Discussion and Criticism[1]

On the Borana Calendrical System: A Preliminary Field Report[2]

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A number of anthropologists, among them Pecci (1941), Baxter (1954), Haberland (1963), and Legesse (1973), have collected data about calendar of the Borana of northern Kenya and southern Ethiopia. Only Legesse organized his information in a system based on astronomical observation, as Doyle (CA 27:286–87) has pointed out, his description seems to have some astronomical incongruities. Doyle suggests a new interpretation of Legesse's data. In this paper I will present some new field information on the calendrical system of the Borana. Most of the data have been provided by my informant Bante Abbagala, a respected elder and an expert on sky observation and the calendar (*ayantu*).

The Borana calendar does not seem to be influenced by the rhythms of the agricultural cycle. The succession of months and of days is conceptualized as cyclic without any beginning. The calendar is used for ritual purposes; each ceremony is expected to be held on a definite day (for details see Baxter 1954, Haberland 1963, Legesse 1973).

The astronomical character of the Borana calendar requires specialist knowledge of sky observation that is usually guarded and transmitted from father to son. *Ayantu* are consulted by the people both for dates, in connection with ritual requirements, and on other matters such as weather forecasting and divination. A person seeking a consultation brings a small amount of tobacco and/or some coffee beans. Such gifts have symbolic value and are not considered payment. In fact, the *ayantu* depend on the same subsistence resources and carry on the same social activities as anyone else. They are not formally recognized or distinguished by insignia. Nor do they form a corporation or meet as a body, though they often meet individually and exchange opinions.

The Borana year, according to Legesse, has 12 named lunar months (table 1). A lunar month is a synodic period of the moon (about 29.5 days). As a Borana month begins on the day a new moon is seen, it may be 29 or 30 days long (Legesse 1973:180). In this paper "new moon" will indicate the moon on the first day it is visible after the astronomical "zero phase" or conjunction with the sun. The Borana new moon usually occurs the day after the astronomical new moon.

According to Legesse, the Borana year, being 11 days shorter than the solar one, affords no correspondence between years and seasons (p. 181). There are no weeks, but there is a cycle of 27 named days that Legesse calls a "ceremonial month" (p. 181). Because the ceremonial month (27 days) does not coincide with the lunar month (29 or 30 days), each lunar month begins on a different day or, more exactly, on a different set of two or three successive days (p. 186) (see table 1).

In order for a given month to begin on the same set of days every year, 13 ceremonial cycles (each consisting of 27 days) must last as long as 12 lunar months (each consisting of 29.48 days). Because there is a difference of 2.76 days between the 13 ceremonial months and the 12 lunar months, Legesse suggests that the system has a yearly error of 3 days (pp. 184, 187). According to him, this yearly error does not become cumulative because it is corrected on the basis of observations of conjunctions between the moon and one of the seven stars or constellations, which occur on certain days (table 1, columns 3 and 4). He suggests that the conjunctions I have numbered 1 and (especially) 7 are the checkpoints of the year, used to correct the error; when the astronomical event occurs, the day is inductively established (p. 185).

A first astronomical incongruity of the system described by Legesse has been pointed out by Doyle: the conjunctions numbered 7 through 12 in table 1 cannot astronomically occur as indicated. On the basis of the lunar sidereal rate, Doyle has estimated the position of the moon at the beginning of every synodic month, starting from the conjunction between the new moon and Triangulum: after one lunar month, the new moon and the Pleiades (no. 8) will really be in conjunction, but at the beginning of the following one the new moon will rise a little bit past Bellatrix instead of Aldebaran (no. 9) and the next one past Sirius instead of Bellatrix (no. 10) (CA 27:286).

As an alternative Doyle considers the hypothesis that the term "conjunction" may be taken to mean "rising single-file" instead of "rising with" as Legesse seems to

1. Permission to reprint items in this section may be obtained only from their authors.

2. The field research on which this paper is based was carried out from January to October 1986 in the area of Sololo, northern Kenya. I wish to thank the Institute of African Studies of Nairobi University, where I was Research Associate. My gratitude to the Borana, all of them, is great, and my personal debt to Bante is matchless: I will never forget it. I owe special thanks to B. Bernardi, for his stimulating teaching and his assistance throughout the various phases of this study, and to A. Colajanni and A. Triulzi. Finally, I am grateful to L. R. Doyle for his comments and suggestions.

TABLE I
Borana Months, Their Alternative Initial Days, and Conjunctions Used for Correction of Calendar According to Legesse

Month	Alternative Initial Days	Conjunction: Between Waning Moon and Triangulum	Conjunction: Between New Moon and One of the Seven Stars	[Conjunction Number]
Birra	Gardaduma Sonsa Rurruma	14 (full moon)		[1]
Çiḳawa	Lumasa Gidada	12		[2]
Sadasaa	Ruda Areri Dura	9		[3]
Abrasa	Areri Ballo	7		[4]
Ammaji	Adula Dura Adula Balla	5		[5]
Gurranḍala	Garba Dura Garba Balla Garba Dullacha	3		[6]
Bittottessa	Bita Ḳara Bita L̇ama	1 (new moon)	Triangulum (Lami)	[7]
Çamsa	Sorsa Algajima		Pleiades (Busan)	[8]
Bufa	Arb Walla		Aldebaran (Baqqalcha)	[9]
Waçabajji	Basa Dura Basa Ballo		Bellatrix (Algajima)	[10]
Obora Gudda	Çarra Ṁaganatti Jarra Maganatti Briti Salban Dura		Central Orion (Arb Gaddu)	[11]
Obora Diḳḳa	Salban Balle Balban Dullacha		Saiph (Uṛji Walla) Sirius (Basa)	[12]

SOURCE: Legesse (1973:183, fig. 7.2; 181, fig. 7.1).

imply. Therefore, the moon and stars would be in conjunction when they had the same "horizon position," and instead of right ascension, it would be declination that was measured. Doyle's hypothesis is supported by the fact that all the conjunctions indicated by Legesse work properly if the 300 B.C. declinations of the seven stars are compared with the lunar declination between August 7, 1983, and July 28, 1984. The date 300 B.C. has been suggested by Lynch and Robbins (1978) for the archaeological site Namoratunga II (east of Lake Turkana), where 19 basalt pillars are thought to have been used as datum points to fix the horizon position of the stars mentioned by Legesse. The astronomical function of the pillars has been questioned by Soper (1982). Doyle suggests that the calendar of the Borana may work in terms of declination and that it may have been invented around 300 B.C. (p. 287).

A second astronomical incongruity of the calendrical system described by Legesse regards the yearly cycle. The Borana year (12 synodic months, i.e., 354 days) is 11 days shorter than the solar year (Legesse 1973:180). On the first day of the month Bittottessa, the *new* moon is always in conjunction with Triangulum (Legesse 1973: 183, 185, 187, 188). This should occur consistently every year. A new moon always appears at approximately the same place in the sky (just above the western horizon) and the same time (just after sunset). If an observation is always made at the same time (as a conjunction with a *new* moon requires), the stars will be in the same place in the sky (using the horizon as reference) after one solar year. Thus, if during a year a conjunction between the new moon of the month Bittottessa and Triangulum takes place, after 12 synodic months (at the beginning of the month Bittottessa again) the new moon will be sighted approximately in the same place in the sky, but Triangulum will need eleven more days to reach that point. On average, Triangulum will be about 11° to the east of the new moon. Every succeeding year the angular distance will increase by those 11° until it is impossible to consider the *new* moon of the month Bittottessa in conjunction with Triangulum.

My new field data show that the current Borana calendar does not refer to declination; instead, each named day indicates a definite right-ascension lunar position,

TABLE 2
Urji Daha

Borana Name	Astronomical Name	Astronomical Position (2000.0) Right Ascension	Declination
Lami	Sheratan (β Ari)	1h 55m	20° 48′
	Hamal (α Ari)	2h 07m	23° 28′
Busan	Pleiades (η Tau)	3h 47m	24° 06′
Baqqalch Sors	Aldebaran (α Tau)	4h 36m	16° 31′
Baqqalch Algajim	Bellatrix (γ Ori)	5h 25m	6° 21′
	Mintaka (δ Ori)	5h 32m	−0° 18′
Arb Gaddu	Alnilam (ε Ori)	5h 36m	−1° 12′
	Alnitak (ζ Ori)	5h 41m	−1° 57′
Baqqalch Walla	Betelgeuse (α Ori)	5h 55m	7° 24′
Baqqalch Basa Guddo	Sirius (α CMa)	6h 45m	−16° 43′
Baqqalch Basa Diqqo	Procyon (α CMi)	7h 39m	5° 13′

on the basis of the lunar sidereal period (27.3 days long). As a month is about 2 days longer than the sidereal period, every successive month starts about 2 days past the 27.3-day cycle, thus correlating the sidereal with the synodic lunar periods. The 11 days' difference between the Borana and and the solar year is adjusted by means of intercalary months.

The group of stars used to establish the days (*ayana*) and the months (*jia*) is called Urji Daha (table 2). These are the only stars connected with the calendar. The position of the Pleiades refers to Alcyone, the brightest star of the group. The astronomical names were established by identifying the stars indicated by Bante on W. Tirion's charts (Menzel and Pasachoff 1983:162–317). The following main discrepancies between these data and Legesse's may be noted: (1) Lami, Triangulum to Legesse, is according to Bante Sheratan and Hamal; (2) Baqqalch Walla, Saiph to Legesse, is Betelgeuse; and (3) Baqqalch Basa Diqqo, an eighth Borana star, is not listed by Legesse.

The astronomical observation is made every month during eight or nine consecutive nights on which the moon comes close to the eight stars. Bante estimated the positions of the heavenly bodies on the basis of the shortest distance between them and an imaginary horizontal north-south datum-line, practically realized by facing east or west. In other words, only the right ascension was taken into consideration; declination played no role. Figure 1 represents the situation in the sky during nine consecutive nights considering only the right ascension of the stars and the moon.

On the first night of observation, Bante remarked that if the moon was to the east of the western star of Lami (Sheratan), it would be in conjunction with Lami.

Position 1, September 20, 10 P.M.: The moon was to the west of Lami; there was still no conjunction. However, we had to wait until morning, because during the night the moon moves slowly eastward.

Position 2, September 21, 5:30 A.M.: The moon had overtaken the first star of Lami. We could provisionally consider it to be in conjunction with Lami, but before drawing any conclusion we needed to confirm the situation on one of the following nights.

On the second night, as a consequence of the fact that we had provisionally established that during the preceding night a conjunction with Lami had occurred, we expected a conjunction with Busan, but it needed to be confirmed.

Position 3, September 21, 11 P.M.: Provisionally, conjunction with Busan.

On the third night, for the same reason as the previous night, we assumed provisionally that there would be a conjunction with Baqqalch Sors.

Position 4, September 22, 11 P.M.: Provisionally, conjunction with Baqqalch Sors.

The fourth night was the checking night: if the moon did not overtake (move to the east of) Baqqalch Sors, it would be conjunction with Baqqalch Sors instead of Baqqalch Algajim as we would expect, in which case the previous interpretation of conjunctions would have to be corrected.

Position 5, September 24, 0.15 A.M.: The moon was still west of Baqqalch Sors. However, we had to wait until morning.

Position 6, September 24, 5:30 A.M.: The moon had not yet reached Baqqalch Sors; therefore on this night the moon was in conjunction with Baqqalch Sors. The previous interpretation had to be corrected as follows: Positions 1 and 2, no conjunction at all; Position 3, conjunction with Lami; Position 4, conjunction with Busan.

From the fifth through the ninth night, the observation was less interesting, involving more or less the same kind of interpretation as on the second and third nights. Table 3 is a summary of the observed conjunctions.

From Bante's comments we may obtain an understanding of the procedure for establishing a particular conjunction. First, during *each* of the consecutive nights there *must* be a conjunction of the moon with one of the eight consecutive stars, whatever the real distance of the moon from them may be. The problem is to establish the correct series, that is, to determine on which night the first conjunction occurs, thus correlating the astronomical event with a solar day. For this purpose the *ayantu* refer to two precise points of reference in the sky: Sheratan (β Ari) and Baqqalch Sors (α Tau). On the first night that the moon is to the east of Sheratan, a conjunction between the moon and Lami is considered to occur. On the last night that the moon is to the west of Baqqalch Sors, a conjunction between the moon and that star is considered to occur. In both cases the time of observation is just before the moon and star disappear because of setting or daylight. When the information from the observation of the two stars does not agree (as in the case described) the reference to Baqqalch Sors prevails. The use of two points of reference on two different nights

TABLE 3
Summary of Observed Conjunctions

Night of Observation	Position of Moon	Date and Time	Conjunction
1	1	September 20, 10 P.M.	—
	2	September 21, 5:30 A.M.	
2	3	September 21, 11 P.M.	Lami
3	4	September 22, 11 P.M.	Busan
4	5	September 24, 0:15 A.M.	Baqqalch Sors
	6	September 24, 5:30 A.M.	
5	7	September 25, 1:45 A.M.	Baqqalch Algajim
6	8	September 26, 5:30 A.M.	Arb Gaddu
7	9	September 27, 5:30 A.M.	Baqqalch Walla
8	10	September 28, 5:30 A.M.	Baqqalch Basa Guddo
9	11	September 29, 5:30 A.M.	Baqqalch Basa Diqqo

may be due to the fact that one of the two observations may fail either because of cloud obstruction or because under certain conditions (e.g., twilight) Sheratan (the less bright star) may be difficult to see.

A procedure of this kind lends considerable precision to the interpretation of a conjunction. In fact, a range of 1–2° in the position of the moon is to be considered reasonable in establishing whether the moon is to the east or to the west of a star (the Urji Daha group is near the ecliptic).

In practice, only one star (Baqqalch Sors) is really relevant for the determination of a series of conjunctions. However, all the stars may indeed be used, whatever their value as lunar sidereal markers. In fact, the *ayantu* know from experience the limits within which the moon must appear to be considered in conjunction with

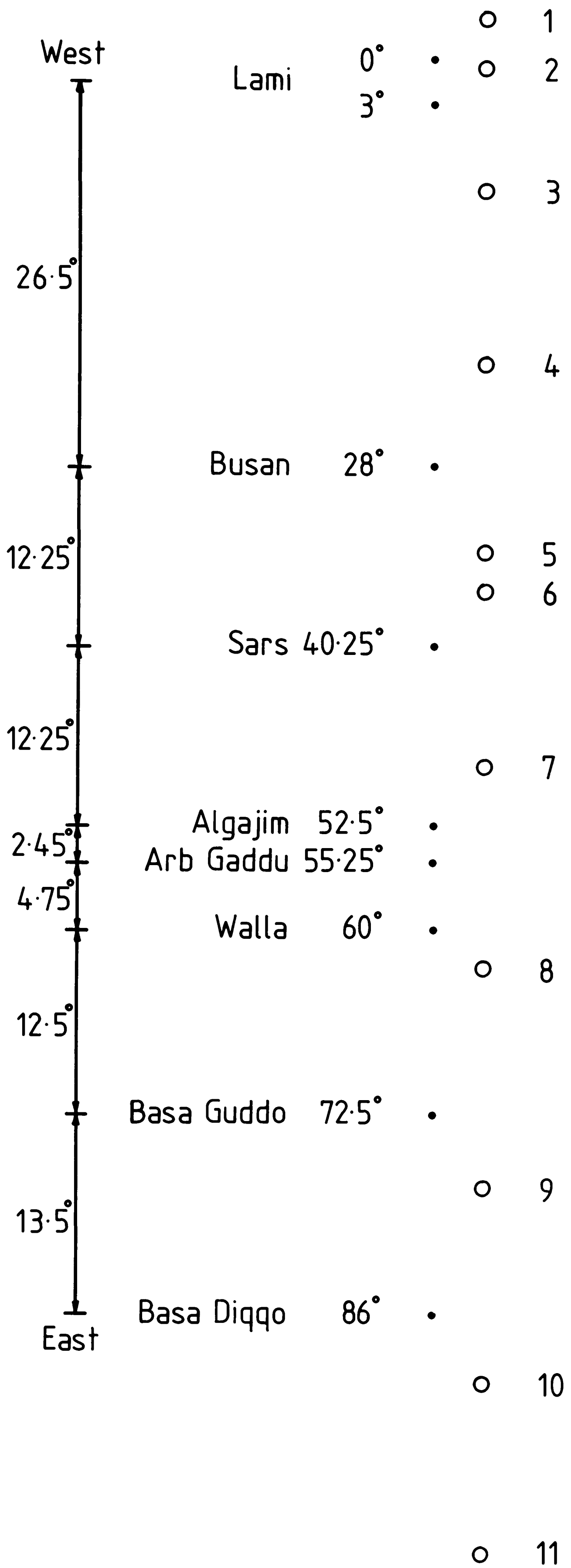

FIG. 1. *Observed conjunctions.* Left, *angular distance between two successive stars (or groups of stars) of Urji Daha;* center, *real relative right-ascension position (right-ascension angular distance from Sheratan, the westernmost star of Urji Daha) of each star;* right, *observed positions of the moon with respect to the stars (determined without instruments by reference to Tirion's charts [Menzel and Pasachoff 1983:162–317]). Positions 8–10 were fixed with the aid of the astronomical almanac, cloud cover having precluded direct observation. Busan is represented by Alcyone and Arb Gaddu by Alnilam (its central star); both stars of Lami are shown because of their considerable angular distance and the important role of the western one, Sheratan.*

TABLE 4
Conjunctions and Corresponding Days

Conjunction	Day
Lami	Bita Kara
Busan	Bita Balla
Baqqalch Sors	Sors
Baqqalch Algajim	Algajim
Arb Gaddu	Arb
Baqqalch Walla	Walla
Baqqalch Basa Guddo	Basa Kara
Baqqalch Basa Diqqo	Basa Balla

TABLE 5
Correlation of Sidereal and Synodic Lunar Periods

Number	Month	Initial Day
1	Sadasa	Gidada, Rud
2	Abrasa	Areri Kara, Areri Balla
3	Ammaji	Adula Kara, Adula Balla
4	Gurrandala	Garba Kara, Garba Balla
4a	Gurrandala (bis)	Garba Dullach
5	Bittottessa	Bita Kara, Bita Balla
6	Chamsa	Sors, Algajim
7	Bufa	Arb, Walla
8	Wachabajji	Basa Kara, Basa Balla
9	Obora Gudda	Maganatti Jarra, Maganatti Briti
10	Obora Diqqa	Salban Kara, Salban Balla
10a	Obora Diqqa (bis)	Salban Dullach
11	Birra	Gardadum, Sons
12	Chiqa	Rorrum, Lumasa

each star. In this way they can establish a correlation between a day and an astronomical conjunction on any of the eight nights of observation. This is particularly useful during rainy seasons, when on many nights observation may fail. However, when the moon is next to a critical position and the evaluation of conjunction is difficult, the *ayantu* must use Lami (Sheratan) and especially Baqqalch Sors as exact lunar sidereal markers.

It is evident that the moon is not always in conjunction simply with the star closest to it; this is especially so because of the irregular distance between the stars of Urji Daha.

According to Bante, the basic connection between astronomical events and the calendar is that every time the moon is in conjunction with one of the eight stars of Urji Daha on one of the eight successive nights a certain day (*ayana*) recurs (table 4). This, in fact, seems to constitute the fundamental principle of the Borana calendrical system. The day on which the moon is in conjunction with Lami is always Bita Kara. On the following day, when the moon is in conjunction with Busan, the day is Bita Balla ("Balla" is equivalent to Legesse's "Lama"), and so on. From here on the day takes its name directly from the star with which the moon is in conjunction. (Among the Borana a solar day [24 hours] starts and ends at sunrise.) To indicate the names of the 19 or 20 days between two successive series of conjunctions, the *ayantu* advance one position of the 27-day cycle every solar day. Applying the fundamental principle, Bante was able to indicate the proper name of each of the days of conjunction represented in figure 1 (table 4).

Will the name Bita Kara always recur when the moon is in conjunction with Lami, cyclically counting the 27 named days one after another? The answer is yes. The 27.3-day length of the lunar sidereal period ensures this. After about three sidereal periods, the 0.3-day deviation will affect the correspondence by about one day, but rather than let this error accumulate the *ayantu* immediately correct the theoretical reckoning of the days on the basis of astronomical observation. If, for instance, they see the moon in conjunction with Lami and the theoretical reckoning gives Bita Balla, they will call the day Bita Kara. Thus a solar day is added approximately every three sidereal periods.

A second important feature of the calendrical system is the use of intercalary months. As in the case of the adjustment of the 0.3-day deviation of the lunar sidereal period, the extra month is added not at fixed intervals but on the basis of astronomical observation. In this adjustment the observation of the lunar phase plays a decisive role. Solar days may also be indicated by their lunar phase. A lunar month is divided into three periods: (1) *bati*, from the day of the Borana new moon to the day preceding that of full moon (usually 13 or 14 days); (2) *gobana*, the day of the full moon (a moon is considered to be full on the first evening that it has not yet risen at sunset); and (3) *duqqana*, from the day after *gobana* to the day before *bati* (usually 15 days). Each day of each period is numbered. We may note that the three periods do not exactly correspond to the astronomical waxing, full, and waning moon. The lunar phase can always be estimated within a couple of days by looking at the width of the lighted part of the moon and checking the time of its setting and rising. However, only on the nights of new and full moon can astronomical observation give a precise correlation between lunar phase and day.

Table 5 shows on which set of two or three successive days each month begins (Kara is equivalent to Legesse's "Dura"). The correspondence holds good every year, and the *ayantu* know it by heart. The same kind of correspondence, with some ethnographic variations, is expressed by columns 1 and 2 of table 1. The first day of a month is the day of the new moon. Thus the table correlates the sidereal with the synodic lunar periods. This correlation enables the *ayantu* to establish the month by combining observation of conjunctions with observation of lunar phases. The first type of observation produces the name of a day and the second the lunar phase of that day. From these the name of the first day of the month (new moon) is easily derived. This procedure is used especially to decide when an intercalary month is needed, as Bante explained by referring to the series of conjunctions reproduced in table 3. The month was Obora Diqqa. During that month he checked the lunar phases very carefully, counting days after the new and full moons. On the day Bita Kara (i.e., on the second night of observation, when a conjunction between the moon and Lami occurred) the moon was in the third night of *duqqana*. As *duqqana* (approximately waning moon) usually lasts 15 days, Bante went on by 13 positions in the cycle of 27 named days (table 1, column 2), starting from Bita Kara, to arrive at the probable name of the first day (new moon) of the following month, Birra. The outcome was Salban Dullach, but, as the month Birra cannot start on this day, Bante said that probably the month Obora Diqqa was to be repeated (table 5, no. 10a). A check of the following new and full moons was necessary, as *duqqana* does not always last 15 days.

According to Bante, only two months can be repeated: Gurrandala and Obora Diqqa, which indeed are the only months that can begin on a set of three successive days. The third day refers to the repetition of the month ("bis" in table 5, nos. 4a and 10a). Thus, when the combined observation of conjunction and lunar phase indicates that the new moon of Bittottessa comes on Garba Dullach instead of Bita Kara or Bita Balla as expected (table 5, no. 5), the *ayantu* say that the month starting with that new moon is not Bittottessa but Gurrandala again (no. 4a). Similarly, when the new moon of Birra comes out on Salban Dullach, that month will be called Obora Diqqa again (no. 10a). Gurrandala and Obora Diqqa are very suitable for repetition, because the months immediately following are characterized respectively by a new and a full moon directly in conjunction with the stars of Urji Daha.

Let us now consider the matter from an astronomical point of view. The new moon of Bittottessa is expected to appear in conjunction with Lami or Busan. Because of the 11° delay of stars with respect to the new moon after every Borana year (12 synodic months), the new moon of Bittottessa will soon appear to the west of Lami. This astronomical situation indicates that the day is Garba Dullach and that Gurrandala must be repeated. During this intercalary month the moon moves on average about 389° to the east (with respect to the stars). This means that it covers a whole revolution plus 29°. Therefore, the following new moon (beginning of Bittottessa) will be sighted in conjunction with Busan again.

On the whole the calendar, as just described, works by establishing the name of days on the basis of the right-ascension position of the moon with respect to the stars. By forcing the month always to begin on the same set of 2–3 days, the 11 days' difference between a Borana and a solar year is adjusted by the intercalation of a month approximately every three years on the basis of astronomical observation. Seasons depend on the solar year, and therefore there is also a correspondence between the Borana year (with the adjustment) and the seasons.

In Legesse's ethnography, the 27-day cycle is considered a mere "ceremonial month," whereas the data here presented show that it is also the lunar sidereal period (27.3 days long). In fact, the 0.3-day deviation is adjusted on the basis of astronomical observation. It follows that the yearly "3-day error" practically does not exist, because at various points in the year the *ayantu* simply wait one day before proceeding with the computing of day-names. A second point of disagreement between the data here presented and the ethnography of Legesse regards the intercalary month. Both Legesse's statement about the seasons and what I have called "the second astronomical incongruity" have their origin in the lack of intercalary months in the calendrical system he describes.

The conjunctions I have numbered 7–12 in table 1 cannot work, and this is the source of Doyle's hypothesis that they work in terms of declination. Legesse writes (p. 181): "In six out of twelve months the seven constellations appear successively, in conjunction with the moon." In my opinion, however, the succession of conjunctions concerns the eight consecutive observations on eight consecutive days every month, not the conjunctions between the new moon and the stars in each successive month. In any case, Legesse's indication that the calendrical system works on the basis of the right ascension of heavenly bodies is fully confirmed by my field data. Bante does not consider declination of moon and stars for calendrical purposes. Although the "declination" interpretation does not apply to the present calendrical system, Doyle's hypothesis is still interesting with regard to a hypothetical prototype; the change in the declination of the stars may have caused a shift in the system from declination to right ascension.

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On Reconsidering Violence in Simple Human Societies

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It's tempting to let sleeping dogs lie; in this case, it isn't tempting enough. I have one salient objection to