'MEANING IN A BORORO JAGUAR SKIN'

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RESUMO: Este artigo propõe analisar e interpretar uma pele de jaguar bororo exposta na Mostra Brasil +500 em São Paulo no ano de 2000. De acordo com o autor, este tipo de pele pintada conhecida como Adugo biri demanda muito mais atenção por parte dos especialistas do que recebeu até o momento. Trata-se, com efeito, de um texto visual, representando e correlacionando números com bastante sofisticação incorporando paradigmas da cultura bororo e desafiando o especialista na sua decodificação. Analisando a pele à luz do que conhecemos a respeito da cultura bororo, o autor oferece uma contribuição importante à compreensão da complexidade da "mentalidade" deste grupo.

UNITERMOS: Bororo – Simbolismo do jaguar – Adugo biri – Etnoastronomia – Etnomatemática.

The Mostra organized in São Paulo in 2000 to mark the most recent 500 years of Brazilian history had the fortunate effect of bringing together and repatriating (if only temporarily) exquisite artifacts that are otherwise housed today in museums in Coimbra, Copenhagen, Vienna, Dresden, Berlin and other European cities. Prominent among these artifacts was a jaguar skin, 130 cm in length, acquired by Johann Natterer during his sojourn in the interior of Brazil (1817-35), which is reported to have reached Vienna before 1823 (Fig. 1; Kann 2000). It was obtained from the eastern Bororo, centrally placed as they are in Matto Grosso, between the Paraguay and Amazon river systems. Already then, these people were being harried by badly-behaved prospectors of European extraction.

A forerunner of Darwin and Wallace, Natterer pioneered research into South American vertebrates, notably mammals and birds, their behaviour and anatomy (1893). He was helped in his work by an expert skinner of animals later employed by Wallace ('Natterer's hunter Luiz'; Wallace 1889:77). In the case of the jaguar skin acquired from the Bororo, we may assume that the skinning had already been done by them since its inside surface is intricately decorated with native designs in red and black, being of the kind known in their language as Adugo biri.[1]

Born not long after Natterer returned to Europe, the Bororo chief Ukeiwaguúo, of the

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(1) Within the last few decades, a further skin of this kind has been donated by the Bororo to the Museu Rondon at the UFMT, Cuiaba (catalogue number 89/002.526). The triangle/losange shape of its units and its name (Ikuie adugo – face/eye/star painting) connect it with the night sky; and in introducing a characteristic assymetry (9 9 9, 9 9 9; 9 9 9, 9 10 10) it correlates synodic and sidereal moons with the night sky number eleven, in the formula: $(27 \times 3) + 29 = 110$.
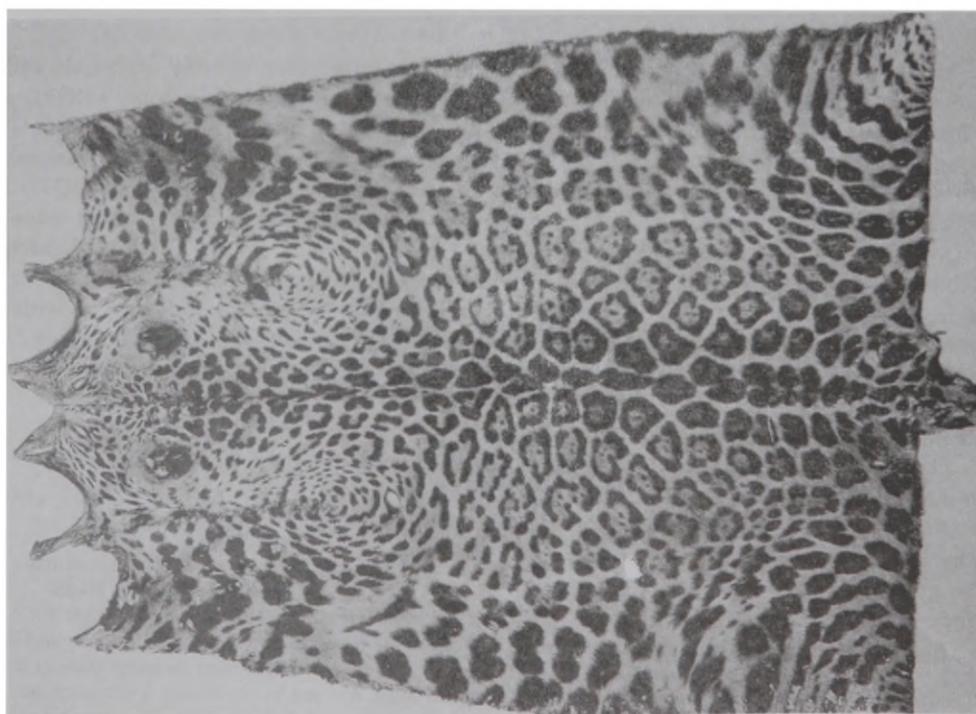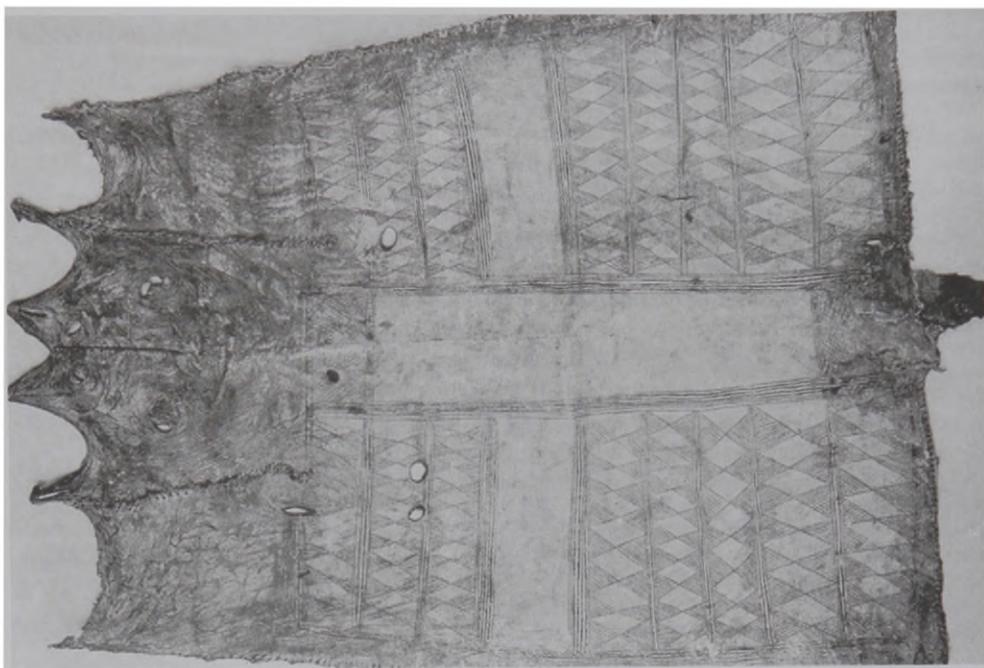
Fig. 1 – The Natterer jaguar skin (after Kann & Riedl Dorn 2001: 246-7). Thanks to Johannes Newath for his help in tracking down this source.

Pawoe clan, decided to collaborate with the Salesian missionaries, who began to arrive in his territory towards the end the 19th century, in order to record native knowledge ever more threatened by invaders from outside. A fundamental corpus of Bororo narratives recounted by Ukeiwaguúo, many of which focus on the figure of the jaguar, was published by Colbacchini in 1925, along with an Italian translation.[2] Ukeiwaguúo's scholarly impulse was continued by Akirio Bororo Kejewu,[3] better known to many as the resistance leader Tiago Marques Aipoburéu, who before his death in 1958 guided Colbacchini's Salesian successors Albisetti and Venturelli in compiling the monumental *Enciclopédia bororo* (1962-1976. = EB). Volume 2 contains his narratives, which differ intricately from Ukeiwaguúo's; and a good selection of those published here and previously appears in English in Wilbert and Simoneau (1983; = WS). Besides Akirio's narratives (vol.2), the *Enciclopédia* reproduces painted jaguar skins - Adugo biri – of the kind found by Natterer, describing in detail their significance and the circumstances of their production (vol.1, pp. 356ff; 229ff).

As for readings of this evidence, narrative and visual, by outsiders, the Bororo are perhaps second to none in native America, in terms of the systemic considerations they have provoked. In *Tristes tropiques* (1955), Claude Lévi-Strauss made quite clear the profound effect that living among and conversing with the Bororo had had upon him, an effect then transmitted through his book on to large areas of western thinking, in the first instance particularly with regard to the intellectual capacity of peoples whom Montaigne had famously characterized as having yet to be taught the A.B.C. (*Essais* I.31). Lévi-Strauss's subsequent four-volume masterwork *Mythologiques* (1964-71) sets off from and insistently returns to the Bororo. In the first

volume *Le Cru et le cuit* (1964), it is a Bororo narrative (WS 198-209) that provides the basic reference and foundation myth as M[1]. Indeed, many have wished to link the binary preference of Lévi-Strauss's whole Structuralist philosophy to his understanding of Bororo logic and social practice. At any event, the effects of this interpretation are overwhelming in such cases as Maybury-Lewis's *Dialectical Societies*, and play a key role in the detecting of 'dialectical' opposition between notions of wild and social, lower and higher, instinct and soul, random and reasoned, and so on in Crocker (1985:280), Viertler (1991) and others. In *Maíra* (1976), the Brazilian writer-anthropologist Darcy Ribeiro extended the Bororo binary model to cover the Tupi, among whom Akirio comes to be numbered; indeed, Ribeiro went so far as to say that Akirio was the true author of the book: "Tiago Marques Aipoburéu...é quem o escreveu" (Sá 1993:84; see also Sá 1997).

Over the last two decades, important work on Bororo astronomy and concepts of space-time has been done by Stephen Fabian (1982, 1992, 1998). Living in Garças and Meruri, Fabian has been able to show how exactly the Bororo continue to observe the sky and how intricately its movements are correlated with social practice. Going beyond the bounds of Structuralism, he has been concerned with the validity of astronomical observation in its own right, and something not necessarily reducible to mentalistic patterning.

Yet only in the *Enciclopédia* – the work of the Bororo themselves in the person of Akirio – do we find concerted attention paid not just to the conceptual structures and *mentalité* of the Bororo but to the visible language manifest in and on their artifacts, and to its wider relevance and significance. When not ignored by the Structuralists as 'non-oral', this language has been read according to that philosophy's principles of non-referentiality.[4] It is

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(2) The variants in the 1942 Portuguese version of these texts are commented on by Baldus. Later versions are also found in 'Bõe bacarô. Algumas lendas e notas etnográficas da mesma tribo [Bororo]', in Rondon 1948; and in Fabian 1992.

(3) Akirio contributed widely to preserving Bororo knowledge: see his contributions to toponymy in Drummond 1965.

(4) See, for example, Lévi-Strauss 1964:246-7. I am thinking here of his analyses of designs made by other members of the Ge-Bororo family, the Caduveo, whose sites of occurence (e.g. face-painting) are comparable with those of the Bororo discussed here. Of particular interest is his appreciation of their formal logic and intricate asymmetries: see Ribeiro 1980.

epitomized in the kind of framed and hence textual statement found on the Natterer skin. Considering it in the detail its formal complexity demands suggests other epistemological approaches, helps to neutralize the constraint of imported western paradigms, and in turn points to little-considered areas of tropical American logic and philosophy. At the same time, placing it in context allows for its highly condensed numerical and formal logic – its 'truth' in this sense – to be drawn out into the larger field of cosmogony and society.

Jaguar and its skin

As the material source of the Natterer skin, the jaguar Adugo plays multiple roles in Bororo cosmogony and society. A figure of fun that can be fooled even by a grasshopper (WS 166), he is also the founding father of the people. Before the arrival of the 'Brazilians', he was the most feared predator and enemy, and yet can be lover and kin. Intensely telluric, he travels through the sky, and has an undeniable astronomical dimension (Fabian 1992). Involved with all eight clans, he has a special relationship with the 'first' of them, whose name Badajebage Xebeguiuigue is glossed 'constructors of the village' (Fabian 1982:298).

The logic embodied in the Bororos' relationship with Adugo underlies many of their rituals and ceremonies, most of all the celebration known as Barege Ekedodu. Described at length in the *Enciclopédia* (EB 1:229ff), this 'feast of the wild' is staged to honour the hunter who kills a jaguar single-handed, as a way of compensating the relatives of a Bororo who has recently died ('como retribuição aos parentes de algum finado, por ocasião da morte do mesmo'). It involves feasting, women and men dancing in pairs, songs sung in honour of the jaguar, and the elaborate decorating of the inner surface of its skin. Held at a 45 degree angle, the painted skin is then paraded along the east-west path that separates the moities of the settlement, and kicked from behind. It becomes the focus of the song 'Animal skin that speaks' (Barogo biri batarureu) which plays on the multiple significance of the jaguar adugo.

The skins prepared for this ceremony are the Adugo biri, a term which means both 'jaguar skin' and 'painted skin'; the one collected by Natterer is an especially fine example. The designs on the inner surface are normally drawn, with the aid of a ruler, in two colours, red and black, obtained from urucu or achiote dye (*nonogo*) and charcoal (*irogodu*). This pair of colours, red and black, is used to distinguish between the Bororo subclans and is said to have adorned the skin, when newborn, of Adugo's twin sons, the Bakororo-doge, who guard the west and east entrances of the settlement. The format characteristic of the Adugo biri designs is a central column with glyph-like units arrayed to either side, which, physically highlighted in the Barege Ekedodu parading of the skin, effectively correlates vertebrate anatomy with the east-west layout of the Bororo settlement. In so doing, it comes brilliantly to exemplify Bororo notions of bodily and social reconstitution, likewise available in the Portuguese term for the feast (refeição; cf. Plitek 1978; Viertler 1991).

The corpus of Adugo biri designs to which the Natterer skin belongs may be read as a small yet highly resonant compendium of Bororo and Amazonian culture more generally. Since they are found elsewhere in the daily life of the Bororo, the designs are as it were framed and re-represented here in the Barege Ekedodu ceremony, as in a reflexive intellectual statement anticipated in the double meaning of Adugo biri (jaguar/painted skin).[5] For the Adugo biri lexicon draws on images that adorn musical instruments (*akodo*), textiles (*aroia*), penis sheaths (*ba era*), palm-fibre fans (*bakureu*), and body and face painting in general (*aroe e-tawujedu*, *boe e-ejiwu*); and these images in turn are explicitly acknowledged to have been derived from the markings on the skin, scales and feathers of other species, primarily the jaguar. Hence, the Adugo biri

(5) The term has now come to mean writing as such, an analogy also seen in Borges's remarkable story 'La escritura del dios', in which a Maya priests 'reads' a jaguar skin. For other tropical American examples of the painted jaguar, see Schultz 1962.

come to epitomise a whole philosophy of origins and social practice, in which the jaguar features large as both founding father and the sky spirit embattled with sun and moon.

Listed as eleven, in alphabetical order, in the *Enciclopédia bororo*, the actual Adugo biri designs are minutely classified in terms of provenance and clan affiliation.[6] Several fall into obvious pairings with respect to skin-cover source and type of patterning. They are all defined by one or other of two suffixes which, though phonetically close as *atugo* and *edugo*, point to categorical difference. Of the eleven listed, eight belong to the first category and three to the second.

atugo: Aije, Aroe eceba oiaga, Aroia, Ato, Bokodori bo,* Enogujeba, Kurugugwa oiaga, Okoge bakororo

(*) in two colours, red and black (coreu akirireu & kujagureu)

edugo: Burego dureuge, Iwara arege, Kogaekogae doge

Heading the *Enciclopédia* list of designs in the first category (*atugo*) is the Ai-je, which adorns the vibrating musical instrument of that name, the 'bull-roarer' (*zunidor* in Portuguese), and it belongs to the Aroroe clan. Its unit consists of a rounded square with an inner fourfold division, quite in the style of a Maya hieroglyph, said to represent the markings on a jaguar skin (Fig. 2). It is read as the monstrous roaring sound produced by the instrument in imitation of a large feline *(ai-)*. Socially, the fours recall the 4+4 clan structure of the Bororo settlement, to either side of the sun's east-west path, and (in the example given in the *Enciclopédia*) the more complex

Fig. 2 – *Aije adugo: a) source of glyph unit in jaguar fur.*
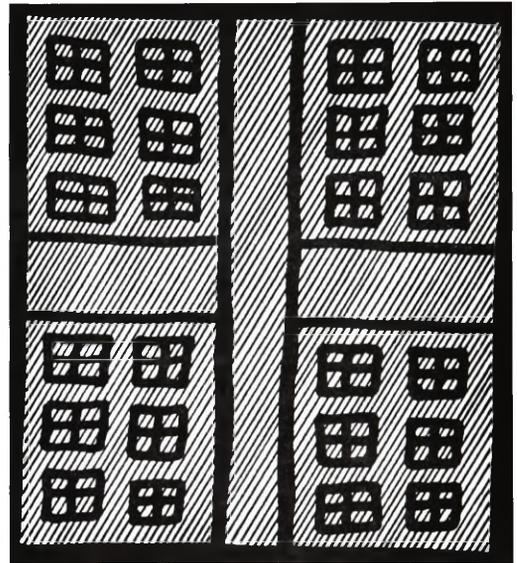
Fig. 2 – *Aije adugo: b) typical Adugo biri of Aije type.*

12+12 arithmetic of the sub-clans. In similar fashion, the Aroia design derives (etymologically at least) from textiles and in fact interweaves, in decidedly textual fashion, both *atugo* and *edugo* motifs (the example in the *Enciclopédia* combines Ato with Burego – see below).

The remaining six designs that have the *atugo* suffix fall readily into three pairs, in terms of both form and zoological origin. The tail feathers (*oiaga*) of the Aroe eceba or

(6) Given the special significance of the number eleven, in the Adugo sky narrative and on the Natterer skin itself (see below), it is tempting to think that it also signifies as the sum of this list. The existence of designs other than those in the actual *Enciclopédia* catalogue make this unlikely, however: see for example the skin (p.228) that has Iwara Arege motifs in the upper area and Burego motifs in the lower. A preliminary account of rainforest arithmetic is included in Closs 1985.

Xerae (harpy eagle) and the Kurugugwa (caracarai hawk), the pair of predators proper to the Apiborege clan who helped Adugo banish sun and moon from the sky, are defined in flag-like units that laterally invert left to right, fall into upper and lower halves (Fig. 3a), and may intimate the principle of diagonal correspondence also basic to the placement of clans and sub-clans within the settlement. The pair of feathered birds is complemented by the carapaced turtle and armadillo (Ato, Bokodori), and two scaly fish (Enogujeba, Okoge). The designs characteristic of each of these further pairs are no less susceptible to the same order of logical and arithmetical analysis, especially the armadillo whose clearly-defined body bands prompted the latinate epithet 'novem-cincta' and serve to align countable units horizontally (Fig. 3b). Together they invite us to explore the story common to the vertebrate life-forms whose boundary with the world is scale, carapace, feather and, first and last, the fur of the singular jaguar.

The three Adugo biri designs that have the *edugo* rather than *atugo* suffix stand out visually as different from the first. They all have glyph-units that consist of a vertical pair of isoceles triangles touching at their apexes, which gives them an 'X'-like appearance, and which are arrayed horizontally in rib-like rows (Figs. 4, 5). They derive from the body and face paintings of the sky spirits: the Burego and Kogaekogae, who revealed the names of the stars, and the Iwara Arege who 'measure' and tell their identities (WS 51-4. *Iwara* may be the rod or ruler used in painting the Adugo biri; in the sky, it aligns the three stars or young herons of Orion's Belt, Bace iwara arege). All three belong to the Badajebage Xebeguiugue clan, to whom the star names were revealed.

The three *edugo* designs are distinguished one from another by the type of triangles they respectively have. The Burego triangles are solid, while the other two types are hatched. In the Iwara Arege design this hatching normally runs along the diagonal formed by the two triangles from lower right to upper left (\); in that of the Kogaekogae it runs along one or other diagonal (\, /) (Fig. 6a, b).

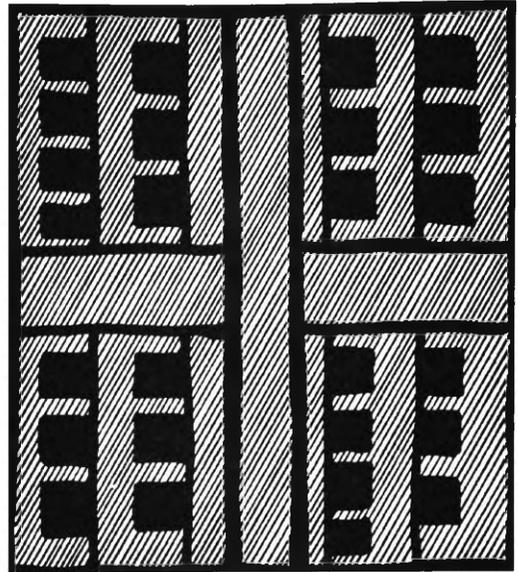The Natterer skin can be confidently placed in the *edugo* group, and may be

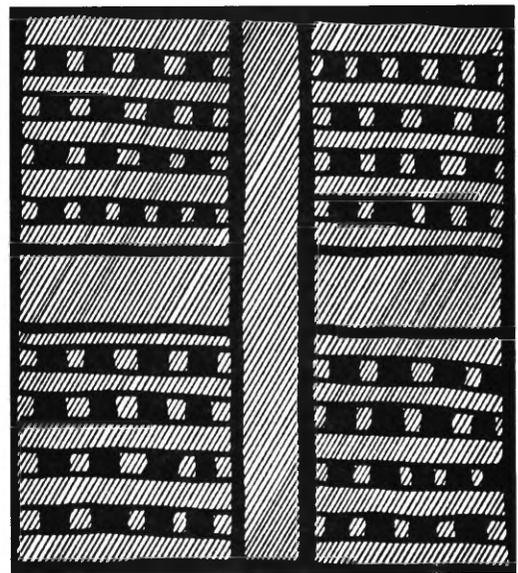*Fig.3a – Feather. Aroe eceba oiaga (eagle).*

Fig. 3b – Carapace. Ato (turtle).

specifically identified as being of the Kogae-kogae type, since the hatching in its triangles runs parallel to either diagonal of the X units. Although such a skin is not illustrated in the *Enciclopédia* (perhaps because of its close
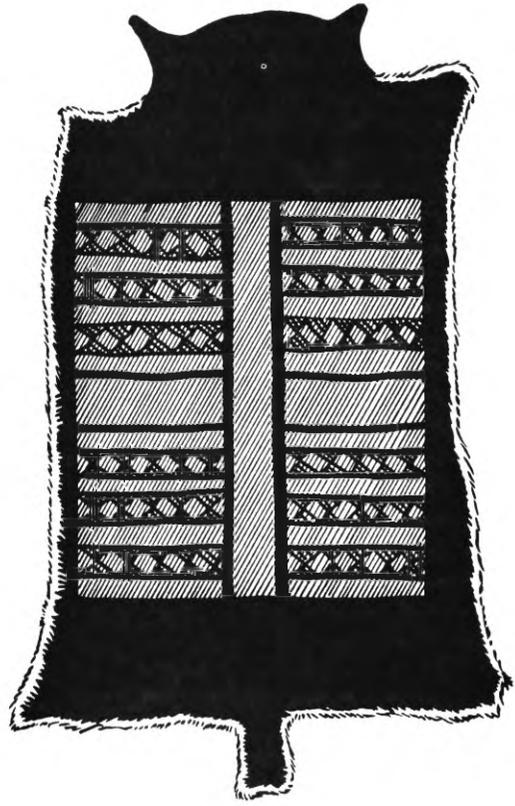
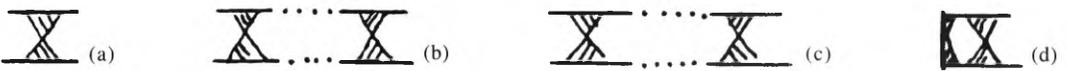*Fig. 4 – Buregodurege edugo.*   *Fig. 5 – Iwara arege edugo.*

Fig.6 – Double triangle or 'X' units: a) Iwara arege; b) Kogae kogae; c) variant of b); d) variant of b).

similarity to the Iwara arege design), the cross-hatching typical of it is found on other Kogaekogae objects that are illustrated, for example the wind instrument *wari* (p. 51). Of all the Adugo biri known, or that have been reproduced, this Kogaekogae example is perhaps the most magnificent.

According to the *Enciclopédia*, the Bororo have mutually non-exclusive explanations of what the Barege Ekedodu ceremony means, and of the particular significance of the Adugo biri within it (EB 1:235). These explanations belong to shamanic modes of thought, or philosophical traditions, identified in that source by the terms *bari* and *aroe*. The former

emphasizes the bargain made with the sky spirits that there be more jaguars to hunt, the beast feared yet desired as anagnorisis. Fully in line with Bororo ideas of reconstitution, the *aroe* version points rather to the material skin that will clothe and protect the soul on its journey beyond death, that will indeed re-embody and re-articulate that soul, complete with teeth and claws, necklace and crown. In the ceremony, the one who hangs the skin from his neck also wears the jaguar's teeth and claws. Hence the visual and numerical interest evinced by the Adugo biri corpus, in the longer story of the vertebrate body and its coverings. Likewise, the central column and

anatomical format recall the body-frame thanks to which Meri the sun was able physically to reconstitute his brother the moon Ari, after the latter had been torn apart by Adugo.

Further insight into just these Bororo notions of precedent, numerical and conceptual, is offered in the accounts of how the jaguar became the forefather of the tribe, and how he put the sun and moon to flight. For in his foundational role, Adugo both engenders the hero Twins known as the Bakororo-doge, who clear for the Bororo their space on earth, and matches himself against the celestial bodies of the sun-moon (Meri-doge), and the stars. These stories are told in two sequences, which belong respectively to the terrestrial and celestial registers, and intricately cross-reference.

The first narrative (WS 174-86) concerns the role of Adugo as father of the hero twins Bakororo-doge (Bakororo and Itubore), who rid the world of excessively dangerous beasts. Installed as the western and eastern guardians of the Bororo settlement, these two effectively initiate the system of eightfold clans arranged in moieties: Xera to north, Tugarege to south at the perimeter, and the inverse at the center, in the men's house. Adugo's wife is the daughter of the Bororo hunter Akaruio Bokodori, of the Badajebage Xebeguiugue clan, who instituted the feasts held in honour of jaguars (WS 110-1). As we saw, when new born, their twin sons – half jaguar and half human – have fine red and black stripes imprinted on their skin; they also display the double triangle markings of the sky people.

In marrying Adugo, Akaruio's daughter inverts Bororo matrilocal custom by travelling to her husband's home. This home is named by him as the last of a series of seven caves, and she takes seven nights to get there, sleeping with the occupants of each of the previous caves along the way. Feline (note the *ai* element discussed above) and wolverine, each occupant has progressively less black in his skin, the jaguar having the finest and most variegated skin of all:

Numerically, and set in pairs as they are, the caves or holes explored by Adugo's bride correspond to the head orifices – the sites of the senses (ears, eyes, nostrils) that she needs fully to identify her future husband, the 'speaker' and owner of the singular mouth (commemorated in the Barege ekedodu song of the 'onça falador'). Moreover, in the classic proportion 7/9, the orifices of the whole body might be insinuated in the penetration of Adugo's bride that goes on in the caves, first thanks to his predecessors, who do not inseminate, and then to him, who does.

The other narrative about the jaguar Adugo (WS 55-6) casts him as the first of eleven creatures, rather than the last of seven, again all vertebrates, who encounter the powerful figures of sun (Meri) and moon (Ari), known jointly as the Meri-doge. These two, sun and moon, have many dealings with jaguars, and each is owner of a decorated jaguar skin made by the other, kept in the areas reserved for the clans Badajebage Xebeguiugue and Badajebage Cobuguiugue (WS 42). Around the village perimeter, these clans occupy the Xera side of the west and east doorways, guarded by Adugo's twin sons Bakororo and Itubore; the finer jaguar skin belongs to the senior twin, Bakororo of the west and the Badajebage Xebeguiugue clan. This clan also has the exclusive right to use proper names based on the words for sun and moon.

In the story of the eleven creatures, Adugo is attacked by the Meri-doge luminaries for having once devoured the moon, an act which obliged the moon's brother, the sun, to reconstruct his body from the remains laid out on a framework anatomy (WS 24-7). The restitutive powers displayed by Meri in this regard enable him elsewhere to endow humans and other creatures with body parts, including teeth and digits.

In being attacked and put to flight, the jaguar Adugo is specifically identified as the

1 Ipocereu (black tayra)	2 Ai meareu coreu (black forest cat)
3 Okwa (small wolf)	4 Rie (big wolf)
5 Aigo (puma)	6 Aipobureu (jaguatirica)
7 Adugo (jaguar)	

father of the Twins, those who guard the horizons between which Meri-doge are here said to be travelling on their celestial journey. The first three of the eleven creatures that Adugo leads are himself plus two of the four feline cave-dwellers who knew the Twins' mother before he did, an inversion of sequence. There follow six birds, including the eagle-hawk pair commemorated in the Adugo biri, and the heron 'night lord', a known constellation. Then, finally, comes the pair monkey and caiman, designated as 'upper' and 'lower', the caiman (Uwai) also being a constellation. Put to flight, each of the eleven is commemorated in turn in the verse of a song, in subgroups marked by pauses:

1 Adugo (jaguar)	
2 Aipobureu (jaguatirica)	3 Aigo (puma)
4 Kurugugwa (hawk)	5 Aroe Eceba (harpy eagle)
6 Toroa (sparrow hawk)	7 Baruguma (little hawk)
8 Bace (heron)	9 Kidoe (parakeet)
10 Aroe pai (monkey)	11 Arogwai (caiman)

Adugo's eleven, including as they do known constellations, have been proposed as a kind of zodiac (Fabian 1982), and it is the case that that number is repeatedly associated with the night sky throughout tropical America (Brotherston 1992:66-7).

In both stories, Adugo appears with other vertebrates in sequences that involve counting and numerical logic. As the last and then the first, Adugo is singular in each case, in what otherwise tends to be an enumeration in pairs. Then, for their part, these pairs form subgroups according to shifts and pauses in the narrative, and to what we know or are told, here and elsewhere, about their skin covering, diet and habits, and the taboos that govern the hunting of them. Among the eleven, the three felines and the subsequent three pairs of birds constitute a subgroup of nine, to which the final pair, after the shift in location, is added as a kind of coda: the egg-laying caiman and the near-human monkey, 'low' and 'high' in the vertebrate story. As we saw, skin covering (scale, feather, fur) is a principal source of the Adugo biri designs.

Embodied arithmetic

Deriving as they do from a range of natural phenomena and conventionalized social indicators, the Adugo biri designs constitute what demands to be acknowledged as a textual corpus, a series of visual statements that are framed and reflexive and which intricately cross-reference. Whatever their natural origin may be or have been, the glyph units ranged in them demand to be counted arithmetically in their own right, in sets and groupings that are predetermined by the particular format, and which vary from ceremony to ceremony (compare, for example, the two armadillo Adugo biri in the *Enciclopédia*, pp.234 and 236).[7] In this process, there is an obvious play with expectation, in the sense of introducing a variant into an otherwise symmetrical pattern, and with styles of counting, serial and cumulative, and with squaring and multiplication generally.

For example, the Aroe eceba oiaga design that reflects the tail markings of the harpy eagle sets its units either side of the middle column, and in upper and lower areas. Facing left, the units to the left mirror, i.e. laterally invert, those to the right, which face right, and thereby affirm a pattern of diagonal correspondence, upper left to lower right, and upper right to lower left. Yet upon inspection the mirroring proves to be not quite symmetrical, since in the former of the two diagonals the inner vertical line becomes the outer (or vice versa; Fig. 3a):

	left	right
upper	4 3	3 3
lower	3 3	4 3 [i.e. not 3 4]

(7) The efforts of outsiders (*barae*) to understand the multiple meanings of the Barege Ekododu ceremony and its artifacts are sometimes satirized during the ceremony itself, in pantomime interludes that feature caricatures of inquisitive early European explorers (EB 1:233).

Again, the turtle's carapace Atu atugo (Fig. 3 b) establishes a norm of four units in each of four rows in each of four areas (i.e. 4 x 4 x 4 or 4^3), only then to modify it in three of the areas – upper left and right, lower right – through the addition of an extra unit in one of the rows (4th, 1st and 3rd respectively):

	left	right
upper	4	5
	4	4
	4	4
	5	4
lower	4	4
	4	4
	4	5
	4	4

This kind of logic is taken further in the arrangement of X units in the Iwara arege design (Fig. 5), where the reading is horizontal, across pairs of ribs, three in the upper area and three in the lower. The left side is quite regular, and proposes a pattern of three fives, upper and lower; and the right side is irregular, since two of the six ribs there increase this number to $5^{1/2}$ and another two ribs increase it to 6:

	left	right
upper	5	6
	5	6
	5	$5^1/_2$
lower	5	5
	5	$5^1/_2$
	5	5

This means that the lowest total on any one rib is 5 and the highest on any pair is 11. These term numbers are then seen to be developed, to left and right respectively. The fives to the left are counted cumulatively, i.e. through all the numbers up to and including five, to give twice 15 (1+2+3+4+5), in what may be called 'sigma' count, in line with the Greek letter which may indicate this kind of addition (Σ). Meanwhile, the right half produces half the sigma count of the higher number, 11. The sum of the two halves is 63, the product of 7 and 9, the intervening odd numbers between 5 and 11. Hence:

1]
$$\text{left: } 2(5\text{x}3) \qquad = 30 \quad = \Sigma 5 \text{ x } 2$$
$$\text{right: } 2(5 + 5^{1/2} + 6) = 33 \quad = \Sigma 11 \text{ x }^{1/2}$$
$$\Big\} = 7 \text{ x } 9$$

Beside having a clear elegance in its own right, this formulation invokes ciphers resonant in Bororo culture. The fives to the left are the digits of the hand and foot that Meri formed for earthly humans; the eleven to the right are the bodies led by Adugo that Meri chased from the sky. The intervening 7 and 9 correspond to the orifices of the human head and body.

In the Kogaekogae design drawn on the Natte skin (Fig. 1), logic and arithmetic follow the same lines, and there are even coincidences between actual totals and number-groups of units (notably the prime number 11), and between the styles in which they are added (serial, cumulative) and multiplied. Yet the Kogaekogae design is far more complex, thanks in part to its characteristic use of two kinds of differently-hatched X units. Also, here there are eight rather than six pairs of ribs (three upper, five lower), and larger totals that range from 7 on a single rib to 22 on a pair. There are even variant forms of the X unit, and a fraction that is less than half.

Starting with format and distribution of rib totals of X-units, regardless of which type they are, and of fractions, the following Number-Group scheme can be established:

ribs		totals of X units	
		left	right
upper	A	8	10
	B	9	11
	C	11	11
lower	D	8	11
	E	10	11
	F	7	11
	G	7	9
	H	9	11

Through simple addition, the grand total of all X units on the 16 ribs is 154. That neither this number nor the framework design is random is immediately suggested by two concomitant formulae. First, the total of the

highest and most populated Number Group, 11, exactly equals that of all the other numbers put together:

2]
$(7 \times 2) + (8 + 2) + (9 \times 3) + (10 \times 2) = 77 = 11 \times 7$

Second, the grand total is the product of the lowest total on any one rib (left F or G) multiplied by the highest total on any pair of ribs (C):

3]
$7 \times 22 = 154$

In both equations, the main factors are the prime numbers 7 and 11, which serve as lower and upper terms for the full flush of five numbers 7, 8, 9, 10, 11, being the only primes in that range. With respect to the skin's material source, they are of course precisely the two primes we saw operative in the Adugo stories of the caves and the sky respectively.

Their clear conceptual resonance in these cases may encourage us to consider in similar terms the intervening numbers, even (8, 10) and odd (9), and further to explore the notion of numerical construction as such, in the prolonged analogy between numbers with their factors and the body with its parts.

Coincident with the format itself (the eight rows of ribs), 8 indicates the number of clans in the Bororo settlement. Doubled to 16 (left A and D) in the binary progression for which Bororo logic is renowned ($2...$, 2^3, 2^4), it also brings anatomy into play. For in the Barege Ekedodu ceremony, the person who bears the jaguar's skin is also adorned with its teeth and claws, tokens of the body which in the *aroe* reading of the ceremony is to be protected and even reconstituted. Multiplying in pure binary progression in the human adult, teeth reach just the total established in the upper right area, that is, 32, or 2^5 (for good measure the total of teeth in a child's mouth, 28, is given in the matching area upper left). As for the human equivalent of the claws, they are correspondingly specified in the other pair of even numbers, the 10s (right A, left E). When strengthening the beaks of birds, Meri goes on to endow humans with their binary sets of

teeth, and their decimal sets of fingers (WS 155). Thanks largely to the Bororo, binary logic became the basis for Lévi-Strauss's Structuralism; as for decimals, digits form the base of Bororo counting nomenclature (Fabian 1992:232)

Just as the even numbers correspond to projections of the human body, so the odd number 9 corresponds to its orifices and stands in a special ratio to the 7 of the head orifices. Indeed, just as in the Iwara arege design examined above (**1**), 9 and 7 here multiply to produce the sum of the intermediary divisible numbers:

4]
$(8 \times 2) + (9 \times 3) + (10 \times 2) = 7 \times 9$

Finally, the question of surface and dimensions, and how it may relate to the other equation stated above: 7 (lowest total on any one rib) x 22 (highest total on any pair of ribs) = 154 (grand total). When the Adugo biri skin is placed on a human body in the Barege Ekedodu ceremony, its inscribed ribs undergo a lateral inversion: what is left and right for the observer becomes right and left for the wearer. At the same time, the pairs of ribs inscribed on the flat two-dimensional surface curve protectively around those of the wearer. Given the coherence of the arithmetical statement made by the grid design so far, along with the concept of this inversion, it is perhaps not too bold to recall that the formula shown above to produce the grand total of units, $7 \times 22 = 154$, can correspondingly be inverted. For, expressed as $^{22}/_7$, or ?, it produces a rounding of the ribs into the third dimension, shaping them into the cylindrical thorax shield. An equivalent argument is proposed by Fabian when he speaks of 'squaring the circle' of Bororo space-time (1992:163)

Cross-matching

The analysis made so far of Natterer's Kogaekogae text has been entirely based on Number Groups, on the sheer grouping and distribution of X units within the rib format, without regard for the type of X unit involved.

The next stage means distinguishing between the two types of unit it uses, those whose hatching points upwards to either left (= X\) or right (= X/; Fig.6b). From the start, we may confirm that, although they are intricately distributed between the Number Groups and to left and right in the upper and lower areas (as we shall see), each of the two types of hatched X unit totals 77, in an exquisite complement to the Number-Group formula established above (see **2**):

5]

X/: $7 + 8 + 9 + 10 + 10 + 11 + 11 + 11 = 77$
X\: $7 + 8 + 9 + 9 + 11 + 11 + 11 + 11 = 77$

Overall, the general direction of the hatching in the units (on the exceptions, see below) corresponds to their respective positions on the ribs to right and left in the upper and lower areas, in the diagonal cross that echoes that of the X unit itself.

	left	right	
upper	X\	X/	i.e. \ /
lower	X/	X\	/ \

Introducing a subtle variation, the hatching in one of the five ribs in each of the lower areas fails, however, to cross-match with that of the three in the respective upper area, right to left and left to right, in the pattern established by the X design. The exceptional fifth ribs (left G, right D) highlight the primes 7 and 11, again, and in so doing implicitly associate the X\ unit with seven and the X/ unit with eleven.

ribs		totals of X units	
		left	right
		\	/
upper	A	8*	10**
	B	9	11
	C	11	11
lower	D	/	\
	E	8	/11
	F	10	11
	G	7	11
	H	\7	9*
		9	11

(*) the two outermost X units have inverse hatching in lower and upper triangles respectively
(**) beginnings of a further X unit innermost (Fig. 6c, d)

The association between the two types of X unit, on the one hand, and the primes 7 and 11, on the other, is in fact developed in the actual totals of these units found in the upper and lower areas, diagonally to left and right. For the totals of X\ units to upper left and lower right relate to both the square and the sigma count of the smaller main prime, 7. Completing the pattern, the X/ totals to upper right and lower left give the sigma count of the larger main prime, 11, reaching that total again via squares, and multiples to the power, of all the smaller primes (2,3, 5), as well as the sigma count of the intervening 9. Always adding only like with like, strictly within the four areas of the grid this produces:

6]

	X		
	left	right	
upper:	$28 = \Sigma 7$	–	
lower:	7	42	$= 7 + 42 = 49 = 7^2$
all:			$\Sigma 7 + 7^2 = 77 = 7 \times 11$

	X/		
	left	right	
upper:	–	$32 = 2^5$	
lower:	$25 = 5^2$	11	
	$\underline{+9 = 3^2}$	—	
	$= 34$	11	$= 34 + 11 = 45 = \Sigma 9$
all:	$34 + 32 = 66 = \Sigma 11 + 11 = 77 = 11 \times 7$		

In other words, the disposition of the two types of X units complements the Number-Group disposition at every stage. What it adds is the notion of cross matching, explicit in the hatching in the two types of units themselves, and which Reichel-Dolmatoff has convincingly related, at one level, to tropical American notions of gender relations between male and female, and human procreation (1981:22). In social terms, it may be usefully compared with the layout and exogamy of the Bororo village, whereby the Xera and Tugarege moieties to north and south are each divided into lesser and greater parts, creating the possibility of more intricate cross-matching (Fig. 7). Finally, it becomes the means for expressing the arithmetic of the sky also inherent in this superb example of an Adugo biri.

ESQUEMA DAS UNIÕES MATRIMONIAIS

Itubóre (leste)

Metade dos
Eçeráe

Metade dos
Tugarége

1 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2

Linha cheia: uniões preferenciais
Linha interrompida: uniões toleradas
Linha dupla: uniões lícitas entre membros da mesma metade

Sub-clãs da METADE DOS EÇERÁE:

1. Baádo Jebáge Çobugiwúge Çobugiwúge; 2. Baádo Jebáge Çobugiwúge Bóe E-iadadawúge; 3. Baádo Jebáge Çobugiwúge Čebegiwúge; 4. Bokodóri Eçeráe Çobugiwúge; 5. Bokodóri Eçeráe Bóe E-iadadawúge; 6. Bokodóri Eçeráe Čebegiwúge; 7. Kíe Çobugiwúge; 8. Kíe Bóe E-iadadawúge; 9. Kíe Čebegiwúge; 10. Baádo Jebáge Čebegiwúge Çobugiwúge; 11. Baádo Jebáge Čebegiwúge Bóe E-iadadawúge; 12. Baádo Jebáge Čebegiwúge Čebegiwúge.

Sub-clãs da METADE DOS TUGARÉGE:

24. Páiwoe Çobugiwúge; 23. Páiwoe Bóe E-iadadawúge; 13. Páiwoe Čebegiwúge; 22. Apiborége Çobugiwúge; 21. Apiborége Bóe E-iadadawúge; 20. Apiborége Čebegiwúge; 19. Aróroe Çobugiwúge; 18. Aróroe Bóe E-iadadawúge; 14. Aróroe Čebegiwúge; 17. Iwagúdu-dóge Çobugiwúge; 16. Iwagúdu-dóge Bóe E-iadadawúge; 15. Iwagúdu-dóge Čebegiwúge.
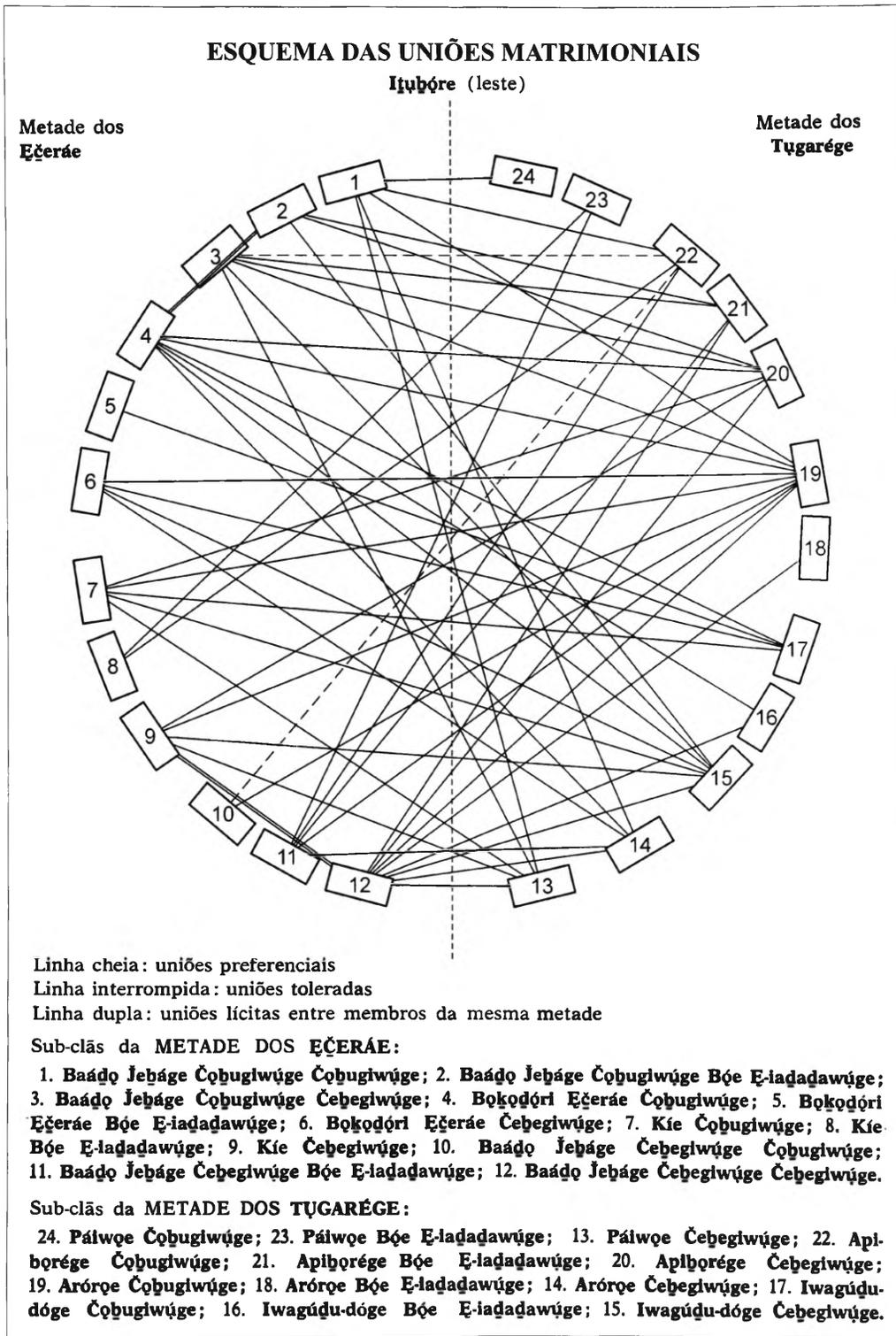
Fig.7 – Clan cross-matching (EB 1: 450).

Bodies of the sky

The Kogaekogae type of Adugo biri identifies those who named the bodies of the sky. For that reason, its complex arithmetic might be expected to invoke those bodies, no less than terrestrial anatomy and clan. Thanks to the work of Fabian and others, there can be no doubt about the sophistication of Bororo astronomy as such.

Guarded by Bakororo to the west and Itubore to the east, the very axis of the Bororo village commemorates the 'sun's path' (as it is called, Meri etawara; WS 95), travelled by the sun, moon and planets. Over the course of the tropical year, the sun, the brightest of them all, rises and sets, to north and south along the east and west horizons, in positions likewise commemorated in the layout of the Bororo settlement (Fabian 1992:163) and, in the case of the June solstice, in the bonfires of the male initiation ceremony Akiri doge. When viewed in plan, the solstice pattern, widely recognized in tropical American astronomy, is also reflected in the very design of the *edugo* 'X' unit. The central or midday moment as such is specified in 'Adugo's bride', when Adugo wrestles with his future father-in-law from dawn until exactly noon:

	northern solstice	southern solstice
sunrise	x	x
	village/noon	
sunset	x	x

Reading the X units as years, on these grounds, alerts us to the unique and striking status of one of the eight rib rows (D). Unlike any other (G includes variant Xs), it has X-units whose hatching always goes in the same direction (X/), on both the left and the right sides. It reads:

7]
8 + 11 = 19 [years]

The formulation could hardly be more resonant in terms of Meri, the sun, and the solar-lunar entity Meri-doge, Adugo's antagonist. For the synodic cycles of sun and moon first coincide after 8 solar years, which equals 99 lunations (plus almost one night), the period as such being commemorated in the Greek term octaeteris. A yet more exact coincidence occurs after 19 solar years or 235 lunations, the so-called Metonic cycle which in Christendom still serves as the arithmetical basis for calculating the date of Easter (which falls on the first Sunday after the first full moon after the Spring equinox). In the Kogae-kogae design, the first cycle or octaeteris is incorporated into the second (Metonic) cycle as 8 + 11 = 19.

As the cipher of the sky jaguar, the eleven has multiple resonance in this equation, once again in a style characteristic of shamanism. In the dimension of years, it mediates between 8 and 19 as the equivalent of 136 moons, and in astronomical fact coincides with the sunspot cycle (which the Bororo may or may not be pointing to here). In lunations, it is a factor of the octaeteris, which amounts to 11 x 9 moons (traditionally, eleven periods of human gestation). Yet again, in the dimension of nights or days, eleven is the epact, that is, the difference between twelve completed lunations (354 nights) and the year (365 days).

Several accounts are known (Fabian 1992:134) of how the Bororo, through the Badajebage clan, learned the star names from one of their number, a boy abandoned at night in the forest. They tell how the Kogaekogae spirits hissed their greetings to the stars (*ikuieje*, 'faces', 'eyes') as they appeared, in sequences which tend to intercalate the inner and outer planets, Venus and Mars, with stars proper, in the fashion of this list (WB 47-54):

Jekurireu; Venus
Akiri-doge; Pleiades
Bace Iwara Arege (Heron); Orion's belt
Pari Burea-doge (Emu); Southern Cross
Tuwagou
Kudoro (macaw); Pavo
Bika Joku; Mars
Jeriguigui (turtle)
Upe (turtle)
Bokodori Jari Paru Kado Jebage

Of the identifiable constellations, the pair of turtles is of especial interest. Initially identified with Corvus, the turtle Jeriguigui was later linked to Orion, in the opposite half of the sky, a transposition discussed by Lévi-Strauss when relating this story to the foundation myth (M_1) of his *Mythologiques* (1964:51,235). Since then, in a brilliant piece of field work and detection, Fabian (1992:147-8) has been able to show that each of the turtles (Jeriguigui, Upe) names two constellations in a gamut which stretches over just less than half the sky, from Orion (Right Ascension 5) to Scorpio (Right Ascension 16). This arrangement in halves that hinge on Scorpio echoes that found in other tropical American systems, for example in the Rio Negro and among the Kogi, and even in Mesoamerica. In all these cases, the other hinge is effectively the Pleiades, the Akiri-doge whose heliacal rising after their disappearance in May is commemorated in the June solstice ceremony, during the dry season, when fires are lit in order to slow the progress of the constellation through the sky.

The correlation of the Pleiades with the June solstice is widely understood as the marrying of two orders of time, solar and stellar, synodic and sidereal. Bororo narratives make the distinction as such between these two orders of celestial time, saliently in the bargain that Meri the sun made with the heron, the Night Lord who is a constellation (WS 38-40). There, sun and star is each shown to have owned its own time, synodic and sidereal, a 'diachrony' according to Crocker (1985:347). Fabian speaks of them as successive 'layers' of time (1992:145), and takes the idea further when observing that the Akiri-doge ceremony 'synchronizes astronomical, ecological, and social time, links the realms of nature, society, and the spirit world, and highlights the significance of astronomical observations in Bororo culture' (1992:133).

The solar year of the solstice is in fact slightly shorter than the stellar year of the Akiri-doge's heliacal rising, a difference which over time produces a steady slippage of the one against the other (so that the synchronicity noted by Fabian can never be very long

lived).[8] For their part, the phases of the synodic moon have a rhythm of just over 29 nights; yet in sidereal time it takes the moon nearer 27 nights to regain its position relative to a given constellation. The distinction is clearly registered in tropical American texts, strikingly in the Barasana sky chart which pairs the steps the moon makes along the two respective paths, 29 in that of its synodic phases – a crescent and full moon – and 27 in that of the stars – a star inset into a crescent moon – (Hugh-Jones 1983:187).

The difference in kinds of time corresponds to an inversion in celestial movement. For while sun and moon move regularly, day and night, from east to west horizon, their apparent movement with respect to the stars, over lunations and years, is in the other direction, from west to east. For this reason, it is of major importance to note the direction that sun and moon are said to be travelling in when they encounter the sky jaguar's eleven. The text specifically states that they are moving from west to east, rather than the expected east to west (WS 55-56). In other words, their path across the sky is not from the horizon of their risings to that of their settings, but through the stars; that is, they journey back along the ecliptic, or zodiac, pointed to by Fabian. In the case of the moon, the regressive motion, night by night, is very clear, certainly to the Bororo.[9]

In astronomical terms, the story of the sun and moon's involvement with the eleven creatures led by the jaguar, who include known constellations, must, then, refer to their sidereal rather than their more obvious syno-

(8) Since Natterer went to Brazil, the rising of the Pleiades has advanced nearly three days in the calendar year; since the Bororo links with the Inca postulated elsewhere by Fabian (1998), it has advanced no less than ten days. Known as the Precession of the equinoxes and detectable in other tropical American systems (Brotherston 2000), this slippage may arguably be what the Akiri-doge fires are meant to counter-act, in 'slowing down' the advance of the Pleiades.

(9) 'Há várias explicações dadas pelos xamãs dos espíritos, acerca do caminho seguido pela lua para voltar ao ponto inicial de sua viagem i.e. ao oriente' (EB 1:9).

dic phases. In this regard it is also worth recalling that of the jaguar's twin sons, the senior one Bakororo guards the west, not the east. In just this sidereal context, the design of the X units on the Kogaekogae skin is best understood as its two constituent triangles. For the Kogaekogae spirits who hiss the names of the constellations, as they rise over the eastern horizon, are said to do so having the two types of hatched 'triangles' painted on their faces. In the case of the Kogaekogae skin, the totals produced by these triangles appear to correspond to the nights of sidereal time, just as the totals of X units (or double triangles) correspond to the years of solar time, above all when we take into account the variant X\ units at the ends of rows A and G (where the hatching in the upper triangle goes in the opposite direction to that in the lower triangle: see Fig. 6c).

The layout of the 77 X\ units in question is as follows:

upper:		28
lower:	7	42

In terms of constituent triangle units, these Xs yield:

8]

all triangles	triangle \	variant triangle /
7x2	7x2=14	
28x2	27x2=54	2
42x2	41x2=<u>82</u>	2
	150	

As we saw, the X\ unit is to 7 what the X/ unit is to 11, and an implicit link between 7 and the moon is made in 'Adugo's bride' insofar as its absence, night after night, prevented her from seeing the occupants of the seven caves. That the reference here becomes in fact the nights of the sidereal moon is borne out by the fact that each of the three totals of \ triangles matches its cycle, especially the final 82. For it is precisely after 3 cycles that the sidereal moon, of 27.3 nights, fully occupies an extra night. The three instalments of \ triangles correspond, then, to totals of sidereal moon

cycles that amount to exactly half the cipher eleven:

9]
$14 + 54 + 82$ = nights of $^1/_2$ plus two plus three moons = $5^1/_2$ or $^{11}/_2$ sidereal moons

Finally, the other prime number consecrated on the Kogaekogae skin, 11, is suggestive of a sidereal cycle complementary to the moon's, that of Mercury. The identity of the 'Moon's follower' (Ari reaiwu) is uncertain though there is no reason why it should not be Mercury (Fabian 1982:286; 1992:144). In terms of astronomical orbit, the kind of body best qualified to be a lunar companion is a planet, and of the planets the inner ones, Venus and Mercury, which (like the moon and unlike the outer planets) pass between earth and sun. And of the two, Mercury is the more likely, since Venus is typically named and celebrated in its own right for its brilliance and size, and because Mercury's phases approximate those of the moon far more closely. In synodic time, Mercury takes just under four moons (118 nights) to complete a cycle (116 nights), and in sidereal time, at <88 nights, it takes just over three moons (82 nights); Venus's cycles are many times longer and less coincident.

One way of accounting for the second type of irregularity in the count of X units on the Kogaekogae skin - the incipient extra unit innermost in rib right A (Fig. 6d) – would be to see in it a reflection of this other sidereal period, a complement to that of the moon. If so, the cycle is expressed via the principle of Number Group and the upper prime eleven, rather than via the principle of hatched triangles within the X\ unit and the lower prime 7, used for the moon. For the extra unit in rib right A potentially raises the group total of the elevens from 77 to just under 88, <44 plus 44, upper and lower. When doubled as triangles, in the fashion of the sidereal moon units, this almost-88 would produce something between 175 and 176, an upper <88 and a lower 88, a good approximation of two sidereal Mercury periods.

Triangles in Number Group 11:

	left	right
upper		< 22
		22
	22	22
lower		22
		22
		22
		22

In proposing this last reading, however, we should stress that, in contrast to everything suggested hitherto, it is not directly supported by a known corresponding Bororo narrative or perception.

*

At the very least, the Bororo jaguar skin brought to Vienna by Natterer demands more recognition as a visual text than it has received hitherto. Deploying and correlating numbers with considerable sophistication, it embodies paradigms of Bororo culture, while its very format and patterning of variables prompt the desire to understand and decode. That it might be just random as a numerical statement is rendered impossible by the series of interlocking equations involving Number Groups and the two types of X unit (**2, 3, 4**).

The 'decoding' is best done in the terms it itself proposes initially, as the skin of an animal which plays a foundational role in the terrestrial and celestial registers of Bororo cosmogony, and which features pre-eminently in the Barege Ekedodu ceremony during which such painted skins are made, paraded and worn. In this way, meaning inherent in the actual performance of the ceremony can be correlated with the key jaguar narratives. This correlation highlights the significance of a logic which is in part but by no means exclusively binary, and of an order of numeracy not normally associated with lowland South America. Pertinent to the attempt to understand human cultural history, this Bororo statement raises questions of epistemology, of how best to read. It is a configuration where relevance is the valency of its numbers and where 'truth' exists insofar as it is embodied and lived.

ABSTRACT: This article proposes the analysis and interpretation of a Bororo jaguar skin exhibited at the Mostra in São Paulo organized in 2000 to mark the most recent 500 years of Brazilian history. The Author shows how this painted skin known as Adugo biri demands more recognition as a visual text than it has received hitherto. Deploying and correlating numbers with considerable sophistication, it embodies paradigms of Bororo culture, which prompt the desire to understand and decode. Analysing this skin in the light of what we know about the Bororo culture, the Author contributes to our understanding of the complexity of this group's "mentality".

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