a set of long tusks or fang-like teeth. This latter feature is the most characteristic part of the Tlaloc regalia. On the head, however, is a sort of cap surmounted by an ornament in two parts, one projecting forward, and the other to the rear. This ornament is also quite characteristic of the Tlaloc figure as usually represented. Let us now examine some of the variations of this figure when used as a day-sign.

The most complete delineation is shown in *a*, figure 36. Here we have all the important features of the god realistically represented. We see the ear-ornament, the goggle eye, the strip or mask with the tusks attached, and the cap with the two ornamental flaps. In the next drawing, however (*b*), we have merely the eye and the strip with its tusks. In *c* we have an even simpler form than in *b*, and in *d* the eye looks like a simple ring, and the teeth like slats. The strip that carries the fangs is also clumsy in this drawing and much simplified.

The drawings in *e*, *f*, *g*, and *h* show different forms, and were chosen with special reference to the ornamental flaps on the cap. In *e* the teeth, eye, and strip are all present, but the two flaps have become just a straight bar. We have a curious bar added just above the teeth, the origin of which I cannot explain. It appears, however, in *f* and *h*. In *f* the teeth look like a soft fringe. In *g* we have just on the head a straight bar (representing apparently the cap ornaments), a round eye, and the teeth. The teeth are not, however, the fangs proper to a Tlaloc figure, as usually represented, but are the triangular teeth characteristic of the Water-monster symbol.

In *h* we see the eye, intersected by a bar, and a simplified set of teeth. Whether this bar is the cap ornament, or the extra bar which appears first in *e*, it is impossible to say.

In *i*, *j*, and *k* we have these same elements very much simplified and distorted. In *i* the teeth, lip-strip, eye, and another design, perhaps representing teeth again, are all arranged to form one horizontal figure. Recognition of this maze of lines as Tlaloc symbols would be almost impossible, if we did not have intermediate stages before us. In *j* the three most persistent elements appear, teeth, eye, and cap ornament, but the teeth are very degenerate, hardly more than a set of scallops. In *k* the whole design is loose and formless, the teeth square at the end instead of pointed, and practically all similarity to the realistic drawing is lost. In *l* we have another one of the fanciful drawings from the Bologne Codex. We have the various parts of the Tlaloc figure, cap with flaps, ear-ornament, goggle eye, and mouth. The whole takes on, however, an entirely new appearance. On the face appears a large patch of black face-paint. The mouth is without teeth of any kind, although the teeth are certainly the most characteristic of all the Tlaloc features.

In *m* we have a curious design from the Aubin manuscript. The goggle eye, the cap, and the fringe of long teeth are all there. The artist has drawn them, however, upside down. In *n* again we have all the parts, but arranged to give quite a different effect from any of the other drawings. The teeth, moreover, are of the Water-monster variety. In *o* we have a drawing that might easily be mistaken for the Water-monster symbol. It would almost seem that the artist had the Water-monster figure in the back of his mind. The drawing shows the goggle eye and the curved lip-strip. The teeth, however, have lost their long tapering shape, and the artist has made them follow around up the curve of the strip, giving almost exactly the effect of Water-monster's upturned snout. We have, however, behind the eye, an ear which would not be in place on the Water-monster design. Altogether, there is none of the symbols which is more complicated and distinctive than the representation of the Rain symbol, and yet there is no design which shows more marked variability or greater similarity to entirely independent symbols.

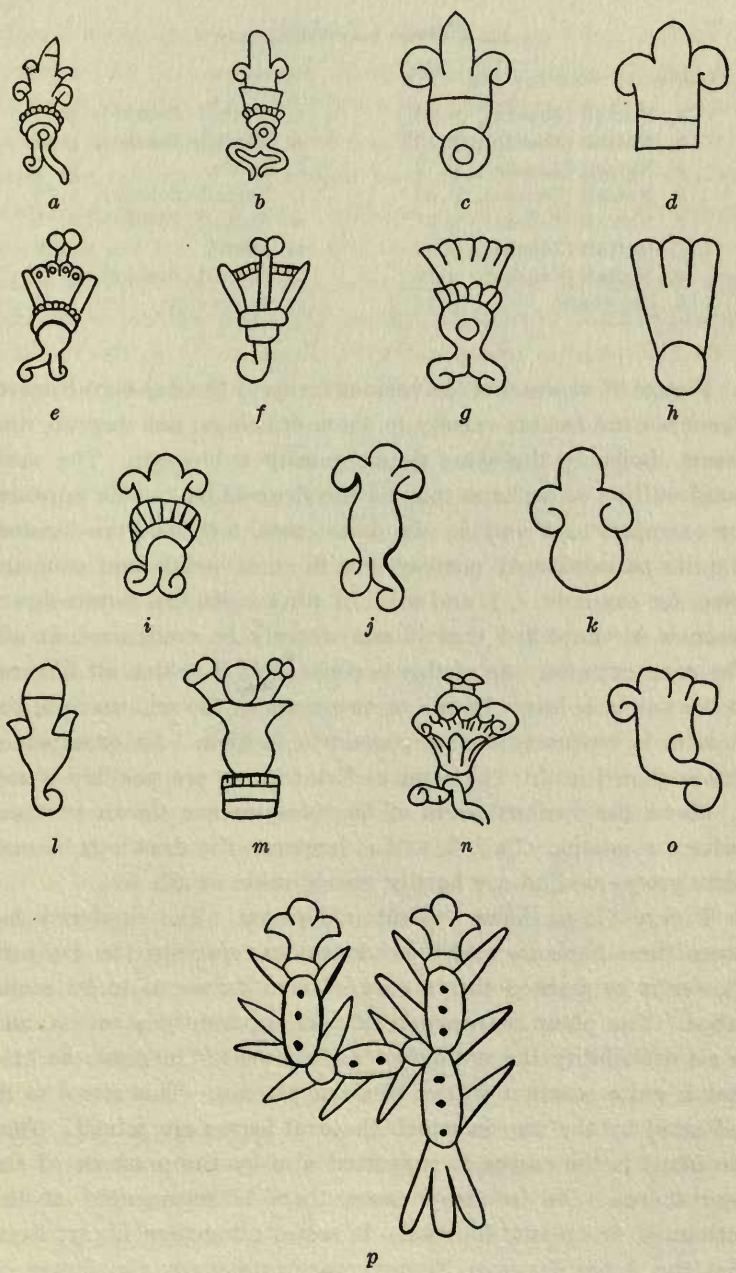


Fig. 37.—*a–o*, The Day-sign Flower (*Xochitl*); *p*, Realistic Drawing of a Plant in Blossom

Flower (Xochitl)

Sources of drawings (fig. 37):

a, Nuttall (Zouche), p. 43
b, Nuttall (Zouche), p. 53
c, Nuttall (Zouche), p. 3
d, Nuttall (Zouche), p. 43
e, Nuttall (Zouche), p. 51
f, Nuttall (Zouche), p. 52
g, Nuttall (Zouche), p. 16
h, Fejervary, p. 17
i, Nuttall (Zouche), p. 2
j, Nuttall (Zouche), p. 15
k, Aubin, p. 4
l, Nuttall (Zouche), p. 76
m, Nuttall (Zouche), p. 6
n, Aubin, p. 6
o, Nuttall (Zouche), p. 19
p, Fejervary, p. 5

Figure 37 represents the various forms of the day-sign Flower. There is considerable variety in these drawings, but they all represent obviously the same thing, namely a blossom. The most usual outline is perhaps that of the fleur-de-lis. This appears, for example, in *a* and *b*. In some cases, however, the blossom is quite painstakingly portrayed with stem, petals and stamens. (See, for example, *e*, *f*, and *n*.) In other cases this flower figure becomes so simplified that it can scarcely be recognized at all. The most extreme case of this is perhaps *h*, in which all likeness to the flower is lost. In one or two cases in the manuscripts the blossom is represented in a geometric fashion. An example of this is shown in *f*. The most realistic forms are possibly *e* and *n*, where the various parts of the blossom are shown in their natural relations. In *j*, *k*, and *o*, however, the drawings become quite grotesque and are hardly recognizable at all.

Figure 37, *p*, shows a plant in blossom. The similarity between these blossoms and those drawn to represent the day-sign Flower is so marked that a case of identity seems to be established. The plant represented in *p* is apparently a cactus, and in all probability the ordinary "prickly-pear," in Aztec *nochtli*, that is quite common on the Mexican plateau. This seems to be indicated by the way in which the oval leaves are joined. That the plant is the cactus is suggested also by the presence of the long thorns. As in many cases, there is represented at the bottom of the plant the root. It seems altogether likely, then, that the Aztec day-sign Flower represents really the flower of the prickly-pear cactus.

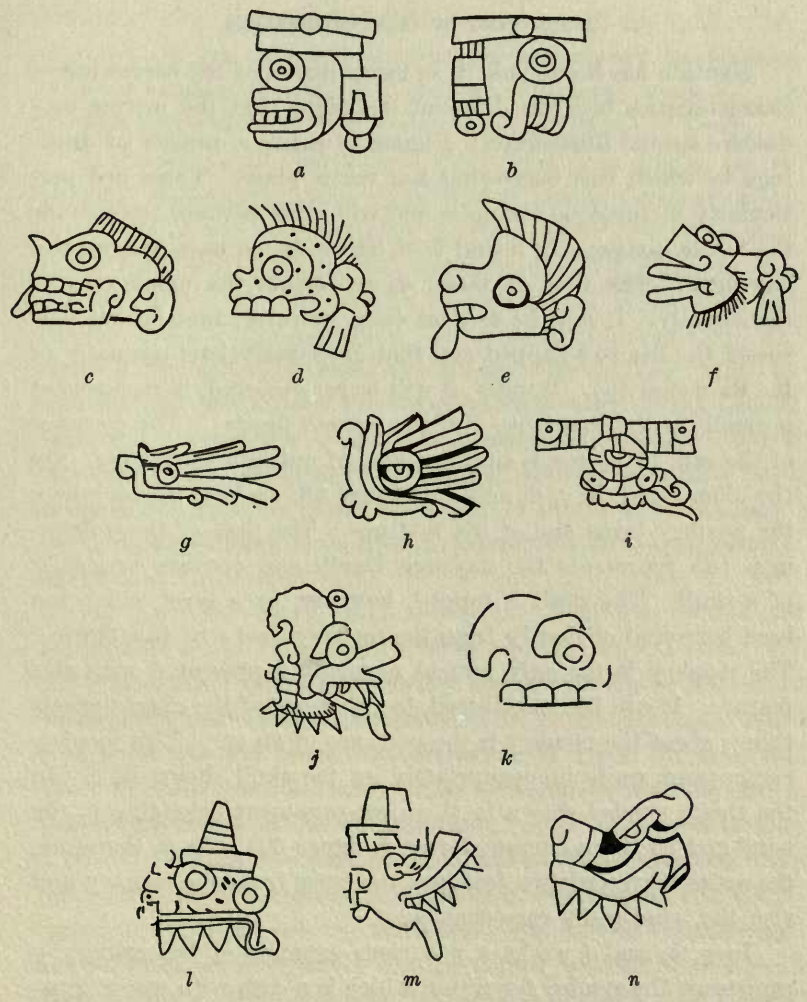


Fig. 38.—Drawings showing the Borrowing of Characteristics between the Various Day-signs

Sources of drawings (fig. 38):

a, Nuttall (Zouche),	p. 71	*h*, Borgia,	p. 64
b, Nuttall (Zouche),	p. 12	*i*, Borgia,	p. 5
c, Vatican B,	p. 88	*j*, Bologne,	p. 3
d, Fejervary,	p. 5	*k*, Vatican B,	p. 21
e, Nuttall (Zouche),	p. 11	*l*, Vatican B,	p. 62
f, Fejervary,	p. 9	*m*, Vatican B,	p. 96
g, Borgia,	p. 57	*n*, Vatican B,	p. 28

BORROWING OF CHARACTERISTICS

Mention has been made in so many places of the borrowing of characteristics between different day-signs that the matter may deserve special illustration. Figure 38 shows a number of drawings in which this borrowing has taken place. These are particularly picturesque examples and will serve perhaps to conclude the whole matter. In *a* and *b* of figure 38 we have two typical day-signs. The first of these, *a*, represents the monkey quite realistically. It will be seen at once, however, that he has borrowed the flat two-flapped cap that is characteristic normally of the Rain sign (*b*). Monkey, it will be remembered, is represented normally with a crest (see *e* of the present figure). The presence of the cap, then, in *a* is simply a case of outright borrowing. On the other hand, in *c*, *d*, and *e* of figure 38, we have a case where the monkey loans one of his features. The first of these drawings (*d*) represents the day-sign Death and consists primarily of a skull. The skull is topped, however, by a crest which has been borrowed obviously from the monkey (see *e* of this figure). The monkey is the only animal normally represented with this feature. It will be remembered, too, that one of the characteristic things about the monkey is the presence of an ear. This monkey ear appears quite inappropriately on the skull shown in *c*. In the Death symbol shown in *d*, an ear-ornament belonging to the wind-god has been borrowed (see *f*, figure 36). In *d*, therefore, the artist borrowed two features, the crest from the monkey and also the wind-god's ear-ornament.

In *g*, *h*, and *i* we have a curious example of borrowing. *g* represents the symbol for water, which is a dish with water pouring out of it, and a little circular object in the center representing a shell. In *i* we see a typical representation of rain-god, the central feature of which is a semi-circular eye. Figure *h* is a representation, like *g*, of water. Instead of a shell, however, the artist represents in its midst an eye which he has apparently borrowed from the Rain symbol.

In *j*, figure 38, we have a representation of the wind-god. He has the usual wind-god's snout with the opened mouth and an eye. He has, however, borrowed from the skull sign (see *k*) an

additional eye, and the hooked rear portion of the skull. We have then in *j* a curiously complicated and rather meaningless figure—a wind-god with beak and ear-ornament topped by a cranium and a loose eye borrowed from the symbol of Death.

In the last three drawings of the figures *l*, *m*, and *n*, we see a curious case of interchanging of traits. Let us direct attention first of all to the water-monster drawing (*n*). The important things here are an upcurved snout ornamented with big triangular teeth. In *l* we have a representation of the rain-god standing for the day-sign Rain. In drawing this latter symbol, however, the artist borrowed two things. In the first place he borrowed the teeth from the water-monster, and in the second place, the pointed cap or mitre from the god of wind. On the other hand, the wind-god here represented (*m*) is shown with an upcurved beak, obviously an imitation of the water-monster; and this curved beak is ornamented with typical water-monster teeth.

CONCLUSION

I should say by way of summary concerning the general tendencies which operate in the delineation of the day-signs, that there is, in the first place, wide variation in type. It must be noted that this variation is not due to historical development; on the contrary, it is due in large part to conscious elaboration or abbreviation on the part of each artist. We sometimes find two widely variant forms in one day-sign, one perfect, the other degenerate, side by side on the same page of one manuscript. The difficulty in recognizing the day-signs, where there is any difficulty, arises from the fact that there are no hard and fast criteria for the recognition of the symbols. One symbol may gradually change until it closely resembles another. To render this approximation still more marked, we have the curious borrowing which has just been illustrated, in which perfect features from one day-sign are transplanted and appear entire in the drawings of another. The amount of variation is so great that an almost unlimited number of examples could be chosen. The day-signs as they are drawn in the manuscripts offer many examples of divergence.

BIBLIOGRAPHY

AZTEC MANUSCRIPTS

Aubin Tonalamatl. [A facsimile manuscript issued as an addendum to Seler's work of the same title.] 1900–1901. Cited as **Aubin.**

Codice Messicano di Bologna (Codice Cospiano). Manuscrito pictórico de los Antiguos Nauas que se conserva en la Biblioteca de la Universidad de Bolonia. Reproducido en fotocromgrafía á expensas de S. E. el Duque de Loubat. Roma, 1898. Cited as **Bologne.**

Codice Messicano Borgiano del Museo Etnografico della S. Congregazione di Propaganda Fide. Reprodotto in fotocromografia a spese di S. E. il Duca di Loubat a cura della Biblioteca Vaticana. Roma, 1898. Cited as **Borgia.**

Codex Ferjérváry-Mayer. Manuscrit mexicain precolombien des Free Public Museums de Liverpool (M 12014). Published by le Duc de Loubat. Paris, 1901. Cited as **Fejervary.**

Codex Nuttall. Facsimile of an ancient Mexican Codex belonging to Lord Zouche of Harynworth with an introduction by Zelia Nuttall. Peabody Museum, Harvard University, Cambridge, Mass., 1902. Cited as **Nuttall (Zouche).**

Il Manoscritto Messicano Vaticano 3773. Reprodotto in fotocromagrafia a spece di S. E. Duca di Loubat a cura della Biblioteca Vaticana. Roma, 1896. Cited as **Vatican B.**

Zouche Manuscript (see "Codex Nuttall").

RECENT WORKS REFERRED TO IN THE TEXT

ANTIGÜEDADES MEXICANAS. See Chavero, 1892.

BANDELIER, A. F.

1880a. On the art of war and mode of warfare of the ancient Mexicans. (Reports of the Peabody Museum of Harvard University, vol. 2, pp. 95–162.)

1880b. On the distribution and tenure of land and the customs with respect to inheritance among the ancient Mexicans. (Reports of the Peabody Museum of Harvard University, vol. 2, pp. 385–449.)

1880c. On the social organization and mode of government of the ancient Mexicans. (Reports of the Peabody Museum of Harvard University, vol. 2, pp. 557–700.)

BENEVENTE, TORIBIO DE. See Toribio.

BEUCHAT, H.

1912. Manuel d'Archaeologie (Américaine (Amérique préhistorique—Civilizations disparues.) Paris.

BOWDITCH, C. P.

1910. The numeration, calendar systems and astronomical knowledge of the Mayas. Cambridge.

Brinton, D. G.
1885. The annals of the Cakchiquels. (Library of Aboriginal American Literature, number 6.) Philadelphia.
1893. The native calendars of Mexico and Central America. Philadelphia.

Chavero, Alfredo.
1876. Calendario Azteca. Ensayo Arqueológico. Ed. 2. Mexico.
1892. Antigüedades Mexicanas (editor). Published by the Junta Colombina. Mexico.

Clavigero, F. X.
1870–1881. Storia Antica del Messico. 4 vols. Cesena.

Crónica de la S. Provincia del Santíssimo Nombre de Jesus de Guatemala. Anonymous manuscript of 1683.

Enock, C. Reginald
1909. Mexico. Its ancient and modern civilization, etc. London and Leipsic.

Fabrega, José Lino.
1899. Interpretation del Codice Borgiano. (Mexico, Museo Nacional, Anales [first series], vol. 5.)

Förstemann, E.
1893. Die Zeitperioden der Mayas. (Globus, vol. 63. Reprinted in Bull. 28, Bur. Am. Ethn., pp. 493–498.)
1895. Die mittelamerikanische Tonalamatl. (Globus, vol. 67, pp. 283–285. Reprinted in Bull. 28, Bur. Am. Ethn., pp. 527–533.)

Goodman, J. T.
1897. The archaic Maya inscriptions. (Biologia Centrali-Americana. Archaeology. Appendix. See Maudslay, 1889–1902.)

Humboldt, A. von
1816. Vues des Cordilleres et monuments des peoples indigenes de l'Amérique. Paris.

Icazbalceta, J. Garcia
1858–1870. Coleccion de documentos para la historia de Mexico. 3 vols. Mexico.
1885–1892. Nueva coleccion de documentos para la historia de Mexico. 5 vols. Mexico.

Jonghe, Ed. de
1906. Die altmexikanische Kalendar. (Zeitschrift für Ethnologie, vol. 38, pp. 485–506.)

Joyce, T. A.
1914. Mexican Archaeology. London.

Kingsborough, Lord
1831. Antiquities of Mexico: comprising facsimiles of ancient Mexican paintings and hieroglyphics . . . together with the Monuments of New Spain by M. Dupaix. . . . 9 vols. London.

Leon y Gama, A.
1790. Descripcion historica y cronológica de las piedras que se hallaron en la plaza principal de Mexico. Mexico.

MACCURDY, GEORGE GRANT

1910. An Aztec "Calendar Stone" in the Yale University Museum. (American Anthropologist, n.s., vol. 12, pp. 481–496.)

MAUDSLAY, A. P.

1889–1902. Biologia Centrali-Americana, or contributions to the knowledge of the flora and fauna of Central America. Archaeology. 4 vols. of plates, 1 vol. of text and an appendix. London.

MOTOLINIA. See Toribio de Benevente.

NUTTALL, ZELIA

1891. The atlatl or spear-thrower of the ancient Mexicans. (Archaeological and ethnological papers of the Peabody Museum of Harvard University, vol. 1, pp. 173–207.)

1901. The fundamental principles of Old and New World civilizations. A comparative research based on a study of the ancient Mexican religious, sociological and calendrical systems. (Archaeological and Ethnological Papers of the Peabody Museum of Harvard University, vol. 2.)

1903. The book of the life of the ancient Mexicans, containing an account of their rites and superstitions. An anonymous Hispano-Mexican manuscript preserved at the Biblioteca Nazionale Centrale, Florence, Italy. [Sometimes called the Codex Magliabecchi.] Part 1, introduction and facsimile. University of California, Berkeley, Cal.

1904. Periodic adjustments in the ancient Mexican calendar system. (American Anthropologist, n.s., vol. 6, pp. 486–500.)

1906. Problems in Mexican archaeology. (American Anthropologist, n.s., vol. 8, pp. 133–149.)

1910. The island of Sacrificios. (American Anthropologist, n.s., vol. 12, pp. 257–295.)

OROZCO Y BERRA, MANUEL

1880. Historia antigua y de la conquista de Mexico. 4 vols. Mexico.

PEÑAFIEL, ANTONIO

1885. Nombres geográficos de México. Catalogo alfabético de los nombres de lugar pertinentes al idioma "Nahuatl." Estudio jeroglífico de las matriculas de las tributos del Codex Mendocino . . . Dibujo de las Antigüedades Mexicanas de Lord Kingsborough. Mexico.

1890. Monumentos del arte Mexicano antiguo. Ornamentacion, mitología, tributos, y monumentos. Berlin.

SAHAGUN, BERNARDINO

1829. Historica General [Universal] de las cosas de Nueva España. Mexico. [An independent edition is printed in Kingsborough, London, 1831, vol. 7. A French translation was edited by Jourdanet and Siméon, Paris, 1880.]

SELER, EDUARD

1891. Zur mexikanischen Chronologie mit besonderer Berücksichtigung des zapotekischen Kalendars. (Zeitschrift für Ethnologie, vol. 23, pp. 89–133. Translated in Bull. 28, Bur. Am. Ethn., pp. 1–55. Reprinted in 1902–1908, vol. 1, pp. 507–554.)

1893. Die mexikanischen Bilderhandschriften Alexander von Humboldts in der Königlichen Bibliothek zu Berlin. Berlin. (Reprinted in 1902–1908, vol. 1, pp. 162–300. Translated in Bull. 28, Bur. Am. Ethn., pp. 123–230.)

1898. Die Venusperiode in den Bilderschriften der Codex Borgia Gruppe. (Verhandlungen der Berliner Gesellschaft für Anthropologie, Ethnologie und Urgeschichte. Reprinted in 1902–1908, vol. 1, pp. 618–667. Translated in Bull. 28, Bur. Am. Ethn., pp. 123–229.)

1900–1901. The Tonalamatl of the Aubin Collection, an old Mexican picture manuscript in the Paris National Library (Manuscrits Mexicains No. 18–19). Published by the Duke of Loubat, with introduction and explanatory text by Dr. Eduard Seler. Berlin and London. English translation by A. H. Keane.

1902–1908. Gesammelte Abhandlungen zur amerikanischen Sprach- und Alterthumskunde. 3 vols. Berlin.

1903. Die Korrekturen der Jahreslänge und die Länge der Venusperiode in den mexikanischen Bilderschriften. (Zeitschrift für Ethnologie, vol. 35, pp. 27–49. Reprinted in 1902–1908, vol. 3, pp. 199–220.)

SERNA, JACINTO DE LA

1899. Mexico, Museo Nacional, Anales, vol. 5.

SPENCE, LEWIS

1912. The civilization of ancient Mexico. Cambridge, University Press. (New York, G. Putnam & Sons.)

SPINDEN, H. J.

1913. A study of Maya art. (Memoirs of the Peabody Museum of Harvard University, vol. 6.)

TERNAUX-COMPANS, H.

1837–1841. Voyages, relations, et mémoires origineaux pour servir a l'histoire de la decouverté de l'Amérique. 21 vols. Paris.

TEZOZOMOC, FERNANDO DE ALVARADO

Crónica Mexicana (see Kingsborough, 1831, vol. 9). Translated into French by Ternaux-Compans, Paris, 1855.

THOMAS, CYRUS

1897–1898a. Mexican calendar systems. (19th Report of the Bureau of American Ethnology, part 2, pp. 693–819.)

1897–1898b. Numeral systems of Mexico and Central America. (19th Report of the Bureau of American Ethnology, part 2, pp. 853–955.)

TORQUEMADA, JUAN DE

1615. . . . libros rituales y monarquía Indiana, etc. Sevilla. Ed. 2, edited by A. Gonzales-Barcia, Madrid, 1723.

Toribio de Benevente (called Motolinia)
Historia de los Indios de Nueva España (see Kingsborough, 1831, vol. 9, where parts of it are printed. Another edition, complete, will be found in Garcia Icazbalceta, 1858–1870, vol. 1.)

Tylor, E. B.
1861. Anahuac, or Mexico and the Mexicans, ancient and modern. London.

Veytia, M. Fernandez
1907. Los calendarios Mexicanos. Mexico, published by the Museo Nacional.

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Index, pp. 381-385.

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