When Time is not Space: The social and linguistic construction of time intervals in an Amazonian culture[*]

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Abstract

It is widely assumed that there is a natural, prelinguistic conceptual domain of time whose linguistic organization is universally structured via metaphoric mapping from the lexicon and grammar of space and motion. We challenge this assumption on the basis of our research on the Amondawa (Tupi Kawahib) language and culture of Amazonia. The Amondawa time interval system is based not on countable units, but on social activity, kinship and ecological regularity. It does not permit conventional "time-reckoning" since the number system has only two numerals with a maximum combinatorial value of four. The Amondawa do not entertain cardinal chronologies such as ages of individuals, or ordinal chronologies such as yearly or monthly calendars.

Using both observational data and structured field linguistic tasks, we show that linguistic space-time mapping is not a feature of the Amondawa language and is not employed by Amondawa speakers (when speaking Amondawa). Amondawa does not recruit its extensive inventory of terms and constructions for spatial motion and location to linguistically conceptualize temporal inter-event relations. As an

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alternative to the Universal (linguistic space-time) Mapping Hypothesis, we propose the socio-culturally motivated Mediated Mapping Hypothesis, which accords causal importance to the numerically based construction of time-based time interval systems and to use of the symbolic cognitive artefacts that support such interval systems.

1. Introduction

Our purpose in this paper is twofold. First, we challenge the widespread assumption of the universality of analogical linguistic mappings between space and time. This (rarely articulated and usually implicit) assumption can be called the Universal Mapping Hypothesis. In linguistic space-to-time mapping, words and constructions whose etymologically primary (and, putatively, cognitively more concrete) meanings conceptualize location and motion in space are recruited to conceptualize and express temporal relational notions. Lexical space-time mapping is widespread (Haspelmath, 1997), and constructional mapping has been analysed in languages as typologically and geographically disparate as (amongst others) English (Clark, 1973; Lakoff and Johnson, 1999), Aymara (Núñez and Sweetser, 2006), Chinese (Yu, 1998,) and Wolof (Moore, 2006). However, we are not aware of any previous studies investigating linguistic space-time mapping, especially at the constructional level, in the languages of small-scale human groups whose traditional way of life is dominated by hunting, fishing, gathering and small-scale cultivation.

The analysis of linguistic space-time mapping in terms of Conceptual Metaphor (Lakoff and Johnson, 1980), based upon universal human cognitive processes and capacities, has led to the widespread assumption that such linguistic mappings are universal. We challenge the Universal Mapping Hypothesis on the basis of our research on the Western Amazonian Tupi Kawahib language Amondawa. Note, importantly, that we do *not* thereby challenge the hypothesized universality of the

cognitive foundations of linguistic space-time mapping; indeed, we shall present some evidence in support of such cognitive universalism.

If our challenge to the universality of linguistic space-time mappings is well founded, we need to account in a principled way both for the ubiquity of such mappings and for their absence in some languages. This is the second purpose of this paper. The account that we propose accords a central role to the cultural and cognitive construction of *time based time interval systems* in the historical emergence of the non-natural (but naturally motivated) conceptual domain of what we shall call "Time as Such".[1] Such time interval systems permit the *framing* of inter-event relationships as dynamic or static relations occurring within a schematic time frame that is conceptually autonomous from the events so framed. We concur, therefore, with Moore (2006: 232) that "motion metaphors of time need to be analyzed as mappings across frames." We further propose, however, that such frame-to-frame space-time mappings, while being cognitively and experientially motivated, are only actuated given certain cultural-historical conditions involving the making and use of cognitive artefacts permitting the segmentation and measurement of Time as Such. This segmentation and measurement is what underlies social practices of *time reckoning*, practices that have been widely studied by anthropologists. In turn, time reckoning is dependent upon (a) the cultural construction of counting practices based upon large number systems (Pica *et al.* 2004); and (possibly) (b) the cultural-cognitive schema of a linear number line (Dehaene *et al.* 2008). Our account therefore proposes that analogical, frame-to-frame space-time mappings are the emergent product of the intercalation of numeric symbolic cognitive processes with language, supported by historically developed cognitive artefacts such as calendars and clocks. It is this hypothesis that we shall designate the *Mediated Mapping Hypothesis.*

2. Space-time mappings in language

Locative and motion words belonging to different form classes can be used in a variety of constructions to express temporal relations and temporal properties. For example, English employs expressions such as:

1. The weekend is coming

2. The summer has passed

3. He is coming up to retirement

4. Check-in was well ahead of departure

5. He worked through the night

6. The coming year

7. The party is on Friday

8. January is always in front of February

9. I am going to get up early tomorrow

10. The symphony is long

Expressions such as (1) and (2) have been characterised (Clark, 1973) as employing a MOVING TIME metaphor, in contradistinction to (3) which exemplifies a MOVING EGO metaphor. As Moore (2006: 200) puts it, "in both cases, ego plays a central role in the metaphorical motion event, and both metaphors construe temporal experience from ego's perspective." Moore then goes on to distinguish such constructions from expressions such as (4), which is not ego-relative, and which exemplifies what he calls a SEQUENCE AS POSITION ON A PATH metaphor. For simplicity, we shall classify expressions involving either MOVING TIME or MOVING EGO metaphors as *Ego-relative temporal motion constructions*, and

expressions such as (4) as *Positional time constructions*. Example (5) shows that non-motion verbs may be inserted into Ego-relative temporal motion construction frames (in this case, expressing a MOVING ACTIVITY construed from the perspective of ego). Adjectival expressions such as (6) are derivative from the MOVING TIME metaphor. Stative expressions such as (7) and (8) can be thought of as variants of Positional time, referenced to a linear or cyclic time interval schema such as days of the week or months of the year. *Going to*-expressions such as (9) occur in many languages and have been extensively analysed in the grammaticalization literature as involving semantic extension from intention to go to a location, to intention to act (Pérez, 1990; Bybee *et al*. 1994; Poplack and Tagliamonte, 2000). In (10), the polysemy of the adjective "long" can be analyzed as stemming from the experiential correlation of the spatial extent of a path with the duration of travel along the path (Grady, 1999).

Here, we shall mainly be concerned with Ego-relative temporal motion constructions and Positional time constructions. Ego-relative motion constructions are by definition metaphorical in some sense, in that they employ spatial lexemes. Positional time constructions, on the other hand, may employ lexemes that have (non-archaically) only temporal meanings, as in:

10. After dinner they went for a walk

11. Check in was well before departure

12. January is always before February

Positional time constructions in many languages permit speakers to invert actual event order in order of mention:

13. Before dinner they went for a walk.

Thus, both Ego-relative temporal motion and Positional time construction frames permit *flexible construal* (Langacker, 1987) on the basis of shifting perspective and topicalization. They offer this flexibility because they have in common that events are conceptually ordered on a notional linear or cyclical time-line (of past to/from future) that permits perspectivization from a point non-coincident with the deictic "now" of utterance. It is only on the basis of such schematization, we contend, that frame-to-frame space-time mapping can occur. Furthermore, such schematizations are not natural, but *constructed* in language and symbolization.

In other words, we maintain that there is no natural, prelinguistic and preconceptual schema for "Time" that, as it were, passively invites and receives (by way of image-schematic structural correspondence) mappings from Space. Rather, it is the existence of constructed temporal schemas of linearity and cyclicity that permits the conceptualization of inter-event relationships as occurring in a domain of "Time as Such" that is *abstracted from the events themselves.* To put it another way, the existence of Ego-relative temporal motion and Positional time construction frames attests to temporal schemas permitting not only flexible construal, but also the positing of a reified "substance" or "content" that the underlying schemas organize. It is this (in some sense imaginary) content that we designate *Time as Such.*

3. Cognitive artefacts, time intervals and Time as Such

All human artefacts are in a broad sense cognitive, inasmuch as they embody human intentionality (Sinha, 1988; Bloom 1996). However, there is a special subclass of what we here call *cognitive artefacts* that can be defined as comprising those artefacts that support symbolic and conceptual processes in abstract conceptual domains. Examples of cognitive artefacts are notational systems (including writing and number), dials, calendars and compasses. Cultural and cognitive schemas organizing

the relevant conceptual domains may be considered as *dependent upon*, and not merely *expressed by*, the employment of cognitive artefacts. Examples (7), (8) and (12) above *depend upon* the intersubjective agreement of speaker and hearer to base shared reference upon the conceptual schemas "days of the week" / "months of the year", which themselves are dependent upon a natural language based notational system (the cognitive artefact). A key property of cognitive artefacts is thus that they are *conventional* and *normative*. Cognitive artefacts may be *motivated* by natural facts and the human phenomenological experience of these facts (eg the orbit of sun or moon; the number of fingers on a human hand), but they are not *determined* by them (witness, for example, the variety of arithmetical bases for number systems).

Cognitive artefacts are instances of the *extended embodiment* of cognition (Sinha and Jensen de López, 2000), instantiating the intersection of material and symbolic cultural forms. The symbolic systems and conceptual schemas that they support are *materially anchored* (Hutchins, 2005) in the artefacts, which permit the socio-cognitive practices (and the reproduction of these practices through inter-generational transmission) constituting a segment of the life world of individual and group (Schutz, 1966). Cognitive artefacts are thus a crucial (and species-specific) aspect of the "ratchet effect" (Tomasello, 1999) in human cultural evolution and development. It is, in this light, tempting to view human natural language itself as a cognitive artefact. We do not address this issue here (see Sinha, 2006; in press), but our account does posit a specific relationship between a particular class of cognitive artefacts and a particular linguistic phenomenon. We hypothesize that a cultural-historical precondition for schematization of time-based time interval systems is the material anchoring of quantified time intervals in cognitive artefacts for measuring, segmenting and reckoning time, such as calendar notations and clocks. In turn, time-

based time interval systems enable the framing of events (in Time as Such) that makes possible the space-time frame mappings underlying Ego-relative temporal motion and Positional time linguistic construction frames.

4. Time intervals, calendars and time reckoning: anthropological perspectives

There is a considerable body of research dealing with culturally specific calendric systems.[2] Calendric systems frequently possess a recursive structure such that different time intervals are embedded within each other, and/or a structure of metrically overlapping intervals. These intervals are typically cyclical in nature, with both embedded and overlapping cycles. The most familiar to us is the now widely adopted lunar and solar (more strictly, monthly and annual) Gregorian calendar. A dramatic example of the complexity that such systems can attain is provided by the classical Mayan calendars.

The Mayan civilization used three different calendar systems. The so-called Long Count calendar organized the historical time of the classic period of Mayan in a fashion comparable to a car's odometer, counting days in geared cycles of ascending size. The Long Count used the number 360 as an approximation of the year, multiplying the 20-day months by eighteen to arrive at a round-figure year of 360 days. This was called a *tun.* Twenty *tuns* composed a *katun,* and twenty katuns formed one *baktun*. These time intervals (*tun, katun* and *baktun*) could be used to specify any day in Maya history. The Long Count could also generate time references in an (in principle) infinite scale, a fact which both structured Mayan cosmology and was the main motivation and function for Mayan mathematical knowledge; this worked with place value and the number zero, both unknown to Mediterranean classical antiquity. The *Tzolkin* (counting days or Sacred Year) calendar was a ceremonial calendar, with 20 periods of 13 days, thus completing a ritual cycle every

260 days. The *Haab* was a civil calendar based on a year of 360 days consisting of 18 periods of 20 days. Five days were added at the end of the Haab year to approximately synchronize it with the solar year (Edmonson, 1976; Wright, 1991).

Calendric systems are not purely quantitative systems of measurement and ordination. They are also expressive of cultural beliefs and values. The Western (Gregorian) calendric system, for example, conceptually superimposes on its cyclic structure a linear model of time as involving motion from an origin (the birth of Christ) to a notional endpoint (the End of Days). This dualistic cyclical-linear conceptualization (with varying relations of dominance between cyclicity and linearity) is characteristic also of other calendric systems, such as the Mayan (described above), the Islamic and the Vedic (Keyes, 1975).

Geertz (1973), in his classic paper 'Person, time and conduct in Bali', argued that temporality (and time interval measurement) in Balinese culture cannot be comprehended without recognizing its contextual embedding within Balinese notions of personhood, social status and social role. Personhood, social role and time form a complex matrix in which Geertz (as interpreted by Vickers, 1990: 166) argues, "time in Bali is not linear, that is not quantitatively divided, but qualitative—organized in terms of degrees of malevolence and benevolence." Calendric time is thus co-constituted with social norms of conduct and power (Bloch, 1977). It is this interpretation that underlies Geertz's hypothesis that Balinese time is 'de-temporalized': the Balinese, claims Geertz (1973: 398), have "a classificatory, full-and-empty, 'de-temporalized' conception of time in contexts where the fact that natural conditions vary periodically has to be at least minimally acknowledged".

Gell (1992: 72) points out, however, that "the evidence for Balinese detemporalization is specifically connected with the permutational calendar … that it

does not generate regular periodicities (such as solar years subdivide in lunar months, which subdivide into market weeks, etc). Instead the permutational calendar specifies quantum units (days) in terms of combined product of independent five-, six- and seven-day cycles". Alongside this Pawukon permutational calendar, which commutes a complex trinomial expression whose completion takes 210 days, the Balinese also employ a variant of the luni-solar Hindu (Vedic) calendar. Gell (1992: 73) summarizes Geertz's argument as being that "both Balinese calendars are non-metrical and 'non-durational', and thus correspond to the climaxless 'steady state' and non-progressive tenor of Balinese life."

Geertz's analysis has been criticized on various grounds, ranging from its Durkheimian over-emphasis on ritualistic conduct (Bloch, 1977) to its neglect of the significance in everyday time reckoning of the quantitative computations made possible by the Balinese calendar, and the degree of expertise displayed by Balinese in exploiting these possibilities. Without entering too deeply into this issue, we would make a very simple point: whatever cognitive and social significance we may wish to accord to cultural variations in calendric systems (see also Keyes, 1975; Davis, 1976 on the Northern Thai system), all such systems are *quantificational*, in the sense of being based upon a measurement system, and all can be considered as *time-based*, segmenting and measuring temporal duration in "Time as Such". The speech practices of *reckoning* or *telling* time, with their etymological roots in Germanic words for *counting* (e.g. Dutch *rekenen*, "to count") express and reproduce this quantificational view of time. Analagous arguments to those applying to calendric time can be made for "clock time", that is the conceptualization and measurement of time intervals in the diurnal cycle, although less attention has been paid to this in the anthropological and linguistic literature (see however Postill, 2002).

Not all societies employ either calendar or clock systems of the quantificational type. Evans-Pritchard (1939, 1940) described what he termed the Nuer "cattle clock" or "occupational time". Time in Nuer society, he proposed, is based on environmental changes and associated social activities. The concept of time in Nuer society is thus a product of the interplay between "ecological time" and "social structure time".

> The oecological [*sic*] cycle is a year. Its distinctive rhythm is the backwards and forwards movement from villages to camps, which is the Nuer's response to the climatic dichotomy of rains and drought … [while] *social structure time* is a relation between a man and the social activities which relate men structurally to one and another (Evans-Pritchard, 1939: 189-192).

The Nuer *ruon* (year) divides time into two principal seasons, *tot* (rainy season) and *mei* (dry season). These two main seasons are supplemented by classifications based on activities. For example, *Jiom* (meaning "windy") refers to the period when the cattle-camps are formed, and *Rwil* refers to the period of moving from camp to village, clearing cultivations and planting. (*op. cit.* p.192). Although there are names for (roughly) lunar months, Nuer society does not count or measure "Time as Such"; the language has no word either for the abstract notion of time, or for units of abstract time, and temporal reference points are provided by social activities. "Nuer have no abstract numerical system of time-reckoning based on astronomical observations but only descriptive divisions of cycles of human activities … since the months are anchored to oecological and social process the calendar is a conceptual schema which enables Nuer to view the year as an ordered succession of changes and to calculate to some extent the relation between one event and another in abstract numerical symbols" (p.197: 200).

Historical time for the Nuer is largely defined in terms of the initiation-based "age-set system", and is therefore conceptualized in terms of "the movement of persons, often as groups, through the social structure" (Whitrow, 1988: 10). In summary, time for the Nuer is a schematized relation between socially and environmentally defined events, and Nuer "time reckoning" is not a calculation of, or in, "Time as Such", but a rough quantification based on social-structural relationships and activities. The Nuer seem, according to Levine's (1997) terminology, to be living on "event time" rather than "clock time": activities are not fitted into a "schedule" governed by the clock or calendar, rather the temporal structure of life emerges from participation in daily activities.

Evans-Pritchard's description of Nuer time reckoning and Nuer event-based time can serve as a useful starting point for our discussion of time in Amondawa; starting with an ethnographic and field-experimentally based description of Amondawa time intervals, and continuing to a description of the lexicon and grammar of space and time in Amondawa.

5. Amondawa culture and society: an overview

The Amondawa[3] are an indigenous group living in the Uru-eu-wau-wau reservation, in the State of Rondônia in Brazilian Greater Amazonia. Amondawa is classified as a Tupi Kawahib language belonging to the family Tupi-Guarani, closely related to the other Kawahib languages (Diahoi, Karipuna, Parintintin, Tenharim, Uru-eu-uau-uau) of Amazonian Brazil (Sampaio, 1996, 1999; Sampaio and Silva, 1998).

The current population is about 115 people. Before official contact in 1986 by the government agency FUNAI, the Amondawa population was almost 160 people; after contact, this number went down by more than 50%, according to contemporary

reports. In 1991, the Amondawa population was no more than 45 people, living in the area surrounding the Trincheira post, which is also the current habitation. The main cause for the precipitate decline of the population was contact-induced disease, such as tuberculosis, colds, measles, malarial fever, chicken pox and other viruses (Silva, 1997). At present, the population is skewed towards the younger generation which makes up more than a half of the population. Political organization is characterized by two forms of authority. The first is traditional, represented by the person of the Chief or Cacique, who is the descendent of past chiefs. The other form is representation by a younger man elected to be President of the Indigenous Association by the whole community. The Presidency accords considerable power in political processes both inside and outside the community. All political issues are decided by the President of the Association after consultation with the Cacique and community. It is the responsibility of the President to represent the community and to deal with political and administrative relations with the Municipal Council, State and Federal Government Agencies. The Indigenous Association is a creation of the Federal Government intended to facilitate the direct allocation of resources to the community.

The Amondawa kinship system, in common with other Tupi Kawahib groups, is organized in terms of exogamous moieties. Descent is patrilineal. The woman does not lose her paternally derived name when she marries, but her children will be the descendent of her husband and adopt names from his moiety (Menendez, 1989: 110). The Amondawa moieties are designated by the bird names Mutum and Arara[4]. The mutum is a black bird living almost all the time on the ground and the arara is a colourful macaw that lives in the highest trees. Descent is reflected in the system of personal proper names, because each moiety has an inventory of masculine and feminine names. Amondawa people change their names during their life course, and

these names are indicative of the person's "age"/social role, gender, and moiety. The change of names occurs at the birth of a new baby and/or when the individual assumes a new position, attribute or role in social life. We describe this system and its significance for the Amondawa cultural conceptualization of time below.

Amondawa productive activity is based around cultivation. The men work in the field planting corns, beans, rice, potatoes and manioc. Traditionally, cultivation has been for subsistence but is now also for the market. Manioc flour is the most important commodity yielding monetary income for the community. Each nuclear family has its own field. The families from the same moiety sometimes share work and profit. This means that in effect each moiety decides how much will be produced each season. There is no culture of accumulation or of keeping produce or seed for the next season; everything produced is consumed or sold and the money is used for buying manufactured products, such as soap, clothes, shoes, TV's. Hunting and fishing, traditionally significant activities, remain the other main sources of food.

The traditional mode of Amondawa education is oral and informal, but since 1994 formal schooling has also been provided by the State. Today the majority of the Amondawa people are bilingual in Amondawa and Portuguese. Portuguese has high status because it is the main vehicle for communicating with others outside the village. Communication between community members is still in Amondawa, and Amondawa is the language of first acquisition. Schooling is bilingual, with a predominance of spoken and written Amondawa as medium of instruction. The teacher is a trained community member supported by the specialist from the State Department of Education. The curriculum emphasizes Amondawa history and tradition and knowledge of the local environment.

6. Time intervals in Amondawa language and culture

Amondawa does not employ cardinal chronologies such as ages of individuals, or ordinal chronologies such as yearly or monthly calendars, since the Amondawa number system has only two numeral terms (*pe'i* 'one' and *monkõi* 'two') with a maximum combinatorial value of four. *Monkõiape'i* or *ape'imonkõi* are alternative lexicalizations of 'three'; *monkõiuturaipei* and *monkõimeme* are alternative lexicalizations of 'four'.

An abstract term for *time* does not exist in Amondawa. The word *kuara* ('sun') is preferentially used to denote time intervals in general, since it is the movement of the sun which governs the passage of both the *time of day* and the *seasons*. Our ethnographic research has failed to identify any co-occurrence of numerals with any time interval designation. These features of the Amondawa language mean that Time Reckoning simply does not occur in Amondawa discourse. This does not, however, mean that the language lacks a lexicon of time intervals. The two time interval systems on which, together with the personal proper name system, we focus in this section are the seasonal and diurnal systems. As far as we know, these are the only such systems.

Method

A field manual was developed, which consisted of elicitation games and questionnaires (Zinken, Sampaio, Silva Sinha and Sinha, 2005). The manual was specifically constructed to identify temporal expressions and their ranges of use in Amondawa. Two of the tasks in the field manual addressed the lexicalization of time interval terms: The *calendar questionnaire* and the *calendar installation*. These tasks are described below.

Task 1 Calendar questionnaire. The aim of the calendar questionnaire was to provide data on the inventory of calendar event-types that are lexicalised in Amondawa. The questionnaire contains of a list of interval terms in Portuguese, relating to time intervals based on the moon (the 'month' and its subdivisions), and on the sun (the 'day' and its subdivisions).[5] It also contains questions about sowing, harvesting, and festivals.

Participants.

Data were collected during five field trips between September 2005 and January 2006. The participants were six adult bilingual native Amondawa language consultants (four male and two female), all of whom were familiar with the researchers administering the instruments and experienced in the role of language consultant.

Procedure

The researcher started by asking direct questions in Portuguese about Amondawa calendar units, names of festivals, parts of the day, and time adverbials as the central topic of the conversation. The researcher did not ask for literal translations, but asked more general questions about broadly equivalent terms in Amondawa and developed on this basis a conversation. It was emphasized to the participants that there were no right or wrong answers and that it was the Amondawa cultural knowledge that was the focus of investigation. The participants' responses were video and audio recorded and post-transcribed.

Results

There is no word meaning 'time' in Amondawa. There are in Amondawa no words for weeks, months and years, and there are no names for time-referenced festivals. In

fact, there are no such festivals in contemporary Amondawa culture, only marriage parties and traditional ceremonies that are not calendrically organized. There are names for seasons and parts of the seasons, for the day and night and parts of the day and night, and some temporal deictic and adverbial terms. These are listed in Table 1, which is not intended to be exhaustive.

Insert Table 1 about here

Task 2 Calendar installation: *seasons*. This elicitation game gave participants the opportunity to build a map of their model or schema of the 'year' (or other interval longer than a month) and its sub-intervals or constituents, by placing a series of paper plates, each representing a conentional time interval, on the ground.. The participants were requested by the researcher to "make a map of the year using the objects".

Procedure

Four participants (all men) were interviewed in Portuguese with simultaneous translation into Amondawa. Paper plates were given to the participant who was then asked to "make a map of time in Amondawa with them", in which each plate should represent one interval of time in Amondawa culture. The example provided was that in Portuguese each plate would represent a month. The participants' responses were video and audio recorded and post-transcribed. Plate 1 shows the results of playing the game with one participant, who has used the plates to construct a schematic representation of the succession of seasons in Amondawa.

Insert Plate 1 about here

Results

In Amondawa, there is no word for ‘year’. Linguistically, time is divided not into years, but into two seasons: the dry season *Kuaripe* (‘in the sun’) and the rainy season *Amana* (‘rain’). The term *Kuaripe*, referring to the hot, dry season, derives from the noun *Kuara* (‘sun’), with the locative postposition *pe*, meaning ‘in’ or ‘at’ (see Section 8 below). The rainy season is designated simply by the noun *Amana* which means rain. The passage of the seasons is marked by changes in the weather, and consequent changes in the landscape, and also by the rhythm of agricultural activities. Each season is further subdivided into three intervals corresponding to the beginning, middle (or “high”) and end parts of the season. Table 2 lists the Amondawa bi-seasonal lexical system.

Insert table 2 about here

Figure 1 represents, approximately, the way the seasons were mapped by participants. It is based upon the constructions of all four participants, each of whom constructed a curvilinear representation which fitted into the available working space, more or less on the horizontal axis perpendicular to the direction in which the participant faced, in either a left-to-right or right-to-left order of placement. No participants attempted to create a circular, cyclic representation. It is unclear whether the curvilinear responses were a result of a compromise between an intended rectilinear configuration and the

length of human reach, or signify that neither cyclicity nor rectilinearity are relevant to the Amondawa seasonal schema.

Insert figure 1 about here

Task 3 Calendar installation: days

This elicitation game gave participants the opportunity to build a map and/or installation of their model or schema of the diurnal cycle. The procedure was identical to that described above for the calendar installation. The day installation game was administered immediately after the calendar installation game.

Results

The term for "day" in Amondawa, *Ara*, refers only to the daylight hours and also has the meaning "sunlight". There is no Amondawa term for the entire 24-hour diurnal cycle. *Ara*, "day", contrasts with *Iputunahim,* "night", which also means "intense black". There is a major subdivision of *Ara*, "day", into two parts, *Ko´ema* (morning), and *Karoete* (noon/afternoon). Thus, additionally to the binary day-night contrast, it is also possible to say that the 24-hour period is divided into three major parts, *Ko´ema*, *Karoete* and *Iputunahim*. Both day and night are further subdivided into intervals which are conceptualized and named on the basis of the daily round of activities. Table 3 lists all time interval terms produced by the participants in the day installation game.

Insert table 3 about here

The schematization of the diurnal cycle does not seem to be cyclical or circular. In trying to explain this task, the researchers used a circular diagram resembling a clock, with light and dark areas. However, none of the participants produced a circular installation. Instead, they produced curvilinear representations similar to those produced in the calendar installation game.

7. Time and the human lifespan in Amondawa

As we noted above, the age of an individual is not measured chronologically in Amondawa culture, which lacks a numerical system able to enumerate above four. Rather, individuals are categorized in terms of stages or periods of the lifespan based upon social status and role, and position in family birth order. As we have also noted, each Amondawa individual changes their name during the course of their life, and the rules governing these name changes form a strict onomastic system. The Amondawa onomastic system is based upon the cross-cutting category systems of life stage, gender and moiety. It is obligatory for each individual to change his or her name when "moving" from one life stage to another, and each name is selected from a finite inventory of names, each of which has a semantic value indicating moiety, gender and life stage. Thus, by knowing the name of an Amondawa person, one can infer these dimensions of their social status.

The principal event which can cause a change of names is the birth of a new member of the family. The new baby will be given a "Newborn" name, and may even assume a name previously held by the youngest existing family member; who then takes a new name. Regardless of the name given to the newborn, all the existing children will acquire a new name. The other situation that can provoke the changing

of names is a change in the role of the individual in the family or in the group. No individual can be a child forever, in other words no-one can have a child name beyond a certain life stage. They have to grow up and assume responsibilities in the family. For example, when an older son changes his name, the father will change his name too. An adult woman will change her name when she is married, and her previous name will go to the youngest sister. (Peggion, 2005, p. 132). The names do not appear to have spiritual significance, and in assuming a new name and new social identity, the individual does not become identified with the personality of previous living or dead bearers of the name. Table 4 gives examples of names in each Amondawa moiety with an indication of their status meanings, although it is important to note that this is only an approximation. Table 4 does not represent the entire name inventory.

Insert Table 4 about here

The Amondawa language also has at least the following generic nouns referring to categories of persons of a particular age (Table 5):

Insert Table 5 about here

Our own and others' research (Sampaio, 1996, Silva, 2000; Peggion, 2005) has not been able to identify any other age-based person categories such as "adolescent". Although we are not fully certain of this, our research to date suggests that there is

only one more general expression, namely *etiawa'ea* ("old", an adjective of quality or state applicable to any object) used for reference to life stage:

1. *Aron jihe etiawa'ea*

   waiting I old (Adj)

   "I am waiting for my old age"

In other cases, life stage is referred to by means of the relevant life stage category, e.g.

2. *a-kuahaw-a-him jie kurumin ga inguarai-awer-a*

   1s.imagine-ger-intens. I child he play-past-nom.

   "Imagining I played as a child"

In summary, the temporal intervals making up human life stages in the Amondawa culture and language are designated in the kinship-related onomastic conceptual system, and to a more limited extent in categories of person of a particular age. They are not related to any calendric or numeric system segmenting "Time as Such", and they are not constituents of either exact or rough quantitative time reckoning.

8. Do Amondawa speakers use space-time linguistic mapping?

Amondawa possesses a rich lexical and constructional repertoire for the conceptualization and expression of location and spatial motion. Here we give only a brief summary. A more extensive comparative and typological analysis, including examples of usage, can be found in Sampaio, Sinha and Silva Sinha (2008). Amondawa largely (though not wholly) conforms to the verb-framed paradigm (Talmy, 1983; 1985; 1991) for expressing motion events, employing path conflating motion verbs, postpositions and adverbs. Motion verbs include the following (NB the verb stem is obligatorily prefixed for person and number):

-ho	go/exit (basic motion verb)
-hem	exit-*xi* enter
-jupin	ascend/climb
-jym	descend

Postpositions, which are obligatory when specifying path of motion in relation to a Ground, include:

pe	at, to, in
pupe / pype	in, inside, into, to the inside
wi	from, out of
re	up, up in, up on, up into, up onto
katy	nearby (stative)
aramo	over, above
urumõ / urymõ	under, below, beneath
pywõ	by, past (path, dynamic)
rupi	along (a path)

Optional directional and deictic adverbs, which can be considered as quasi-verbs, and whose meanings are highly context-dependent, include:

ura	inside the Ground
hua	coming (towards speaker)
awowo	going (away from speaker)

This brief description clearly demonstrates that Amondawa possesses a large inventory of lexical resources in the domain of space and spatial motion, potentially

available for recruitment in space-time linguistic mapping. Constructional resources, as would be expected, are no less richly available: we refer the reader to Sampaio *et al* (2008) for a full account. In the rest of this section, we describe the way in which time relations are expressed in Amondawa.

The linguistic conceptualization and expression of time relations in the Tupi languages of Brazil has been little researched and analyzed, even though descriptive grammars of Tupi languages have a long history. Father José de Anchieta, in his grammar of Old Tupi published in 1595 (*A arte de grammatica da lingua mais usada na costa do Brasil*), noted that past and future were not expressed in verbal tense-marking morphology, but by aspectual modification indicating things and events which have either already occurred or are yet to occur (Leite, 2000). Amondawa has a nominal aspect marking system, in which the termination of nominalized (relations to) things or states in the past, or the expectation of them in the future, is marked on the noun. Muysken (in press) discusses the prevalence in Tupi-Guarani languages of what he designates as Nominal Tense-Aspect-Mood[6], and in other language families including seven other Amazonian families, suggesting that this may be an areal feature (though the phenomenon occurs in some North American, African and Australian languages too). We have not yet analyzed nominal aspect in Amondawa in any detail, and we shall not discuss it further here, except to note that these markers are not derived from any of the locative or motion items listed above, or any others that we have noted. The semantics and pragmatics of Nominal TAM in Amondawa and other Tupi-Guarani languages is clearly an important topic for future research.

Amondawa, in the absence of verbal tense, does not oblige speakers to specify event time, and in many or most cases temporal reference is interpreted (similarly to other Tupi-Guarani languages: Gonzáles, 2005, 154) according to context. However,

when required, the time of an event in the past or future is marked by temporal deictic adverbial particles and dependent morphemes. Future is expressed by *-nehe, pot, poti…nehe*. Past is expressed by *ki…ko, ki…i´i, emo, ramo*. Present or immediate future (now, right now) by *tiro, koro*. These items do not closely specify a reference time, but involve varying degrees of intensification of temporal distance (in the past or future) or of immediacy in relation to the time of utterance.

14. T-aho koro ´i ga nehe
    Rel-*3s-go* *now* *intens.* *he* *FUT*
    he will go out (from here) just now.
    (Proximal Future)

15. Kuaripe taian ´i ga nehe
    dry season *arrive.intens* *he* *FUT*
    He will arrive in the summer (dry season)
    (Distal Future; spoken during rainy season)

16. Da-o-ur-i ki ga ko
    neg-3s-come-neg *PAST* *he* *PAST*
    He did not come
    (Past)

There is at least one word that can be used to designate a temporal reference point. The meaning of the word *ko'emame* approximates to 'tomorrow' or 'the morning of the next day'. This compound word derives from applying a temporal suffix –me ('when') to the noun *ko'ema* meaning 'morning' (see Section 6 above). Note that this suffix is not derived from any of the locative terms listed above, and has no locative

meaning. It should also be noted that *ko'emame* does not distinguish between "tomorrow" and (for example) "the day after tomorrow".

We do not claim that the data we present above, which were taken from questionnaire and elicited narrative data, are exhaustive of temporal terms, or terms that can be used temporally. Furthermore, we suspect that the terms we list above are polysemous; they may (or may not) also express modal, aspectual and evidential notions. Nevertheless, we feel reasonably confident in making two assertions. First, Amondawa speakers are able to (and regularly do) talk about events in the past and future, and to temporally relate events to each other using linguistic and constructional resources. Second, these resources appear not to be derived from the Amondawa lexical and constructional inventory for expressing spatial location and motion.

Of course, relying on limited spontaneous and elicited speech data may lead to the researcher missing evidence for space-to-time mapping, and we also used questionnaire items from our Field Manual (Zinken *et al*, 2005) to ask bilingual Amondawa speakers to provide literal translations of Portuguese expressions such as:

17. O ano que vêm

    The year that comes = the coming year

In all cases the speakers rejected the possibility of using Amondawa motion verbs in Ego-relative temporal motion constructions. Furthermore, when we asked Amondawa speakers to narrate the well-known "Frog Story" (Mayer, 1969; Berman and Slobin, 1994), there was no evidence of the use of locative terms to specify Positional Time, nor of any Positional temporal words corresponding to English 'before' and 'after'.

However, one further task that we administered did yield the use by (in each case below) at least one Amondawa speaker of a motion verb (sometimes with a locative postposition or particle) to describe temporal relations between time intervals.

Task 4 Time landscape game

The task involved the manipulation by the experimenter of paper capsules (or *figures*) that were designated and named by the experimenter as time intervals, with the experimenter using the elicited Amondawa terms reported in Section 6.

Procedure

The experimenter placed one or two figures on a horizontal line perpendicular to the gaze of the consultant, in some cases with a small doll representing an observer situated on the same imaginary line of movement. The experimenter then laterally moved one of the figures along the imaginary line so that it reversed its relative position in relation to the other figure / ego doll. The consultant was simply asked to describe in Amondawa what they had seen.

Results

The following are examples of descriptions produced by the Amondawa consultants:

18. Oho kuara tiro

    3s-go sun now

    The sun/dry season goes

19. akuam kuara

    Cross sun

    The sun/dry season has passed across

20. uhum kuara

Coming sun

The sun/dry season is coming

21. Amana ako kuara renande

Rain be-moving sun in front of

The rainy season is (moving) in front of the dry season

22. Kuara o'an amana renande

sun born rain in front of

The dry season [is] born in front of the rainy season

23. Iputuna´iwa owun ewire

night/dark coming up behind

The night is coming behind (the sun)

It should be noted that all of the above utterances were elicited in situations involving *spatial motion*. It would thus be an unwarranted over-interpretation to claim that the utterances instantiate space-time linguistic mapping. The elicited utterances do, however, clearly demonstrate that there are no lexical restriction rules or other intra-linguistic constraints in Amondawa that preclude the recruitment and use of words with motion and location meanings (which usually interrelate objects) for linguistically conceptualizing and expressing inter-event relations. Furthermore, we have evidence that the apparent absence of conventionalized space-time linguistic mapping in Amondawa is not due to Amondawa speakers being determinedly "literal", or reluctant to analogically extend the meanings of motion verbs, since they readily give Amondawa examples of "fictive motion" constructions (Talmy, 1999).

9. Discussion

Amondawa, we have established, has both a time interval lexicon and a rich lexico-grammatical inventory for spatial motion and spatial relations. This inventory can, under suitable (if artificially induced) conditions be employed by speakers in constructions of the kind that we see in (18) to (23) above, which have the *form* of Ego-relative temporal motion and Positional time constructions, even though they cannot be said to exemplify linguistic space-time mapping. Why then does Amondawa not regularly employ such constructions to conceptualize and express temporal relationships between events, intervals and ego? Why, in short, does Amondawa provide negative evidence for the Universal Mapping Hypothesis?

We would strongly disavow any interpretation of the data that we present that would exoticize the Amondawa by suggesting that they are a "People without Time". The Amondawa, like all human groups, are able to linguistically conceptualize inter-event relationships which are, by definition, temporal. The Amondawa language exhibits a complex nominal aspect system. Speakers lexicalize past and future in temporal deixis. They have cultural narratives of the collective past and mythic narratives, and the lexicon of kinship, social status and personal identity is based on life span developmental time. The Amondawa are not a People without Time, and if we wish to account for the seeming absence in the language of conventionalized space-time analogical mappings, this cannot be sought in a generalized absence of reference to, or thinking about, temporally structured events and relations.

Nor do Amondawa speakers appear to adhere to a principle or "postulate of the the cultural value of immediate experience that constrains grammar and living ... [yielding] an inability in principle to talk about things removed from personal experience" such as that proposed by Everett (2005: 633) for the genetically and

typologically unrelated Amazonian language Pirahã. Everett (2005: 631) specifically proposes that the absence in Pirahã of reference-time (as opposed to utterance-time) based time/tense, as well as "the lack of concern for quantifying time in Pirahã culture" is *a consequence of* the principle of immediacy of experience. Whatever may be the case for Pirahã, the Amondawa have narratives which both relate them to other groups and lend their own community a history and an identity. These narratives link the present day Amondawa to a time before "contact", and in turn to the narratives that were told in those times. Amondawa grammar and Amondawa speech practices for talking about temporally situated and related events cannot, therefore, be derived from the principle of immediacy of experience. We do not have space to discuss Everett's proposals in detail here, except to note suggest that possible areal commonalities in the linguistic conceptualization of time in Amazonian languages, and cultural motivations for these, is a topic that urgently requires further investigation.[7]

Although Everett's principle of the immediacy of experience cannot account for our data on Amondawa, we do agree with his more general thesis of the socio-cultural motivation of linguistic facts and language practices. Our data point unambiguously to the conclusion that Amondawa speakers (at least when "thinking for speaking" in Amondawa: Slobin, 1996) do not conceptualize events as occurring in Time as Such, and do not employ linguistic space-time mapping expressions; it is this that we seek to explain.

In our Western cultural and cognitive world, we are accustomed to the notion that "Time" is an autonomous, abstract conceptual domain. We are not referring here to the phenomenal experience of time, as duration or as a fundamental aspect of events (Bergson, 1910), but about the way in which time is *thought* about and *talked* about.

Our usual cultural presupposition is that time, in this latter sense, constitutes a domain of thought-about, reflective experience, schematized in linear or cyclic terms, that is in some sense independent of the events that occur "in time". It is this abstract conceptual domain that we refer to as Time as Such. A guiding assumption of much current research in language and cognitive sciences (which can be traced back at least to the philosophical reflections of Immanuel Kant (1929 [1787]), is that Time as Such is a universal cognitive category. An important exception to this generalization is to be found in Evans (2004), who proposes that what he calls the "matrix" sense of 'time' (see Note 1)is not universal, and that, consistently with our own data, "Moving Time and Moving Ego are culturally constructed complex cognitive models" (Evans, 2004: 212).

Time intervals based upon Time as Such, of which Levine's "clock time" is but one example, we can refer to as *time-based* time intervals, whose boundaries are constituted by the segmentation of a conceptual time "substance". Widespread though such a notion of the time interval may b, the data we report in this paper, as well as other anthropological research, cast doubt upon its universality. The Amondawa seasonal and diurnal time interval systems, we suggest, exemplify an *event-based* schematization of time intervals. Event-based time intervals are those whose boundaries are constituted by the event itself. In this sense, there is no cognitive differentiation between the time interval and the duration of the event or activity which defines it, and from which in general the lexicalization of the time interval derives.[8] Thus, the event-based time interval cannot be a metaphoric temporal "container" for other events, only an event which coincides with or comprehends other events. We have found that:

a) Amondawa time interval conceptualization is not integrated or coordinated with the two-term, four-number Amondawa numeral system. This fact precludes numeric time reckoning as a cognitive and linguistic practice.

b) The rhythms of the natural world dominate the seasonal and diurnal time interval systems. The prominence of the sun, in terms of the intensity of emitted heat and light in different seasons, and its position in the sky at different times of day, is reflected in language consultants' choice of the lexeme *kuara* 'sun/sunlight' as the nearest Amondawa equivalent term for the Portuguese word *tempo*, 'time', for which no strict translation equivalent exists.

c) Both the seasonal and the diurnal time interval systems involve division and subdivision. The superordinate level of the seasonal system is bi-partite (dry season-rainy season), while that of the diurnal system seems to have two alternative divisional structures, a primary bi-partite one (day-night) and a secondary tri-partite one (morning-afternoon-night). Beneath these superordinate divisions are lower level subdivisions.

d) In both cases it is the subdivision level of organization that is coordinated with the organization of social and, in particular, labour activity, regulating planting and harvesting times and working times during the day.

The seasonal and diurnal time interval systems can therefore properly be thought of as cognitive, cultural and linguistic schemas, but they differ from more familiar calendric and clock schemas in that there is no evidence that they are conceptualized by speakers as being cyclical in structure. Cyclicity is schematically characterized in terms of a circular or orbital path of motion in which "moving time" returns

recurrently to the positions which demarcate the time intervals. None of our language consultants either verbally described a temporal cycle or produced a physical schematic model (installation) that possessed a circular structure. Rather, the schematization seems to be simply in terms of succession, which may be (as we have seen) spatially modelled as a line, though not necessarily a straight one. Amondawa seasonal and diurnal time intervals are best thought of as high-level event categories—"happenings", as it were, in the natural and social world, with which other happenings may coincide, or to which other activities and events are indexed. The event-based Amondawa time intervals are thus related to other events by relationships of succession and simultaneity, not metaphoric "containment".

The third time interval system that we have analyzed above is the conceptual system of Amondawa life stages, as this is reflected in Amondawa onomastic practices and knowledge. Time intervals in this system are conceptually inseparable from the Amondawa kinship and descent system, and form the basis of the social identity of individuals within that system. The names themselves have at least in some cases a meaning derived from gender and social roles, eg *Kunha´pó* derives from *Kunha* ('woman') and *po* ("make/do/work"), "doing as a woman".

The time intervals that co-constitute (with gender and moiety) the onomastic system are not linguistically independent concepts, that is, they are not (or not all) designated by nominals (although there are nouns for child, adult and elder). Hence, we cannot say of these time interval concepts that they are "high level events" in the same way as are the seasonal and diurnal time intervals. In fact, from a linguistic point of view they are implicit or covert categories which are, in at least some cases, lexicalized only in conflation with other (gender and moiety) categories, and then only as personal proper names. Life-stage time intervals are thus even further

removed from the conventional Western conception of a time interval than the event-based seasonal and diurnal time intervals.

Amondawa time bears some similarities to Nuer time as described by Evans-Pritchard. The social and linguistic construction of time is based upon the interplay between ecological facts in the natural environment, and social facts or structures. The basis for social structure time in Amondawa, as in Nuer culture, is twofold: the rhythm of activity, especially work, and the stages of life constructed in social affiliation, although, whereas for the Nuer this is based upon initiation cohort groups, for the Amondawa it is based upon individual "movement" through a kin-defined onomastic system. In the terms that we have employed above, for both Amondawa and Nuer, time intervals are event-based and social, rather than time-based.

There are also two notable differences between Nuer and Amondawa time intervals. First, the Nuer employ what we might call a "quasi-calendar" of 12 months. Nuer months are not strictly lunar (though the Nuer know the lunar cycle), nor based upon any other fixed number of days. Rather, they are conventionally, if indeterminately, based on both lunar and ecological cycles, and the associated rhythm of social activities.

> Nuer would soon be in difficulty over their lunar calendar if they consistently counted the succession of moons, but there are certain activities associated with each month, the association sometimes being indicated by the name of the month. The calendar is a relation between a cycle of activities and a conceptual cycle, and the two cannot fall apart, since the conceptual cycle is dependent upon the cycle of activities from which it derives its meaning and function. (Evans-Pritchard, 1940: 100).

Second, the Nuer months can be enumerated, permitting roughly quantified time reckoning, although "Nuer do not reckon [months] as fractions of a [year] unit. They may be able to state in what month an event occurred, but it is with great difficulty that they reckon the relation between events in abstract numerical symbols." (Evans-Pritchard, 1940: 104).

Nuer time is not the only system of time intervals reported in the anthropological literature that employs lunar months in a non-quantified system. The time interval system of the Ainu culture of Southern Sakhalin, which in other respects (economy, social structure and cosmological time) is quite different from the Nuer system, includes lunar months which regulate ritual as well as trapping and fishing activity. However, "the Ainu are quite oblivious to names of the months as well as the number of months in the year" (Ohnuki-Tierney, 1973: 289), and the Ainu, whose basic number system (non-derived numbers) extends to five, rarely or never reckon time intervals numerically, using the opposition between two or three and the derived number six to contrast short with long durations. In the same sense that we have used this term with respect to the Nuer, we can thus call the Ainu month-year system a "quasi-calendar" of a non-quantificational kind, a characterization which is consistent with Ohnuki-Tierney's conclusion that "the Ainu concept of time is basically qualitative; quantitative measurement of time is little developed. Therefore, no temporal divisions represent measurable units; they are distinguished from other units in the same time scale by the special meaning which the Ainu attach to them." (*op. cit.* p. 292).

Amondawa time intervals do not include months, and time reckoning is entirely absent from the repertoire of cultural practices. We might hypothesize, then, that while both Amondawa and Nuer time interval systems are event-based, the Nuer

system possesses more features potentiating an evolution to a time-based system. Amongst the symbolic resources necessary for the cultural emergence of time-based time interval systems, such as true calendric and clock systems, is the existence of a more elaborate number system than the restricted Amondawa quantificational system. However, comparison with the Nuer case suggests that while necessary, this, in itself, is not sufficient.

What implications does this analysis hold for understanding time as a conceptual domain, and its relationship with space? We advance three linked hypotheses. First, time-based time interval systems and categories are in a fundamental way linguistically constructed, that is, they cannot be "thought" without thinking them *through* language and *for* speaking (Slobin, 1996). The conceptual schematization of time-based time interval systems is not based in pre-linguistic and pre-conceptual image schemas (Lakoff, 1987). Rather, the schemas are actually constituted by the use of linguistically organized, materially-anchored symbolic cognitive artefacts. Second, the conceptual domain of Time as Such is not a human cognitive universal, but a cultural and historical construction constituted by schematized time-based time interval systems, reflection upon which is language and culture dependent. Third, because the cognitive domain of Time as Such is a cultural, historical and linguistic construction, the hypothesis that it is universally constructed by metaphoric mapping from the conceptual domain of space is false. Rather, even if it is the case that space-time mappings are motivated by compelling inter-domain analogic correlation, and perhaps facilitated by neural structure, it is the cultural, historical and linguistic construction of the domain of Time as Such that potentiates the linguistically widespread (but *not* universal) recruitment of spatial linguistic resources for the structuration of the temporal domain.

At this point, a brief excursion into the vexed issue of the Whorfian analysis of Hopi time, and more generally Whorf's formulation of the linguistic relativity hypothesis, becomes unavoidable. Whether or not Whorf's own linguistic analysis of conceptualization and expression of time in the North American indigenous language Hopi was adequate and comprehensive (Malotki, 1983), Whorf noted (in one of his unpublished and unfinished articles; Whorf, 1950: 27) a cultural-cognitive phenomenon in Hopi that bears directly on the topic of this article. The Hopi speaker, he said, "has no general notion or intuition of *time* as a smooth flowing continuum in which everything in the universe proceeds at an equal rate, out of a future, through a present, into a past; or, in which, to reverse the picture, the observer is being carried in the stream of duration continuously away from a past and into a future." In other words, he claimed that Moving Ego and Moving Time construals were absent in Hopi, just as we claim that they (and Positional time construals) are also absent in Amondawa. Recent experimental demonstrations of Whorfian or Whorf-like effects in linguistic space-time mapping (eg Borodistsky, 2001; Casasanto, in press a,b) make the tacit assumption, on the contrary, that linguistic space-time mappings are universal, differing between languages in their orientation and directionality.

It is also worth noting that the recent Whorfian research on space-time mapping also demonstrates the powerful influence of experimentally induced contextual variation on response patterns—what we might profitably call Vygotsky-Luria effects (eg Vygotsky, 1978). Seen from this perspective, Whorfian effects are best understood as *linguistically entrenched Vygotsky-Luria effects based in semiotic mediation*; and they exemplify an *influence* of linguistic structure and habitual linguistic practice upon non-linguistic construals. Such effects of language on thought (as Casasanto, in press b points out) in no way imply an absence of universal

cognitive capacities. In fact, our data clearly demonstrate that even when entrenched, habitual, regular linguistic space-time mapping is *absent*, the cognitive capacity for construing temporal concepts in terms of spatial arrays is present in Amondawa speakers; indeed the tasks that we administered *depend upon* the language informants' capacities to make such construals. Our hypothesis, quite explicitly, does *not* propose any generalized absence of the capacity for cognitive space-time mapping on the part of speakers of Amondawa (or any other human group).

In short, our hypothesis is that the domain of Time as Such is not a cognitive universal, but a historical construction based in social practice, semiotically mediated by symbolic and cultural-cognitive artefacts for time based time interval reckoning, and subsequently entrenched in lexico-grammar. Linguistic space-time mapping, and the recruitment of spatial language for structuring temporal relations, is consequent on the cultural construction of this cognitive and linguistic domain. This hypothesis, if true, has more general implications. If we are to abandon universalism, we also need to re-examine the notion of cultural evolution and its place in language and cognitive variation, without postulating universal, pre-determined pathways, and by situating language and cognition in the social ecology of what Bourdieu (1977: 86) called *habitus*: "a subjective but not individual system of internalized structures, schemes of perception, conception and action common to all members of the same group."

Conclusion

We challenge, on the basis of research on the Amondawa language and culture, the widespread assumption that linguistic space-time mapping is universal (the *Universal Mapping Hypothesis*). We propose an alternative account that can be formulated as

the *Mediated Mapping Hypothesis* (MMH), consisting of the following sub-hypotheses:

a) The widespread linguistic mapping (lexical and constructional) between space and time, which is often claimed to be universal, is better understood as a "quasi-universal", conditional not absolute.[9]

b) Though not absolutely universal, linguistic space-time mapping is supported by universal properties of the human cognitive system, which (together with experiential correlations between spatial motion and temporal duration) motivate linguistic space-time mapping in linguistic conceptualization.

c) The linguistic elaboration of this mapping is mediated by number concepts and number notation systems, the deployment of which transforms the conceptual representation of time from event based to time based time interval systems; yielding the culturally constructed concept of Time as Such.

d) The conceptual transformation of time interval systems by numeric notations is in part accomplished by the invention and use of artefactual symbolic cognitive artefacts such as calendric systems.

e) Whether or not the concept of Time as Such is lexicalized, the framing and schematization of events as occurring “in Time as Such” is a precondition for the evolutionary development of linguistic (metaphoric) space-time mapping constructions. It may be that such framing is also a precondition for the emergence of event time-referenced (as opposed to utterance time-referenced) tense systems, but this latter sub-hypothesis requires extensive further investigation.

This account, we stress, is hypothetical, derived from the case study evidence that we present in this article, and while it is consistent both with our own and others' evidence it stands in need of extensive testing based upon a larger database of detailed research both in Amondawa and in other related and unrelated languages.

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[1] There is no consensually recognised terminology for referring to what we here call Time as Such. Peter Harder (pc) has suggested the term "Platonic Time", but this has connotations of a Form independent of human practice, while we emphasise that the abstract notion of Time as Such is specifically a consequence of cultural and cognitive practices of its measurement, and that its abstraction from such practices *depends upon* its symbolic organization and material anchoring. Kevin Moore (pc) has suggested that it is equivalent to Evans's (2004: 141) "matrix sense" of time. We agree with this, but emphasize that Time as Such is a concept that covers not only the nominalised abstraction but also the schematic framing; indeed we suggest below that the former is *derived* from the latter.

[2] We restrict this discussion to time interval systems, rather than attempting to address the much wider topic of the anthropology of time in general. For reviews, see Gell (1992), Munn (1992).

[3] *Amondawa* is not the original pre-contact self-designation of this community, but is now the community usage.

[4] The original indigenous name is *Kanideia*, but the term *arara* has become common usage post-contact.

[5] The standard version of the Field Manual (Zinken *et al.* 2005) is written in English but was translated by the field researchers into Portuguese.

[6] Not all Tupi-Guarani languages mark aspect on the noun: some have a more familiar verbal aspect system (see eg Gonzáles, 2005).

[7] See the response to Everett by Gonçalves, 2005; and a posting made by two of the present authors to The Linguist List (Silva Sinha and Sinha, 2007).

[8] The event-based time interval may be characterized as a change of state (eg 'sunrise'), as a stative event attribute (eg Amondawa *ara*, 'daylight'), or as an activity. The lexicalization may be metonymic or "pars pro toto", as in Amondawa *pojiwete*, 'when we start work, morning' (Whitrow, 1988: 15).

[9] A conditional universal is implicational in the sense that if A is conditional upon B, the existence of A implies the existence of B.

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Plate 1: One participant's representation of the Amondawa year.

Figure 1: The Amondawa Season Schema

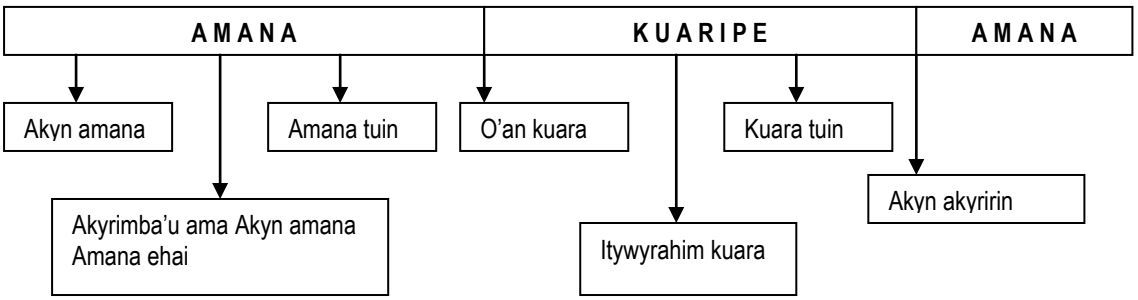

Table 1: Amondawa temporal reference terms

Nominals with temporal meaning	**English translation**
Kuara	Sun
Jahya	Moon
Ipytuna	Night, Black
Ko'ema	Morning
Ko'emameme	"Tomorrow"
Other time words	
Koro, koroite	Today, now, right now
Tiro	Today, now, right now
Tirove	Today, in the past (earlier today)
Awo	Here, now
Kiko	Past

Table 2: Amondawa seasonal time interval words

AMONDAWA	**ENGLISH**
Kuaripe	**Time of the sun ("SUMMER")**
O´an kuara	"The sun is born". The arrival of the sun (beginning of the time of the sun).
Itywyrahim kuara	"Burning sun". Very strong, hot sun, high summer.
Kuara Tuin *Or* *Akyririn Amana*	"Small sun". End of the time of the sun. "Almost rain". The time of falling rain is close.
Amana	**Rain / Time of the rain ("WINTER")**
Akyn Amana	"Falling rain". The arrival of the rain.
Akyrimba´U Amana *Or* *Amana Ehãi*	"Heavy falling rain". Time of the heavy rains. "Long rain". Rain of long extent and duration.
Amana Tuin *Or* *Akyririn Kuara*	"Small rain". End of the rainy season. "Almost sun". The time of the sun is close.

Table 3: Parts of the day in Amondawa

Ara or ajia	**Day (daylight)**
Ko´Ema	**Morning**
Pojiwete	"When we start work". Early morning.
Kojawahim	"When we feel hungry".
A´U Matera	"When we eat". Lunchtime.
Ajia Katua *Ajimbu´U*	"Good morning time". After lunch. "Heavy morning" Late morning.
Pyriete Kuara Ruwi *Ajia katua*	"The sun is high" High noon.
Karoete	**Noon; afternoon**.
Pyryrym Kuara	"The sun is turning". Early afternoon.
Momina Werin Kuara	"The sun is almost gone". Late afternoon, dusk.
Momina Kuara	"The sun is gone". Early evening. Twilight.
Iputuna	**Night (black)**
Opon Jahya Tiro	"The moon jumps up now". Moonrise.
Apehyiahim	"No more work intense". Sleep time.
Apoji Katua *Ypytunahim*	"Good …. " "Intense darkness" Middle of the night.
Pyriete Jahya Ruwi	"The moon is high in the sky".
Jahya Pyryrym	"The moon is turning". Dawn is coming.

Ko´Ema Werin	“Almost morning”. Dawn.
Opon Kuara Tiro	“The sun jumps up now”. Sunrise.
Ko´ema	**Morning**

Table 4: Amondawa names and life stages

Arara (F)	**Arara (M)**	**Mutun (F)**	**Mutun (M)**	**Life stage**
Tape	*Awip*	*Morãg*	*Mbitete*	Newborn to toddler
Potei	*Tangãe*	*Pote´i*	*Kuembu*	Child to pre-adolescent
Poti´I	*Pure- Tebu*	*Mbore´i*	*Koari*	Adolescent (from puberty)
Kunhate	*Juvipa*	*Mboraop*	*Tarup*	Young adult
Mande´I *Adiju* *Umby*	*Purap* *Mboria* *Mboria*	*Mboropo* *Kunha´pó* *kunhaviju*	*Yvaka* *Moarimã* *Mboava*	Adult
Mytãg	*Jari*	*Mbore´a*	*Uyra*	Elder

Table 5: Generic nouns referring to categories of persons

Kurumin	Baby/child
Kwambáea *Kuñã*	Man Woman
Amu *Tiwi*	Old man Old woman