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# Sommario

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# Spatial Frames of Reference in aṣ-Ṣāniᶜ Arabic:
# Preliminary Observations
# of Language-to-Cognition Correlation

Lₑₜᵢzᵢₐ Cₑᵣqᵤₑgₗᵢₙᵢ

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I compare linguistic and cognitive representations of projective spatial relations in traditional aṣ-Ṣāniᶜ Arabic (TAA), i.e., application of spatial frames of reference (FoRs). TAA uses all three FoRs in language, selected according to properties of Ground objects (Gs). Absolute FoR is used with non-prototypical arrays and unknown Gs. It is anchored in cardinal directions or prominent landmarks, according to task. G-based FoR selection is absent from cognition, where only the Absolute FoR is applied. Since Bedouin languages use Absolute FoR, recognizing saliency to astronomical directions, I hypothesize the primacy of the astronomically anchored Absolute FoR, as in TAA cognitive bedrock, with respect to other FoRs later developed by language. Deterministic claims on the innovative position of language with respect to cognition are confirmed, yet TAA language-to-cognition mismatch indicates prevention or delay in achieving mutual isomorphism.

Kₑʏᴡᴏʀᴅs: Frames of reference, language-to-cognition correlation, aṣ-Ṣāniᶜ Arabic.

## 1. *Universalism and Relativism: Language-to-Cognition Correlation*

I present here results of linguistic and cognitive tests conducted on spatial representations among the aṣ-Ṣāniᶜ Bedouin tribe in the Israeli Negev. Aṣ-Ṣāniᶜ Arabic is a tribal variety of Negev Arabic (Blanc, 1970; Henkin, 2008, 2010) that belongs to the Northwestern Arabian Ḥijāzi type. Speakers of aṣ-Ṣāniᶜ Arabic, who are part of the Gderāt tribal confederation, live northwest of Beer-Sheva, in the Bedouin village of Liqiyyih, founded in the 1970s on a portion of their tribal land. A very important factor that makes Bedouin communities particularly interesting for fieldwork investigation is the striking genetic, ecologic, and cultural continuity, a very favorable condition for the most recent coevolutionary trajectories of typological studies

(Levinson *et al.*, 2011; Levinson and Gray, 2012; Levinson and Dediu, 2013; Levinson, 2013). In particular, such strong continuity is guaranteed by strict endogamy, manifested in a customary law according to which Bedouin males preferably marry the daughter of the paternal uncle (*bint al-ʕamm*). This practice endures in the present as the most common rule for matching couples (Sacchi, 2003). Furthermore, customary practices survive in the selection of partners. This net of social constraints impedes the formation of couples of different origins, separating first of all different tribal confederations (Tiyāha, Tarābīn, ʕAzāzmih, Z̲ullām), and within them, the noble tribes – *al-ʔaṣliyyīn* or *sumrān* (Henkin, 2010) – from the non-noble ones (*al-ḥumrān*), originally protégés; and those from the slaves, the clients, and other protégés. These invisible, yet still effective, processes of preservation maintain in the present a very complex and multifaceted traditional society. Shifting from nomadic to sedentary lifestyle, social conservatism has led Bedouin communities to organize their settlements according to the pattern of familiar affiliation, for the practical reason that related household heads possess contiguous lots of land. Indeed, Liqiyyih is largely inhabited by the members of the same aṣ-Ṣāniʕ family, comprising many nucleuses, and called *ʕišīrih*, which together possess the land inherited from their great-grandfather, with the addition of some families affiliated to the aṣ-Ṣāniʕ as former servants or clients and protected.

The linguistic profile of the community can be described as a dialectal variety of Negev Arabic, with some peculiar phonological traits – such as strong, conditioned *imāla* – that make the aṣ-Ṣāniʕ community immediately identifiable among other Negev Arabic speakers. Other tribal varieties of Negev Arabic have been described by Blanc (1970), Henkin (2010), and Shawarbah (2007; 2012). Despite «dialectal, socio-linguistic and stylistic variation» (Henkin, 2010), Negev Arabic tribal varieties are mutually understandable.

This article focuses on the language of the aṣ-Ṣāniʕ elders, which I label Traditional aṣ-Ṣāniʕ Arabic (henceforth TAA). Younger generations speak a very levelled variety, koineized with rural and urban Palestinian varieties. Ongoing processes of urbanization and linguistic levelling in new, tribally mixed towns, the acquisition of literacy in standard Arabic, and Hebrew contribute greatly to linguistic and cultural change.

I focus here on the comparison between linguistic and cognitive representations of spatial frames of reference (FoRs) in order to contribute to the debate over the relationship between language and cognition, which

is enshrined within the more complex question regarding the universal vs. linguistic-relative nature of concepts.

Language and nonlinguistic mental activities are undoubtedly corre-lated. How and to what extent this correlation is expressed are questions not likely to be incontrovertibly solved. Languages differ in the way they constrain speakers in attending to and encoding different aspects of real-ity (Sapir, 1921; Slobin, 1996; Boroditsky, 2006) and possibly lead to the existence of different kinds of minds and world experiences. According to Whorf (1956), languages shape non-linguistic mental activity (habitual thought) and experience (reality) according to their distinctive categories. Whorf's Linguistic Relativity assumes that non-linguistic representations are not innate, but rather emerge from the use of certain linguistic expres-sions (Gumperz and Levinson, 1996; Levinson, 1996a; 1997; Lucy, 1992). This radical view has long been abandoned in favor of light deterministic claims (Bowerman, 1996; Davidoff *et al.*, 1999; Dehaene *et al.*, 1999; Boro-ditsky, 2001) and rejected by some who maintain the validity of universal and innate concepts (Li and Gleitman, 2002).

Universalism claims that cognitive and linguistic representations are basically the same across languages and cultures, with the exception of superficial variations (Hayward and Tarr, 1995; Landau and Jackendoff, 1993; Landau, 1996; Logan and Sadler, 1996; Miller and Johnson-Laird, 1976; Munnich, Landau and Dosher, 2001; Regier, 1996; Regier and Carl-son, 2001). The two functions are somehow linked so translation from one system to the other is possible (Fodor, 1975; Jackendoff, 1983). Within Universalism, linguistic representations are treated as truth-conditional (Svorou, 1994: 3), i.e., as representations of an 'objective world' that actu-ally exists. Domains that are universally experienced yet differently rep-resented by speakers of different languages, e.g. space, time, grammatical gender, color, shape, and substance are favorable testing grounds for this debate between innate universal structures and language-based relativistic constraints (Boroditsky, 2006).


## 2. *Variation in Spatial Representations*

Space is a subject of particular interest because of its fundamental im-pact on the development of other cognitive domains. Theorists of metaphor-ical mechanisms for cross-domain semantic transposition (Lakoff, 1980;

1993) assumed the derivation of temporal concepts from spatial ones to be biologically determined. These speculations relied on assumptions regarding the existence of spatial concepts modeled as universal intuitive categories (Kant, 1768) preceding linguistic capability and simply reflected in it. The Kantian lesson of transcendental concepts did not assume that language has an active role in structuring mental concepts or organizing experience, just as Universalism holds.

Nevertheless, analysis of verbal, nominal, and adpositional linguistic strategies of semantic representation have revealed extraordinarily wide cross-linguistic variability (Mithun, 1999: 142). The discovery of striking cross-linguistic variation in the domain of space sparked renewed interest in the relationship between language and cognition, leading to a revival of Sapir-Whorf notions within new relativistic paradigms (Marotta, 2010).

The specific non-linguistic knowledge of the environment we live in could be conceptually structured in the brain according to specific salient linguistic features. Memory, route-finding, non-verbal communication, and sensory-motor activities should vary according to the categories encoded in the spoken language (Jackendoff, 1983; Langacker, 1986).

In particular, Haviland (1979; 1993; 1998) working with the Guugu Yimithirr community in Australia, reported that in their language, the human body is not used as the origin of the axes in locative expressions such as in front of/behind/right/left. Rather, cardinal directions (north/south/east/west) are consistently used. This framing strategy was later labeled Absolute FoR, and it works according to the example in Figure 1, in which the position of the cat relative to the car is represented by the utterance: *the cat is east of the car*. The primitiveness, innateness, and universal availability of axial oppositions based on the human body, such as right/left and front/back axes, was no longer sustainable.
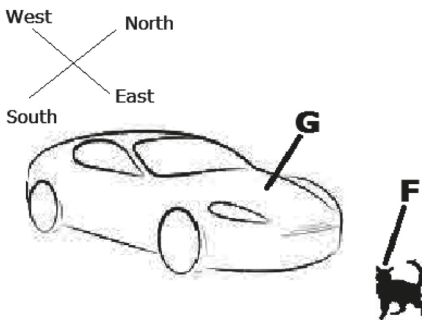


Figure 1. *The Absolute FoR:* The Cat is east of the Car.

The Guugu Yimithirr data were later implemented by an analogous situation reported by Brown and Levinson (1993) among Tzeltal Mayan speakers, who use the geomorphic indicators *uphill/downhill* to locate objects in space. Together with

Mopan, these languages represented the first reported examples of the fact that sensitivity to orientation across the lateral dimension of the human body is not a necessary component of human mental activity, but rather a «cultural [construct] facilitated by language» (Danziger, 2001: 217).

The discovery of the Absolute FoR had tremendous impact on behavioral, cognitive, and psychological sciences (Marotta, 2013), decisively contributing to the beginning of the neo-Whorfian renaissance (Danziger, 2001: 200). Levinson's (1996a; 2003) cognitive experiments proved linguistic structures prime speakers of languages that use Absolute framing to constantly orient themselves, experience and memorize scenes in Absolute terms, while speakers of European languages, who do not use cardinal directions in small-scale location, do not. Molyneux's long-debated philosophical question (Levinson, 1996b) seemed thus to have found a definitive answer, confirmed by later studies carried out on a congenitally blind population, which structured its world knowledge not via physical experience (visual perception), but rather on the basis of spoken language (Marotta, 2013). In the last thirty years, many voices from different perspectives have animated the debate on the effects of language on experience, yet the basic questions regarding the possible existence of a core universal mind and the limits of linguistic constraints (Boroditsky, 2006) have not yet been comprehensively answered.

This article contributes to the debate on the relationship between language and cognition with recent data from extensive fieldwork conducted between 2012 and 2017 on linguistic and cognitive spatial FoRs in TAA. Particular attention is devoted to the Absolute FoR in use in daily language and small-scale location in TAA language and cognition, with surprising differences between both functions that have not been detected in any other language to date.


## 3. *Spatial Frames of Reference*

FoRs are semantic and cognitive strategies used to project coordinate systems onto spatial arrays in order to linguistically describe and cognitively locate objects (Figures, Fs) in relation to reference objects (Grounds, Gs), with Fs and Gs spatially separated in the horizontal or vertical dimension. Here, only the front/back axis on the horizontal plane is investigated.

By means of FoRs, the space surrounding Gs is partitioned into distinct

regions where Fs can be located. If someone says *the cat is in front of the car,* the listener will look for F-cat in the region of G-car associated with the English prepositional expression *in front of,* i.e., the front region of the car. Regions can be conceptualized as search areas (Svorou, 1994) or thought of as differentiated visual angles of the horizontal plane, whose origin is centered on G. FoRs are thus conceivable as criteria for the assignment of spatial regions.

Prepositions are labels attributed to the different regions. They are organized in armatures, definable as systems of region names, such as front, back, and side of a certain G. The term 'armature' is used by Levinson (2003) in relation to the inherent partition of a body into regions that can be carried out according to an animal-body-like frame, a human-body-like frame, or other kinds of specific frames.

According to Levinson (2003), FoRs are of three types: Intrinsic, Absolute, and Relative. In the Intrinsic FoR, the coordinate system radiates from G. *Marc is in front of the house* means that Marc (F) is in the region projected from the inherent front part of the house (G). In order to become the center of the coordinate system, G must show some clear inherent functional or geometric asymmetry. A house has an inherent front, where the main access point is located; but symmetrical objects, such as a ball/tree, are generally less eligible for this strategy, and are potentially more likely to prime one of the remaining two FoRs. The G-centered strategy has been called also 'object-centered' FoR (Marr, 1982), 'inherent strategy' (Tanz, 1980), and 'non-deictic strategy' (Hill, 1982).

The coordinate system of an Absolute FoR is derived from some environmental gradient or feature that provides fixed bearing throughout space. This external source is called the anchor (A), and coordinates are derived from it (Levinson, 2003; Danziger, 2010). An anchor can be identified in cardinal directions (north/south/east/west), e.g., *Marc is north of the tree*, or in relation to a local landmark, e.g., *Marc is on the river-side of the tree*, meaning that Marc (F) is on the side of the tree (G) closer to the river (A).

In the Relative FoR, the body of the observer (O) is the A. *Marc is in front of the tree* means that Marc (F) is in a region of space contiguous to that part of the tree (G) where O's front is projected. This FoR is easily primed by Gs such as trees, poles, or balls, which lack Intrinsic salient asymmetry on the front/back axis, so that some salient asymmetry has to be mapped onto them from an external source. The O-centered strategy has been also called 'viewer-centered FoR' (Tanz, 1980; Marr, 1982) and 'deictic strategy' (Hill, 1982). The Relative FoR can be applied according to three different strat-

egies of projection: 180° Rotation, Reflection across the frontal transverse plane, or Translation. These strategies are demonstrated in Figure 2:
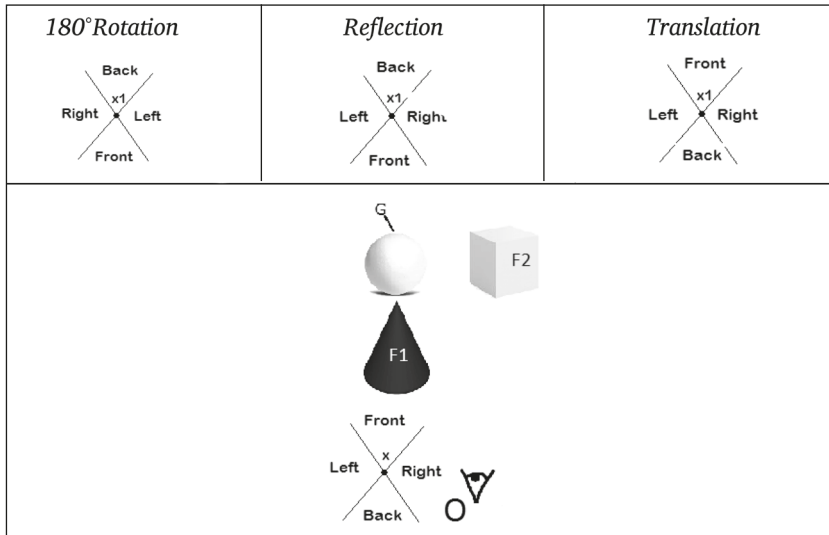


Figure 2. *Transfer of Observer-Centered Axes (X) onto the G-Object (X1).*

The figures (F1) and (F2) are a cone and a cube respectively. G is a sphere. According to the rules of 180° Rotation, whereby the X axial system has been turned 180° to become X1, one sees that *the cube is to the left of the sphere* and *the cone is in front of it*.

Reflection transfers the coordinates from O (X) to G (X1), leaving right/left unchanged, as when one faces a mirror, so now *the cube is to the right of the sphere* and *the cone is in front of it*.

Translation treats the X1 axial system as a direct replica of X, so now *the cube is to the right of the sphere* and *the cone is behind it*. The strategy of Translation, rare in Western languages, is generally called the 'Hausa System' after Hill's (1982) contrastive description of Hausa and English spatial languages.

## 4. *Notes on FoR Theory*

### 4.1. *Prepositional Polysemy across FoRs*

Prepositions happen to show polysemy with respect to the position of the region with which they are associated, so an English speaker saying: *the*

*cat is in front of the car* could be working out two different situations, which I show in Figure 3:



Figure 3. *Two different Ways to process the Sentence* The Cat is in front of the Car *in English.*

In Figure 3, Image 1, the front region represented by 'in front of' is interpreted Intrinsically. The front region is seen as an inherent part of the car, i.e., the one associated with t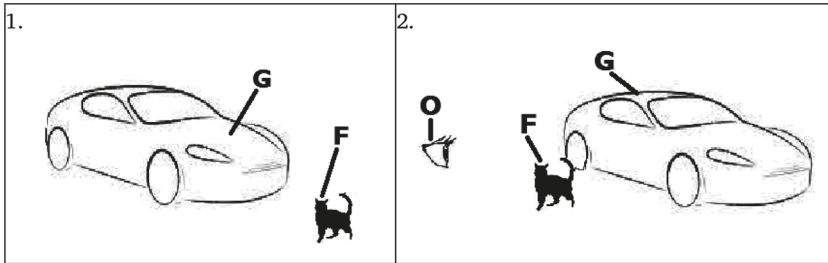he direction of the movement. In Image 2, O imposes its own perspective on the entire array, despite the existence of inherent facets of the G-car. In such a case, the Relative FoR is used and any part of the car (even back and sides) can be associated with the front region. Thus, in English the different spatial meanings of the preposition 'in front of' depend on where the front region is projected in relation to the G-object. In other words, 'in front of' depends upon the point of view the speaker adopts. If the observation's *origo* is the speaker himself, any side of the car can be the 'front'. If, on the contrary, the car acts as the 'objective' point of reference, 'in front of' can refer only to the functional, inherent front of the car. So, the meaning of the prepositional expression 'in front of' depends on the FoR selected.

According to Bowden's (1992) theoretical assumptions regarding the grammaticalization of spatial prepositions in Oceanic languages, projective prepositions like the English 'in front of' and 'behind' can be defined as polysemic elements, since they are used in accordance with different FoRs. They present «distinct senses [that] all belong to the same grammatical category» (Cablitz, 2006: 310).

Polysemy also occurs within the Absolute FoR. In the same language, cardinal prepositions (north/south/east/west) can be anchored in landmarks, and landmark-based prepositional armatures (uphill/downhill) can be anchored in astronomical directions. Polysemy in cardinal prepositions is observable in the Northwestern Ḥijāzi Arabic dialectal family, to which

Negev Arabic, which includes aṣ-Ṣāniˁ Arabic, belongs. The term *giblih*, meaning the direction of the prayer toward Mecca, shifts to mean "south". This anchoring is due to the position of the tribal homeland of Northwestern Ḥijāzi speakers, who settled north/northwest of Mecca. The word *giblih* alternates freely with *janūb ~ jinūb*, "south" in all Negev Arabic dialects. In contrast, Galilean Bedouin keep the meaning of *janūb* "south" and *giblih* "Mecca" separate, because they originate from the Syrian *jazirah*/Northeastern Arabia. Analogously, the same *giblih* means "north" in Yemenite Arabic dialects, spoken south of Mecca.

Human-body based armatures can be anchored in cardinal terms. In the language of Aymara, the human-body-like armature constituted by 'in front of' and 'behind' is anchored in the east/west axis. Thus, in order to convey the meaning 'east of', the Aymara say 'in front of', while to convey the meaning 'west of' they say 'behind' (Nuñez and Cornejo, 2012).

The Absolute anchoring of body parts is observable in Akkadian, in which the words for "east" and "west" are *pani* and *axarātu*, respectively. *Pani* comes from the Semitic root P.N.Y, producing in Hebrew *panīm* "face", *li-fney*, "before" and *panā*, "to face toward". *Axarātu* comes from the Semitic root ʔ.X.R, which produces ʔ*axarey*, "behind"/"after" in Hebrew and ʔ*āxir* "last" in Arabic. In Akkadian *pani,* "front" and *axarātu*, "back" body parts have been anchored in cardinal directions.

The association of 'face' with 'east' and 'back' with 'west', similar to what is mentioned above regarding Aymara and Akkadian, must be very primeval in Arabic as well. Indeed, 'right (hand)' comes from the root Y.M.N and 'left (hand)' from S².M.L. The name for Yemen, the southernmost land of the Arabian Peninsula, and *šimāl*, the Arabic word for "north" come from the same roots respectively (Cerqueglini and Henkin, 2017a).

The right side comes to be associated with the south and the left side with the north only when a person faces east, with the west behind his back. The association of 'face' with 'east', reflected in the etymology of the Akkadian words, provides the anchoring point for understanding the probable secondary development of the north/south axis, derived from the human body-based right/left axis in the Arabic *Sprachraum*: here the terms for "east", *šarg* and "west" *ġarb* have no etymological connection to bodily armatures, meaning "sunrise" and "sunset" respectively.

TAA shows contiguity between body armatures and cardinal directions in linguistic communicative tasks carried out inside a traditional Bedouin tent. Bedouin tents are, without exception, erected with the entrance facing

east, so that 'east' and 'front' coincide in its armature. Inside the space of the tent TAA uses *giddām*, "in front" and *wara* "behind" meaning 'east' and 'west', respectively, as I show below (Figure 12).

Furthermore, in TAA cognitive tests, the Intrinsic FoR appears in some special contexts next to the almost exclusively dominant Absolute FoR. This is due to the presence of an artificial landmark, in form of a cone, intentionally reminding the subjects of a mountain, suitably positioned on the experimental desks and called 'Intrinsic primer', as in Li and Gleitman (2002), to trigger Intrinsic responses (Figure 19).

### 4.2. *Establishing FoRs' Inventory*

Before the discovery of the Absolute FoR, Intrinsic and Relative FoRs were regarded as the only possible universally available strategies, as European languages are provided with both strategies, and switch almost freely among them. Front/back and right/left axial oppositions were thought of as essential for human spatial processing (Clark, 1973; Miller and Johnson-Laird, 1976; Olson and Bialystok, 1983; Piaget and Inhelder, 1956). The development of the Relative FoR was regarded as entailing the previous development of the Intrinsic FoR, considered the first to be acquired by children (Johnston and Slobin, 1979). Studies on vision (Carlson-Radvansky and Irwin, 1993; Marr, 1982) confirmed the existence of perspectives in spatial observation that exclusively represented the Intrinsic or Relative strategies (Levinson, 2003: 70). The Relative FoR was thought of as being largely predominant, since front/back and lateral axes would be derived from the oppositions experienced along the axes of O's human body. The order of acquisitions of spatial representations was supposed to proceed from topological relations to Intrinsic and Relative FoRs, paralleling the metonymical-metaphorical processes of grammaticalization described in Svorou (1994). Grammaticalization of projective prepositions was regarded as a process of abstraction from concrete lexical meanings to extensively applicable relational meanings, a semantic change that proceeds along predictable paths of cross-linguistic universal tendencies (Svorou, 1986; 2003; Heine, 1997).

Elements of analogy and conceptual contiguity between Intrinsic and Relative FoRs are still being debated, with special attention to anchoring strategies (Danziger, 2010). In the Intrinsic FoR, A = G, in the Relative FoR, A = O (Carlson-Radwansky and Irwin, 1993; 1994; Carlson-Radwansky

and Logan, 1997; Li and Gleitman, 2002; Mishra, Dasen and Niraula, 2003; Wassman and Dasen, 1998) or A=Listener. Levinson (2003) proposes a new subdivision in which the Relative FoR only defines those cases where G≠O. Thus, *the ball is in front of me*, formerly considered Relative, is Intrinsic in Levinson (2003), because G=O, i.e., the strategy is binary (F; G/O).

The Absolute FoR has also undergone attempts at re-classification, so, e.g., in Bohnemeyer (2011) the Levinsonian Absolute FoR is distinguished from landmark-based and geomorphic FoRs, a new Direct FoR (Relative FoR with O=G) is distinguished from both Relative and Intrinsic FoRs, and different strategies for abstracting Intrinsic armatures from matrix-objects and projecting them onto G-objects are described. Levinson's (2003) classification is followed here.

## 5. *FoR-based Typologies*

In order to test the hypothesis of similarity between linguistic and cognitive representations, languages have been classified typologically as predominantly Relative-framing, Intrinsic-framing, or Absolute-framing. The dominant FoR in language has repeatedly been proven to appear in cognitive responses (Levinson, 2003).

Since in cognition one FoR seemed to always be largely and clearly prevailing, the presence of more than one FoR within a language was conceptually explained by postulating that one FoR had to be dominant in every linguistic group, as a 'default perspective', and this is the FoR that affects the cognitive experience.

The existence of multiple referential strategies in a single language is attested to – for Intrinsic and Relative FoRs – by a long tradition of studies on language acquisition in Western languages (Piaget and Inhelder, 1956; Talmy, 1983; Landau, 1996; 2010). The definition of default perspective is invoked to conceptually reconcile the existence of multiple referential strategies in a single language and the deterministic influence of language on the cognitive level.

Levinson invokes situation-based selection, leaving open the question of whether it is due to task-specificity or rather to selective criteria other than tasks. «In the case where more than one frame of reference is available, one may find one frame of reference preferred for one situation, and another for another situation» (Levinson, 2003: 179). In fact, Levinson proposes that

task-specificity affects the selection of referential strategies to different extents in different languages:

In certain cases, like Tzeltal and Guugu Yimithirr (...) the linguistic resources are very constrained (...) Tzeltal only uses the intrinsic/topological system for objects close in space. In other cases, though, classifying communities by linguistic resources as opposed to language use will give a different typing – for example in English or Dutch, both Relative and Intrinsic frames of reference are available and colloquially used, but the Relative frame is clearly predominant for most kinds of spatial description. (Levinson, 2003: 179)

According to Tversky (1996), the actual employment of one or another of the FoRs depends on the properties of the task – e.g., the scale of the things to be described, the use of the information, and so on. Nevertheless, many different referential systems have been described whose complexity is not reducible to the hypothesis of one dominant default perspective in each language selected among the three main referential strategies.

The complexity of type-mixing referential styles (or 'referentially promiscuous languages'; Bohnemeyer, 2011) has opened up new perspectives for the study of the development, conceptual contiguity, and contextual selection of referential strategies beyond typological classification and deterministic claims.


6. *Methodology and Scopes*

Ten men and ten women over age 65 were chosen as informants, representing the traditional language. Non-verbal stimuli were used to test language and cognition separately. They were inspired by the methodological canon developed by the Max Planck Institute for Psycholinguistics to test semantic and cognitive typology: De León's photos of natural objects, 'Man and Tree Pictures' (Levinson, 1992), and 'Ball and Chair Pictures' (Bohnemeyer, 2008; O'Meara and Pérez Báez, 2011). I used printed pictures, images shown on the computer screen, toys, and real objects to represent spatial arrays. Stimulus tools represented familiar and unfamiliar objects, differentiating between traditional and modern lifestyles.

Linguistic tests were performed as the interaction between interviewer (I) and speaker (S=O), one speaker at the time. I repeated the test question *wīn F min G*?, "where (is) F in relation to G?" for each array I submitted to

S, imposing my selection of Gs. Arrays were shown both on computer screen and in real life, both as pictures and as three-dimensional toy objects. The same array was tested three times, while I changed my position within the experimental setting in order to prevent S from considering me an anchor. The three times were non-consecutive, in order to prevent effects of sequential motion, such as *F moved away from G*.

In cognitive tests, the question under experimental review was whether differences in the spatial linguistic patterns predicted differences in cognitive performance. Informants were requested to perform their responses in non-linguistic ways, i.e., by manipulating the stimuli. Each informant was tested separately.

Here I report and discuss only the outcomes of the experiments of the Reconstruction and Recall types. Memory tasks, which I conducted in accordance with the design in Levinson (2003), show some peculiarities that deserve to be treated more extensively in a different paper and will not be discussed here. Reconstruction tests were performed using three-dimensional toy objects, while Recall tests were performed using pictures.

My basic methodological pattern was the rotation paradigm, described in Brown and Levinson (1993), Pederson *et al.* (1998), Li and Gleitmann (1999), and Levinson (2003). According to this paradigm, between stimulus and response, the informant is rotated by 90° or 180°.

### 6.1. *Reconstruction Task*

I adapted this task from the 'animals in a row' paradigm in Brown and Levinson (1993). The informants memorize the positions of three animals, arrayed in a line in front of them on Table A. The animals are then removed from view. After 40 seconds' delay, the subjects are turned around or escorted to Table B, oriented differently by 90° and by 180°. There, the subjects are handed the three original animals in random order and asked to position them 'in the same way as before'.

Responses can be of Intrinsic, Relative, or Absolute types.

The 180° rotation paradigm tests of Relative vs. Absolute responses are shown in Figure 4.

If, on Table A, the animals had their noses facing north, which happens to be to the right of the informant facing the stimulus, s/he can set up the animals on Table B still facing north, the Absolute solution, or still facing her/his right, the Relative solution.
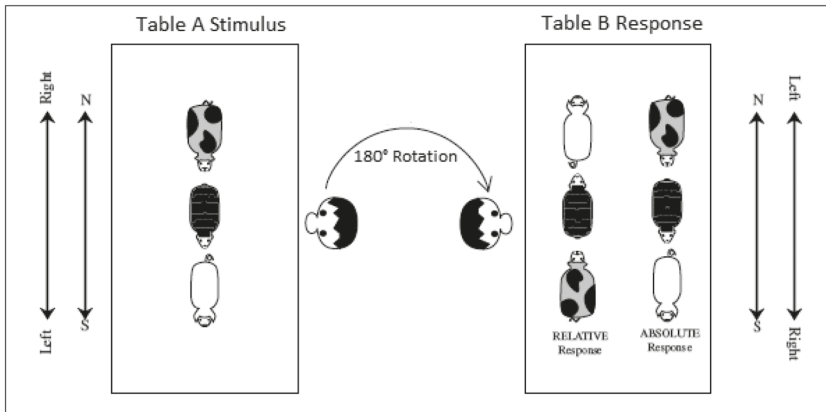
Figure 4. *The 180° Rotation Paradigm in the Reconstruction Task.*

In order to test the effects of the Intrinsic FoR, the 90° rotation paradigm is applied in combination with the condition called 'Relative Ducks'/'Absolute Ducks' described in Li and Gleitman (1999). I call this condition the 'Intrinsic primer'. The Intrinsic primer consists in a not inherently oriented object, in Li and Gleitman (1999) a couple of toy ducks.

I designed two identical brown cones, each 30 cm tall, with a base diameter of 20 cm. They appear in Figure 5 seen from above. Both cones are placed on both Tables A and B before the beginning of the experiment.

The Intrinsic primer must be positioned on one side of the informant on Table A and at her/his opposite side on Table B. For example, the Intrinsic primer is at the informant's left on Table A and at their right on Table B. Doing this avoids eliciting Relative and Intrinsic responses that are the same. Indeed, after 90° rotation, the Intrinsic primer will also be found in a different cardinal direction in relation to the informant. The procedure is identical to that in the experiment described after 180° rotation. The layout of the experiment after 90° rotation is illustrated in Figure 5.

As shown in Figure 5, the presence of the Intrinsic primer makes it possible to distinguish between the three basic referential strategies. Nevertheless, I decided to perform all the tests in both the classic version, without an Intrinsic primer, and in the version including it. In fact, as shown below (Figure 19), the presence of the Intrinsic primer actually elicits different responses even in some of those speakers who responded Absolutely after 180° rotation.
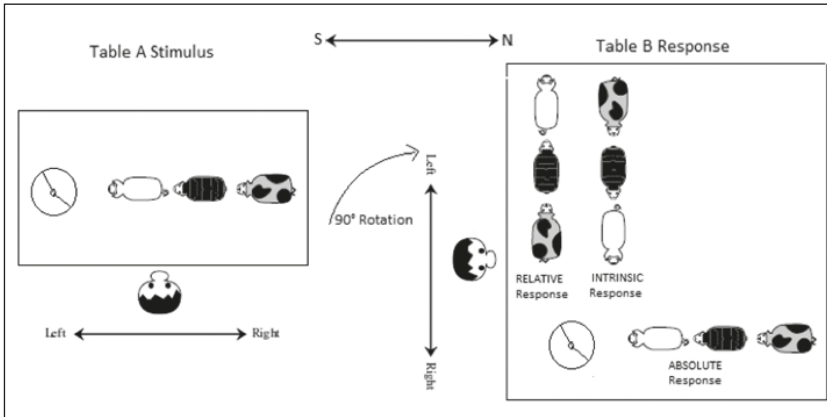
Figure 5. *The Reconstruction Task after 90° Rotation with the Intrinsic Primer.*

## 6.2. *Recall Task*

Linguistic experiments have demonstrated the impact of salient landmarks in FoR selection, especially as cardinal directions were, in a number of reported cases, anchored in salient geographic elements of the local territory (Figure 15). In light of these findings, I decided to insert geographic elements into the cognitive experiments. I did so using pictures that portrayed mountains and rivers in the array (Figures 6, 7, 8, and 9).

I designed a new series of cognitive experiments in line with the cultural and linguistic peculiarities of TAA. These experiments are of the type termed 'Recall' or 'Recognition' in Levinson (2003). Informants had to observe the stimulus picture, to turn by 90° and 180°, and indicate or choose the picture that portrayed the same scene they had seen before among a set of three response pictures in which one picture showed the Relative response, a second showed the Absolute response, and the third was a distractor.

Figure 6 reports the first attempted layout of this experiment.

Here, in the stimulus section, the informant was facing west and saw a picture containing a wadi and a man next to its bank. According to the actual orientation of the experimental setting, the informant saw the wadi flowing from south to north, from her/his left to her/his right, with the man standing beyond the wadi, to the west. The direction of the wadi's flow was represented in the picture by a slanting slope, descending from south to north in the stimulus's setting. The wadi was closer to the informant and the man was farther away.
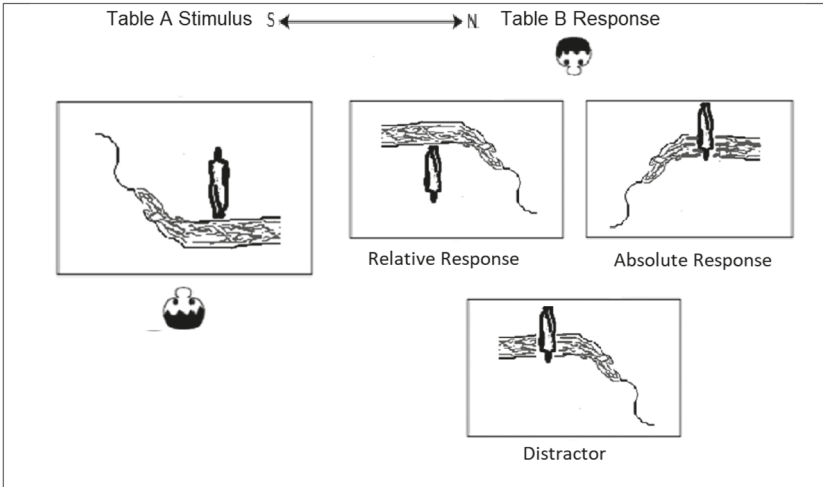
Figure 6. *First Attempt at Designing the Recall Task*.

In the Response section, the picture with the Relative response shows the wadi still closer to the informants than the man and still flowing from informant's left to his/her right. The astronomically-anchored Absolute response shows the man still standing west of the wadi, which still flows from south to north, following the descent of the slope in the picture. The distractor shows the river flowing from north to south as it actually happens in the Negev, and the man still west of it.

A first experimental round was fundamental for the insertion of the landmark-based Absolute response. Indeed, in an early phase of the fieldwork, some informants – mainly women – in fact chose as the correct answer a picture meant to be the distractor.

The distractor showed what I thought was an inconsistent picture, ignoring both Relative and Absolute orientations. Once I asked these informants to defend their choices, they said that the main wadis in their territory flowed from north to south. It was then that I noticed that these informants anchored the picture of the wadi to the actual direction of flow that they were used to. I consider this response to be an application of the landmark-based Absolute FoR, consistent with what I show in §7.5 of the linguistic experiments. Next, I designed the experiment, inserting a picture containing a landmark-based Absolute response in the response table. The final layout can be seen in Figure 7:
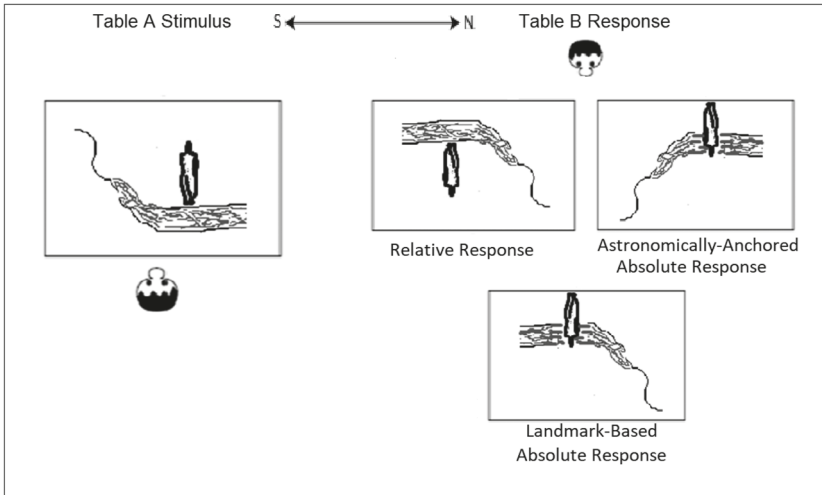
Figure 7. *Recall Task after 180° Rotation.*

The layout of the picture experiment after 90° rotation is shown in Figure 8. The design of the Recall task after 90° rotation and in the presence of the Intrinsic primer was particularly difficult and challenging. As shown in Figure 8, the task includes the recognition of the stimulus among four different possible responses, including the landmark-based Absolute response and the Intrinsic response, for whose detection this type of experiment was originally designated.

The main reason why I insisted on performing the Recall experiment after 90° rotation was that geographic elements are inherently shaped, presenting in many cases a proper Intrinsic armature. I wanted to test possible cognitive effects of such an inherent partition in Intrinsically framed responses.

Salient objects, such as tents and natural elements, have a double referential nature, Intrinsic and Absolute in TAA, with a strong prevalence of the former in topological representations and the latter in projective representations (Cerqueglini, 2015). The results of the Recall test after 90° rotation were positive in this respect, showing some Intrinsic effects.

An evident element of complexity in the design of the Recall test after 90° rotation was the Intrinsic primer. Indeed, its location proved to conflict in many cases with the geographic elements represented in the pictures. Due to its shape and color, my conic Intrinsic primer has been commonly associated by TAA informants with a mountain, therefore indicating the east,
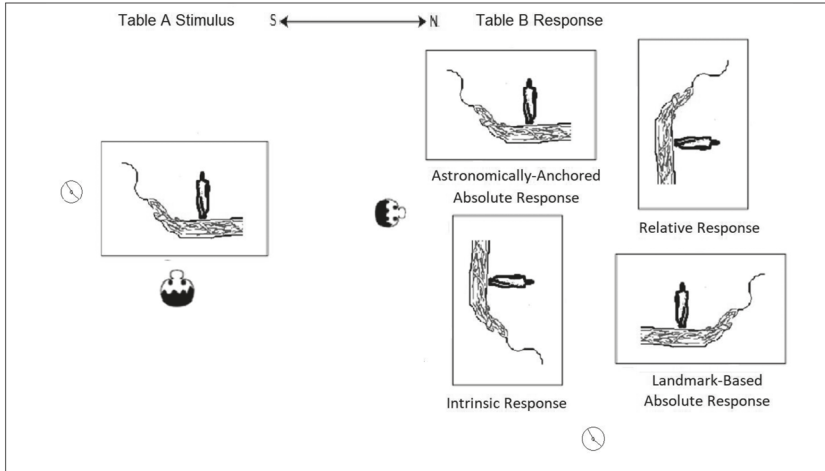
Figure 8. *Recall Task after 90° Rotation*.

especially outside the tribal territory. The east is indeed the direction in which mountains are to be found from the perspective of the TAA focal homeland, i.e., toward Jordan.

As in the Reconstruction tasks, the Intrinsic primer could be reframed as the anchor of a landmark-based Absolute FoR, inspired by the actual geographic layout of the Negev. The conflict between the Intrinsic primer and the geographic element in the picture is made evident by the fact that both were demonstrated elsewhere to be suitable in representing a landmark to establish an Absolute orientation.

Some informants ultimately looked among the responses for the one that seemed more suitable to represent the true state of facts, for example the actual relative position of mountain and wadi, ignoring the request and the relationship between response and stimulus, as shown in Figure 9.

Despite the fact that the Recall test after 90° rotation has so far presented evident experimental pitfalls, producing answers that cannot be considered in the computation of TAA cognitive referential strategies as such, the responses given to it by TAA informants reveal interesting cultural behaviors related to the perception and conception of space of what can still be considered a *Naturvolk*. Such responses shed light on the TAA speakers' background knowledge of space and routine orientation, which clearly appears to be deeply enshrined in the physical configuration of their home
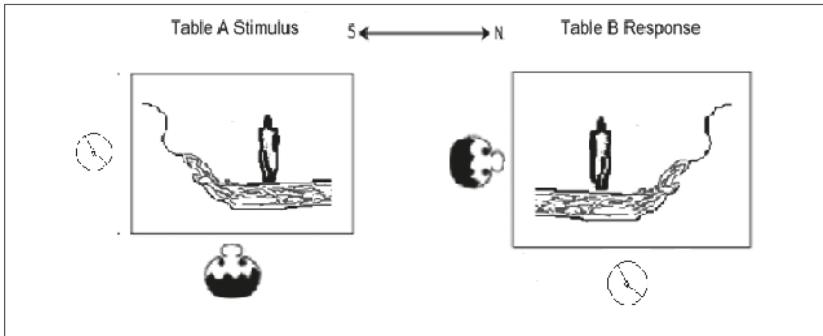
Figure 9. *Recall Task after 90° Rotation: Most Frequent Response.*

territory. The background memory of the tribal land and its geography is revealed in the experimental responses, where mutual location of a mountain and a river, different from that experienced in the familiar ecology, seems to be unconceivable. This probably happens because the strong tendency to the Absolute orientation primes the interpretation of any abstract or artificial landmark as a real one. In particular, in the case of a symmetrical mountain-like cone, its orientation can be provided by the orientation of actually experienced and familiar mountains.

Furthermore, the Recall task after 90° rotation was solved Intrinsically by a minority of informants – three women – testifying to the minuscule effects of Intrinsic armatures in projective relations including landmarks. For these reasons, I decided to include the description of the Recall task after 90° rotation in this section, yet below I will relate only to the data that refers to the Recall task after 180° rotation.

All linguistic and cognitive stimuli discussed above were administrated under different conditions:

i.      indoors at speakers' homes;

ii.     indoors in an unfamiliar place far away from the tribal territory;

iii.    indoors in a traditional Bedouin tent;

iv.     outdoors within the tribal territory;
        iv.a.   with local landmarks in sight;
        iv.b.   with local landmarks out of sight;

v.      outdoors far away from the tribal territory.

These conditions were inspired by the 'Blinds-down condition', the 'Blinds-up condition', and the 'Outdoors condition' described in Li and Gleitman (1999). Pilot surveys showed salient differences in linguistic experiments performed outdoors, indoors in a house, and indoors in a tent. Linguistic tests performed inside a tent showed that its dual Absolute/Intrinsic orientation (always facing east) reflected on traditional unshaped items that are inherent to it, e.g., tent-poles or cushions. Furthermore, some cognitive experiments yielded different results when performed inside the boundaries of the Negev and far away from the tribal land.

## 7. *The aṣ-Ṣāniˤ Linguistic Data*

This section is devoted to the presentation of the linguistic responses.

TAA speakers use all three FoRs, selecting them on the basis of G's properties and axial constraints. I detail below these conditions.

### 7.1. *Intrinsic FoR*

As discussed in §3, linguistic projective spatial representations – spatial descriptive utterances produced in the linguistic experiments reported here – contain by definition at least two spatial entities: F, the object to be located, and G, in relation to which F is located (Levinson, 2003). The common basic structure of projective spatial utterances is: *F (is in) x-direction in relation to G*. Cross-linguistic universal bias has been recognized toward the selection of the most stable, large, familiar object in any spatial array as G (Svorou, 1994). Thus, someone who sees a bicycle parked beside the door of a house will say *the bicycle (F) is in front of the house (G)* rather than *the house (F) is behind the bicycle (G)* unless requested or constrained to locate the house in relation to the bicycle. In the experiments reported in this article, I establish, in my preliminary question, which object is F and which is G for each array. Asking *where is the stone in relation to the donkey?*, as in Figure 10, I compel the informant to select the donkey as G in her/his answer. In order to disambiguate the answers, avoiding possible effects of informants' autonomous G-selections, the same arrays were tested in different positions and from different distances in relation to the informants (§6). In TAA, when G is an animate, asymmetrical object of the type donkey/horse/man/camel/dog or an asymmetrical culturally salient inanimate object, such as

| | |
|---|---|
|  | 1. G-Donkey: Back Region<br><br>I:  *wīn ad-dims min al-ḥmār?*<br><br>O: *ad-dims wara al-ḥmār.*<br><br>I:  "Where is the stone in relation to the donkey?"<br><br>O: "The stone is behind the donkey." |
|  | 2. G-Donkey: Front Region<br><br>I:  *wīn az-zalamah min al-ḥmār?*<br><br>O: *az-zalamah giddām al-ḥmār.*<br><br>I:  "Where is the man in relation to the donkey?"<br><br>O: "The man is in front of the donkey." |

Figure 10. *G-donkey/horse/man/camel/dog priming Intrinsic FoR. I = Interviewer.*

tent/knife/coffee pot, the Intrinsic FoR is automatically applied to define front and back regions, regardless of the position assumed by F and G in relation to O, as shown in Figure 10. The examples in Figure 10 report G-donkey as exemplary for G-horse/man/camel/dog and wild mammal quadrupeds and carnivores in general.

Usually, projective relations along the front/back axis of animated mobile Gs of the type donkey/horse/man/camel/dog are expressed by the prepositional doublet *giddām* "in front of" and *wara* "behind", respectively.

While *wara* is etymologically independent and unrelated to any nominal or verbal meanings, *giddām* is related to the root G.D.M., from which *gidm* "foot" is derived. This etymological content may be associated with G donkey/horse/man/camel/dog, because these are mobile objects. In contrast, static Gs that prime the use of the Intrinsic FoR are associated with the preposition *wijh* "human face" rather than *giddām*. Thus, informants say: *wijh al-xūṣah*, "in front of the knife" (where the front is the side of the sharp blade) and *wijh al-bīt*, "in front of the house". *Wijh* is also associated with horizontal surfaces, like water, so *wijh al-mayyih* means "on the surface of the water". *Wijh,* like *giddām*, is the opposite of *wara*, but not for all Gs;

in the case of the G-knife, TAA speakers distinguish only the front region, while its opposite side is called *janb* "side".

Interestingly, the coffee pot has no 'front' and 'back' as body parts. In its armature, it has a bottom (*gaʕrah*), a mouth (*afʔam*), a side (*janb*) and a handle (*īd* "hand"). It acquires functional front and back regions, corresponding to the mouth and handle respectively. This is probably a functional extension of the front/back axis of the human body grasping the object from its handle/behind to serve the coffee from its mouth/front: during the action of pouring, the coffee pot is routinely aligned to the body of the grasper. Thus, via habitual interaction, it may acquire the grasper's front/back axis by Translation. As the interaction between grasper and grasped object occurs ritually in the same way, for the coffee pot, the new front/back axis becomes a secondary, functionally acquired Intrinsic armature.

In TAA, many objects associated with traditional life and the physical environment, such as coffee pot/tent/mountain/wadi, are partitioned according to specific armatures that entail human and animal body parts. Such armatures are used mainly in topological relations (e.g., *ʕa-rās al-gōz*, "on the head of the hill"; *ʕind šidg al-wādi*, "at the wadi's jaw" meaning "at the wadi's outfall"; *ʕa-širb al-wādi*, "on the wadi's lip" meaning "on the wadi's bank"; *ʕa-wijh al-xūṣah,* "on the face of the knife", meaning "on the knife's blade"), or to indicate relations of proximity (e.g., *garīb min afʔam al-gallāy*, "close to the mouth of the coffee pot", *biʕīd ʕan ṣadr al-bṭīn*, "far away from the chest of the mountain", i.e., "far away from the middle-upper part of the mountain's flank"). Only a very restricted set of body part terms common in topological relations is grammaticalized to express projective relations.

Indeed, when natural elements are Gs, the Absolute FoR is used without exception in linguistic tasks. The Intrinsic armatures of geographic landmarks have some effect in cognitive performances, as I demonstrate below (Figure 19).

It is difficult to establish whether Intrinsic armatures in TAA are fixed or object-centered (Levinson, 2006: 78). The fixed armature, or Zapotec type (MacLaury, 1989) establishes fixed abstract regions around G, independently of the location of its parts. In the object-centered armature, or Tzeltal type (Levinson, 1994), regions are anchored onto G's parts, independently of its position. In TAA, it seems that when G is in its functional position (the knife on the surface to be cut, the coffee pot in its normal upright position) fixed armatures are applied, while when they are not in their prototypical functional position, the object-centered armature is applied.

In the tent, the fixed cardinal armature and the object-centered armature coincide. Therefore, the tent can be treated Intrinsically or Absolutely. In the Negev, all tribes used to orient their tents facing east. So spatial relations occurring in the front region can be expressed by *F is east of the tent*, while if in the back region, they can be expressed by *F is west of the tent*.

Culturally salient, asymmetrical, inherently shaped Gs of the type donkey/horse/man/camel/dog/coffee pot/knife attract the Intrinsic FoR in all positions and experimental conditions. Projective relations along G's lateral axis are expressed by a generic *F is beside G* (F *ˁa-janb* G) or replaced by cardinal directions, i.e., by the Absolute FoR. Cardinal directions are also used to distinguish all symmetrical parts of the human body (legs, arms) with the exception of the hands.

## 7.2. *Relative FoR*

Symmetrical inanimate Gs of the type stone/tree/cushion/pole, positioned in the center of O's visual field, prime the application of the Relative FoR via Translation, as shown in Figure 11, where G-cushion and G-tree are taken as examples of the Relative framing G-class.



| | |
|---|---|
| | 1. G-Cushion: Back Region |
| | I: *wīn as-sallih min al-misnēd*? |
| | O: *as-sallih wara al-misnēd*. |
| | I: "Where is the basket in relation to the cushion?" |
| | O: "The basket is behind the cushion." |
| | 2. G-Tree: Back Region |
| | I: *wīn al-faras min aš-šajarah*? |
| | O: *al-faras wāgfih wara aš-šajarah*. |
| | I: "Where is the horse in relation to the tree?" |
| | O: "The horse is standing behind the tree." |

Figure 11. *G-Cushion outside Tent and G-Tree, priming Relative FoR (Aligned Field).*

This is known as the Hausa System (Hill, 1982) or the Aligned Field, as G, F, and O are aligned. F will be considered to be behind G if F is closer to O than G. The coordinate system projected onto G is a parallel extension of the original coordinate system centered on O. The lateral axis is processed Absolutely or by the use of ʕ*a-janb*, "beside".

Unlike what happens in Hausa, however, in TAA only the back region, expressed by *wara*, is projected onto the side of G stone/tree/flock closer to O. The front region is missing, replaced by relations of proximity. The lack of the front region may be due to the resistance of the informants in projecting a front region onto symmetrical unshaped objects.

### 7.3. *The Case of the Internal Space of the Tent as a Referential Field among TAA Women*

The tent is one of the most salient objects in TAA culture and language. It represents a referential field, i.e., a space where the general rules of FoR selection are violated. In general, as shown above, Gs that are not inherently shaped, such as G-pole and G-cushion, attract the Relative FoR when in the center of O's visual field and the Absolute FoR when not aligned to O. The same behavior has been reported for G-tree and G-stone.

Poles and cushions are inherent parts of the tent. Their collocation in its interior is fixed, with the central front (*migdim*) in the center of the entrance, to the east, and the cushions positioned all along the internal perimeter of the main area reserved for guests. The Intrinsic orientation of the tent (always facing east) reflects on such traditional unshaped items, which are inherent to it. An example is shown in Figure 12.



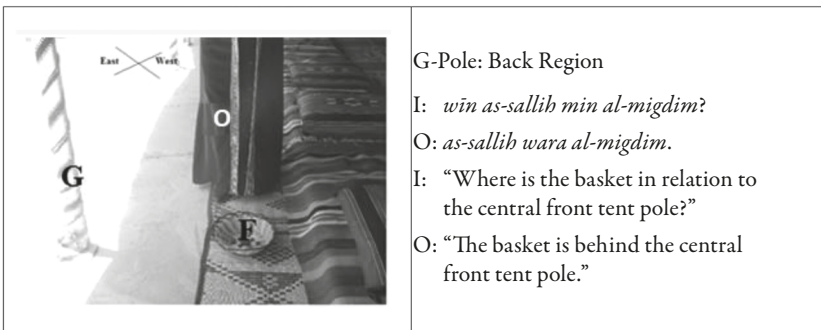| | G-Pole: Back Region |
|---|---|
| | I: *wīn as-sallih min al-migdim*? |
| | O: *as-sallih wara al-migdim.* |
| | I: "Where is the basket in relation to the central front tent pole?" |
| | O: "The basket is behind the central front tent pole." |

Figure 12. *G-Pole inside Tent, priming Intrinsic FoR (O facing north).*

In Figure 12, a TAA speaker, a woman in a traditional long dress (*ṯōb*) facing the F-basket, declares it to be 'behind' the front tent-pole G that is to her right, at the entrance. As G-pole has no inherent partition outside the tent, saying 'behind the pole' is possible inside the tent because of the referential space that the tent represents. Indeed, this spatial array with un-shaped G and FG not aligned in the center of O's visual field automatically attracts the Absolute FoR outside the tent in all experimental conditions. Here, since the Intrinsic front of the tent is invariably to the east, the F-basket west of the G-pole is behind it. The use of 'in front' and 'behind' with these unshaped Gs is anchored in the Absolute orientation of the tent, 'in front' meaning 'east' and 'behind' meaning 'west' in these particular cases.

Interestingly, the Absolute anchoring of 'in front of' and 'behind' inside the tent was elicited in seven out of ten women and none of the men. This result, produced by the 70% of the female informants, and completely unknown in the male population, represents one of the few gender-based differences observed in TAA referential strategies. The association of 'in front' and 'behind' of traditional unshaped domestic objects with the tent-based armature reflects the special relationship between women and the traditional house. Indeed, women were in charge of erecting and maintaining the family tent, properly hosting guests, and organizing the internal spaces for the family members according to role and status.

Under the same experimental conditions, all male informants responded with representations based on the astronomically-anchored Absolute FoR, not recognizing any difference between the inside and the outside of the tent. This linguistic difference reflects the rigid separation of the sexes and gender roles in traditional Bedouin society.

Treated as G, the tent itself has a double armature, Intrinsic and Absolute. While the spatial relation occurring in the western region of G-tent is also expressed by *wara* "behind", in the east or front region, it can be encoded by *wijh* and *giddām* with a clear, substantial distinction; when F is oriented toward and facing the front side of the tent, people say *F wijh al-bīt,* i.e., man and tent are "face to face". When F is not inherently shaped or is facing in another direction, *giddām* is preferred.

### 7.4. *The Case of G-Sheep/Goat*

Interestingly, G-sheep/goat, which would be expected to prime the Intrinsic FoR, like G-donkey/horse, instead attracts the use of the Relative

FoR, but in an unusual manner - consistently with what happens in the case of G-stone/tree, when G-sheep/goat is placed in the center of O's visual field, facing in the same direction as O, its back region is expressed by *wara*. But G-sheep/goat's front region is expressed by the Relative *minnih wġād*, lit. "from it (G) and away (from O)". Despite G-sheep/goat being an asymmetrical, inherently shaped, and mobile entity, exactly like G-donkey/horse, the Intrinsic *giddām* is not used in association with its front region.

Furthermore, once G-sheep/goat, placed in the center of O's visual field, is turned to face O, the back region of the Aligned Field coincides with its snout. So, the use of *wara* is avoided. In this case, the back region of the Aligned Field is expressed by *minnih wjāy* "from it (G) and coming (toward O)", while the front region, as mentioned, is expressed by *minnih wġād* "from it and away".

The fact that the Relative FoR (Aligned Field) is expressed by different prepositional strategies (*wara*/0; *minnih wjāy*/*minnih wġād*) according to G-type is a noteworthy phenomenon in TAA and sheds light on the constraining force of Gs' features and the relation of FoRs with the internal processes of grammaticalization.

The treatment of G-sheep/goat according to Translation of the Aligned Field suggests that TAA speakers conceptualize sheep and goats as less inherently shaped and asymmetrical than horse/man/donkey, yet more shaped and asymmetrical than G-stone/tree/flock, as demonstrated by the avoidance of *wara* when the snout coincides with the back region of the Aligned Field.

The minimized saliency attributed to the anatomical parts and to the orientation of G-sheep/goat is confirmed by the fact that once G-sheep/goat is placed transversally to the center of O's visual field, so that O sees it from the side, the snout and rear part of the animal are expressed only by ʿa-janb, "beside", because the rules of the lateral axis of the Aligned Field override the relevance of these anatomical parts.

It is important to notice that the anatomy of all animals, including sheep/goat, is a very well developed lexical domain in TAA, within which every kind of animal has specific lexical items indicating its body parts, for instance for cooking. Yet the anatomy of sheep/goat has no specific salience in the domain of spatial projective relations, while the anatomy of donkey/horse as well as camels is more relevant. I asked my informants the reason for the different treatment of the sheep and the goat in the experiments in comparison to other animals, such as donkeys, horses and dogs. They answered
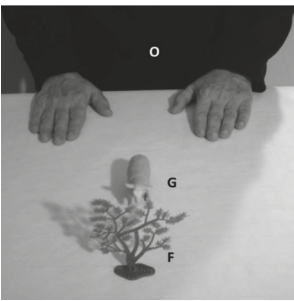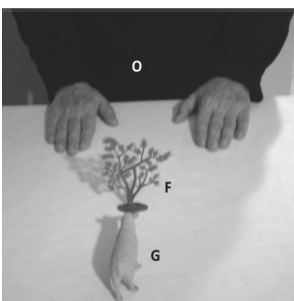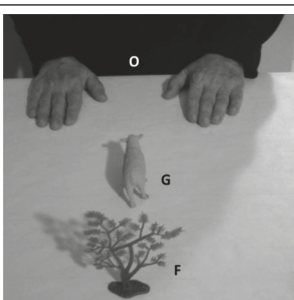
1.

L: *wīn aš-šajarah min al-ḫurūf?*

I: *aš-šajarah wara al-ḫurūf.*

L: "Where is the tree in relation to the sheep?"

I: "The tree is behind the sheep."



2.

L: *wīn aš-šajarah min al-ḫurūf?*

I: *minnih w ġād.*

L: "Where is the tree in relation to the sheep?"

I: "From it (G) and away (in relation to O)."


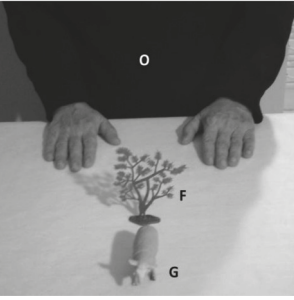
3.

L: *wīn aš-šajarah min al-ḫurūf?*

I: *aš-šajarah minnih w jāy.*

L: "Where is the tree in relation to the sheep?"

I: "The tree is from it (G) and coming (toward O)."



4.

L: *wīn aš-šajarah min al-ḫurūf?*

I: *aš-šajarah minnih w ġād.*

L: "Where is the tree in relation to the sheep?"

I: "The tree is from it (G) and away (in relation to O)."

Figure 13. *G-Sheep in the Aligned Field.*

that carnivores, similarly to horses, donkeys and camels, are intelligent, capable of making decisions about targets, movements and directions, while sheep and goats are pushed to the grazing ground by men and do not follow autonomously straight, intelligible paths. They merely move around, never raising their heads, always eating face down. Someone who has no target in life is said to be 'one who goes around like a sheep', or just 'one who goes where others go'. This attitude is considered a sign of limited intelligence and a dangerous form of behavior. Such people, like sheep, are seen as victims of circumstances who are unable to change their destiny (Cerqueglini, 2015).

In TAA, different animal anatomies undergo differential spatial treatment. In the case of horse, donkey, camel, and dog, body parts are grammaticalized into spatial regions and prepositions. This does not happen in the case of sheep and goat. As real or fictive motion is one of the main triggers of prepositional evolution (Talmy, 2018), the highest and most autonomous mobility attributed by TAA speakers to horses, donkeys, camels, dogs becomes a strong primer in the process of grammaticalization of their parts and remains encoded in the grammar of space.

From an evolutionary and embodied perspective, different types of routine interactions between man and different animals are indexicalized in the traditional cultural inventory of spatial scenes and reflected in language. The salience of the inherent directionality of horses and camels is primed by the practice of riding, in which the perspective of the animal coincides with that of the rider, so it becomes conceptually similar to the human's inherent directionality. The same happens with dogs, which also prime the Intrinsic FoR in TAA. Indeed, dogs routinely flank the human or the ridden animal. The routine orientation of different kinds of animals is considered an extension of the ego-centered human system via the effect of routine interactions with different animals. Thus, horse/donkey/camel/dog acquire the human perspective through physical contiguity. Since the only relevant spatial relation in combination with G-sheep/goat is primed by the coincidence of the rear part of the animal with the back region of the Aligned Field, expressed by *wara*, it can be assumed that this perspective of alignment between human and animal becomes indexicalized by the effect of the routine action of pushing sheep/goat to graze from behind. According to the Bedouin custom of herd grazing, sheep and goats are pushed forward in front of the shepherd, from a distance, by means of a stick and vocal commands, toward the direction established by the man (Marom, 2011). Even in the Negev Bedouin as-Sayyid sign language, the sheep is represented with its tail toward

the speaker (Sandler *et al.*, 2005), just as it appears in the routine real-life scene, where the animal proceeds to the grazing area pushed from behind by the shepherd:
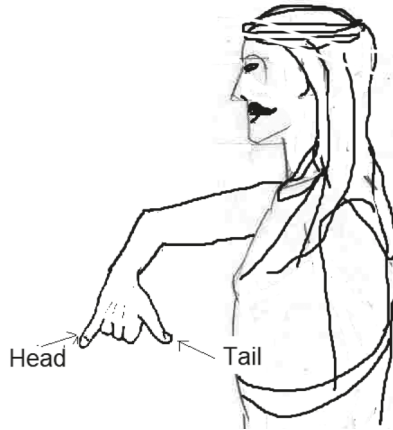


Figure 14. *The Gesture for 'Sheep' in the as-Sayyid Sign Language.*

Recurrent spatial scenes and interactions are usually engraved in the linguistic inventory and constrain linguistic representations. Thus the customary interaction between man and sheep/goat, i.e., the animal proceeding in front of the shepherd in response to his lead, is represented iconically in the as-Sayyid sign language by the placement of the right hand in front of the speaker with the thumb representing the sheep's tail toward him and the pinkie on the other side symbolizing the snout. The obligatory position of the signing hand in front of the speaker in as-Sayyid sign language parallels the TAA Aligned Field primed by G-sheep/goat. Indeed, as explained in Figure 13, the Relative FoR is applied as Translation or Aligned Field only when the G-sheep/goat and F are aligned in front of the speaker as if proceeding in a row. Different prepositional strategies are applied in different cases (Cerqueglini, 2015) and the Absolute FoR is necessary when G-sheep/goat is outside the center of the speaker's visual field (§7.5).

Another important feature that affects the treatment of sheep/goats as spatial Gs is that these animals are seen usually in flocks and very seldom alone. This plurality somehow decreases the value of the animacy attributed to an individual member of the category.

In contrast, a plethora of specific motion verbs is used to describe the quality, speed, and conditions of the gait of horses and camels. The domain-specific, spatial salience of the anatomy of horses, camels and donkeys may

be due to the practice of Bedouin tribes, travelling across wide spaces, of orienting parts of the ridden animal according to fixed bearings, such as stars, in order to follow a specific path, as shown in these examples of traditional route instructions from the Rwala (or Ruwālah) Bedouin tribe:

> lay the North Star on the face of thine animal (northerly course);
>
> lay it on thy left brow (north-northeast);
>
> lay it on thy left shoulder (go northeast);
>
> lay it on thy saddleback from the left (go eastwards);
>
> lay it on the back saddle knob (go south) (Musil, 1928: 355).

### 7.5. *The Absolute FoR*

The Absolute FoR is represented in TAA by the quadripartite series of cardinal directions *šamāl ~ šimāl* "north", *giblih* "south", *šarg* "east", and *ġarb* "west". Middle positions do not exist.

The main applications of TAA Absolute FoR are:

i.  in substitution of the right/left axis with all kinds of Gs;

ii.  in cases where G is an unknown, culturally non-salient, or modern object (dinosaur/cow/computer/key/shoe/chair). Numerous objects familiar to younger generations are outside the scope of the Intrinsic FoR attribution in TAA. The finding that chair/key/shoe do not prime the Intrinsic FoR may be surprising to speakers of European languages, where the seat of the chair and the toe of the shoe are generally considered the front region. Since TAA does employ the Intrinsic FoR for inherently partitioned familiar objects, the absence of an inherent partition or armature for these unfamiliar objects in TAA is noteworthy. The functional armature of such newly acquired objects is not well recognized or focused (Cerqueglini and Henkin, 2017b);

iii.  the Absolute FoR is also used in contrastive distribution with the Relative FoR (Aligned Field) when the arrays are not aligned with O's visual field, i.e., with Gs of the stone/tree/flock and sheep/goat types; in all positions where the Relative FoR is not applied, such as when F is to be located laterally in relation to G in the center of O's visual field; or when F is to be located in relation to G in any position not aligned with any axis of O; or when F and G are to be located laterally to O.

Thus, the Absolute FoR is used in G-dependent or G+Axis-dependent conditions in relation to O's visual field. Axial conditions are also evident in the selection of the grammatical strategies according to which the Absolute

FoR is applied. So, for example, to locate an F-stone east of a G-chair, TAA speakers can use two grammatical strategies:

i.   *ad-dims šarg al-kursi* "the-stone (is) east (of) the-chair";
ii.  *ad-dims min al-kursi wšarg* "the-stone (is) from the-chair and-east".

The two forms are not conceptually synonymous:

i.   is used with F east of G, without reference to the position of O in relation to the array;
ii.  is used with F east of G, when O is aligned with FG along the east/west axis.

In other words, the criterion of FGO's alignment, which is the primary rule in TAA Relative FoR, also enters the semantics of the Absolute FoR, producing a semantic distinction: ii. is constrained by the condition of FGO's alignment along the same cardinal axis, marking O's position in relation to the FG array. Therefore, I call i. 'Non-deictic Absolute FoR' and ii. 'Deictic Absolute FoR'.

The anchoring strategy of the Absolute FoR in TAA is expressed in cardinal terms, generally anchored to the astronomical directions. In some cases, speakers can resort to a landmark-based strategy, mainly when informants are faced with images shown vertically on the computer screen, representing natural elements.



| Orientation of Array and Participants | |
|---|---|
| Array Shown on Screen | Question and Answer |
| | I:  *wīn al-burrād min az-zalamah?*<br>O:  *al-burrād fi-jālih al-ġarbi.*<br>I:  "Where is the coffee pot in relation to the man?"<br>O:  "The coffee pot is on his western side." |

Figure 15. *Mountains, Computer Screen, and Anchoring System of Cardinal Directions.*

The stimulus image in Figure 15 represents a man with a coffee pot in his own left-front region and mountains in the background. I asked the informants: *where is the coffee pot in relation to the man?*. Following the Absolute system, and in particular according to the north/south axis along which I and the screen were placed, the answer should have been that the coffee pot was to the east of the man. But in fact they said it was in his western region.

I wondered about this abrupt change of vision. In any case, this kind of answer was not inferable from the actual cardinal alignment in which the interviews were set. The answer becomes plausible only in the light of the fact that in the Negev the mountains are in the eastern part of the region. Thus, since in the image the mountains are behind the man, the pot is then on his western side, being in front of him, i.e., opposite to the position of the mountains.

The hypothesis is then that the presence of geographical elements ascribable to a direct 'embodied' local and routine experience primes the selection of the locally anchored cardinal system, based on the adaptive memory developed by the community through its direct experience of its inhabited territories. Interestingly, in the absence of geographic elements in the images, the astronomical system of cardinal directions is used, anchored directly onto the computer screen or any other indirect layout (Cerqueglini, 2015).

## 8. *Discussion of the Linguistic Data*

The distribution of front/back prepositions across referential practices is largely based on the features culturally attributed to G-objects and axial constraints. *Giddām*, "in front" is used only to express the front region in the Intrinsic FoR with mobile Gs, while, more seldom, *wijh*, "in front" is used with asymmetrical immobile Gs. *Giddām* and *wijh* can indeed combine with a very restricted set of Gs due to their etymological transparency and the specific semantic and cultural features associated with them. Similarly, *ˁa-janb* "beside", is used only with asymmetrical Gs in the Intrinsic FoR, to approximatively designate the lateral axis in close proximity to G. Otherwise, projective representations along the lateral axis are always expressed in Absolute terms. *Wara*, "behind" is used to express the back region in all cases in the Intrinsic FoR and in non-conflicting cases in the Relative FoR. *Minnih wjāy* (lit. "from it (G) and coming toward O") and *minnih wġād* (lit. "from it (G) and beyond", i.e. "on the opposite side of G with respect to O"),

where no reference to body parts is entailed, are used only in the Relative FoR (Aligned Field) with G-sheep/goat. Finally, cardinal directions are used only in Absolute representations, with both astronomical and landmark-based anchoring.

Therefore, TAA prepositions show different degrees of grammaticalization, according to the region they express and the FoRs with which they can be associated (Cerqueglini, 2016). The more the semantic split applies to a given preposition (the fewer FoRs can be associated with it), the less it is grammaticalized, and the more it remains specialized to a restricted number of constructions/items. In TAA, the prepositions that express the front region in the Intrinsic FoR are less grammaticalized than *wara*, which expresses the back region across Intrinsic and Relative FoR, i.e., with a larger number of Gs.

I label the univocal association of preposition and FoR 'prepositional split'. This phenomenon is dictated by properties or features culturally attributed to Gs (symmetry, directionality, mobility, and so on). In TAA, the ontological status of a given G in the domain of space must match the etymological content of a certain preposition in order to be properly associated with it and with the respective FoR.

The only violations of the prepositional split are found in women's language, and they are represented by the Absolute anchoring of 'in front' and 'behind' with unshaped Gs that belong to the referential space of the tent (Figure 12) and the use of landmark-based cardinal prepositions to describe arrays containing salient landmarks and shown on the computer screen. As shown in the reported example (Figure 15), even though G is a human being, the landmark-based Absolute FoR is applied instead of the Intrinsic FoR.

Very interestingly, violations of prepositional split are found in the language of the women, which undoubtedly represents a relevant variation and, probably, the driving element of linguistic innovation in referential strategies. The fact that men exclusively use the Absolute FoR anchored astronomically, while women also know a landmark-based version of this strategy, supports the idea that the women's language is innovative in character.

The aṣ-Ṣāniʿ lesson teaches us that features thought of as universal, such as a/symmetry and mobility, are culture-dependent. These features, culturally attributed to Gs, largely prime the selection of FoRs and prepositions.

In addition to G's features, axial conditions also affect FoR selection. The most evident case is that of G-stone/tree/sheep/goat, processed according to the Relative FoR when FG are aligned in the center of O's visual field,

as if FGO proceed in a row (Figure 13), and according to the Absolute FoR in all other cases (Cerqueglini, 2015).

To the best of my knowledge, the uses of the Relative FoR are very restricted, while Intrinsic and Absolute FoRs seem more customary. This is especially true regarding the Absolute FoR, used in two anchoring strategies, two deictic versions, and several scopes. In particular, the Absolute FoR is used to solve all problematic, not prototypical, not culturally salient Gs, FG arrays, and OFG axial conditions. This characteristic makes it eligible to represent the TAA 'default perspective'. 'Default perspective' (i.e. the unmarked perspective) is a definition coined by Bohnemeyer (2011) to indicate the most important referential strategy in what he called referentially promiscuous systems, i.e., those languages whose speakers use several FoRs, freely shifting among them.

The attribution of the status of default perspective to TAA Absolute FoR seems to be supported by the importance it has in cognitive performances. Nonetheless, TAA cannot be considered a referentially promiscuous language, but rather a referentially complementary system (Cerqueglini and Henkin, 2017b), as TAA speakers do not shift freely among FoRs, but select them according to the complex system of constraints described above.

## 9. *Cognitive Data*

TAA informants prevalently responded according to the Absolute FoR in all three cognitive tasks described in §6, with some evidence of Intrinsic responses, especially among women.

The 180° rotation paradigm was applied to experimentally distinguish between Absolute and Relative performances. Since in language TAA speakers use the Intrinsic FoR with some Gs, cognitive tasks were adapted to highlight possible Intrinsic representations as well. As reported, the Intrinsic primer was inserted in the experimental layout, in combination with the 90° rotation paradigm, following the experimental procedure of Li and Gleitman (2002).

In the cognitive tasks, I included all the kinds of toy objects tested as Gs in the linguistic experiments, proceeding according to partitions in language: asymmetrical vs. symmetrical objects and axial conditions in the presence of symmetrical objects.

The referential space of the tent had no impact on cognitive practices, nor did indoor and outdoor experimental layouts. The only exception to this common rule was due to the presence of salient landmarks outside the boundaries of the tribal land, whether in or out of sight, which primed the use of landmark-based Absolute strategies in some tasks, as explained below (Figure 22). These results are consistent with the linguistic tests shown in §7.5.

The Relative FoR, less developed in linguistic representations, is completely absent from the cognitive responses.

Below, I report in more detail the most salient core of the experimental data.

### 9.1. *Reconstruction Task after 180° Rotation*

Reconstruction tasks showed the prevalence of the Absolute FoR, anchored astronomically, after 180° rotation, as shown in Figure 16. No salient differences were reported between indoor and outdoor conditions, within or outside of the tribal lands. Unlike what was observed in the linguistic tasks, the referential space of the tent had no effect on traditional objects inherent to it.

In Figure 16, I report the experimental responses concerning two groups of three toy objects each: man/horse/tree and man/tree/stone, administrated as stimulus objects after 180° rotation.

Figure 16 shows the prototypical Absolute response, where the array as a whole and each of its parts are framed according to cardinal axes. The sequence of the three objects is respected, with the man maintained in the eastern part of the row and the tree in the western part. Furthermore, asymmetrical shaped objects (man/horse) are oriented in the responses according to the same direction as they were in the stimulus, i.e., both looking west. This means that the partition of shaped objects, such as man/horse, is observed.

### 9.1.2. *Toy Stone and Toy Tree*

Remarkably, in Figure 16 the toy tree is not oriented consistently between stimulus and response. In Stimulus 1, its prominent branch is protruding eastward, while in the response it is protruding westward. In Stimulus 2, the largest axis of the tree's foliage is turned toward the man, i.e., east/west, while in the response the largest axis of the foliage is turned north/south. This mismatch proved not to be accidental. Indeed, it occurred repeatedly, with both toy tree and toy stone, as can be seen in Figure 17.

| Table A Stimulus | Table B Response |
|---|---|
| 1. MAN/HORSE/TREE | |
|  |  |
| 2. MAN/TREE/STONE | |
|  |  |

Figure 16. *Absolute Responses in Reconstruction Task after 180° Rotation.*

I exploited the particular character of the plastic toy tree, being evidently asymmetrical – its foliage is not round, but flattened, as if the object had a prominent lateral axis. Similarly, the toy stone has a prominent axis, longer than the other one. Informants did not notice these characteristics, and processed these toy objects as if they were symmetrical. This phenomenon could be interpreted as a linguistic constraint on TAA habitual thought. In language, stones and trees are considered unshaped Gs, attracting the Relative FoR (Figure 11). It seems that in cognition too they belong to the same ontological category of symmetrical entities. Indeed, none of the informants noticed the existence of prominent branches in the toy tree or a prominent axis in the toy stone, and they easily forgot the original orientation of these objects in the responses. In contrast, the axial orientation of the whole array remained Absolute.

| MAN/STONE/TREE | |
|---|---|
| Table A Stimulus | Table B Response |
|  |  |

Figure 17. *Asymmetric Toy Stone and Toy Tree treated
as Symmetric Entities after 180° Rotation.*

To summarize the results of this section, I conclude that the general orientation of each array and the respective position of its elements are remembered in Absolute terms. In particular, asymmetrical entities (man/horse) were oriented in the responses according to the astronomical direction they faced in the stimuli, i.e., their Intrinsic partition was considered and remembered (Figure 16). Recall that in language, G-man/horse, like G-donkey/camel/dog/carnivore mammals, are processed Intrinsically. Conversely, in the case of entities considered symmetrical (stone/tree), the inherent asymmetries of the actual toys were neglected (Figure 17). Recall that in language, G-tree/stone are processed Relatively or Absolutely.

This experiment proves that spatial arrays are encoded and remembered in Absolute terms. Yet, a certain isomorphism with the linguistic structures is observable in the habitual distinction between symmetrical and asymmetrical entities, as recorded in the linguistic tasks. In other words, TAA informants also reveal some attention to the criterion of symmetry, relevant in language, in cognitive tasks.

### 9.2. *Reconstruction Task after 90° Rotation*

In this task as well, most of the responses were Absolutely framed, according to cardinal directions, as shown in Figure 18:

| Table A Stimulus | Table B Response |
|---|---|
|  |  |
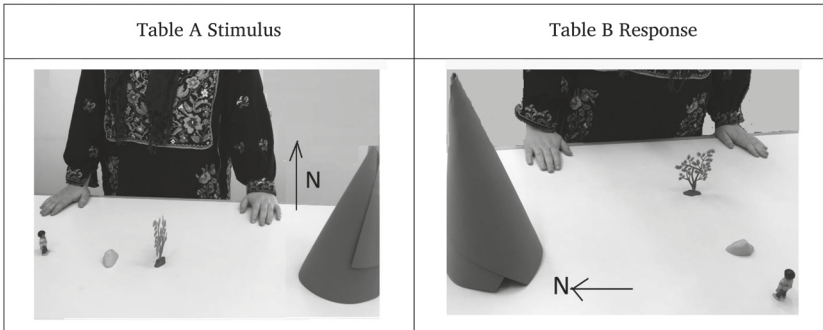
Figure 18. *Inefficacy of the Intrinsic Primer within the Tribal Land Area.*

Nevertheless, as shown in Figure 19, the Intrinsic primer and the 90° rotation triggered deviating responses in four informants out of twenty, i.e., 20%, interestingly all women.

Figure 19 reports a case of such a deviating response.

| Table A Stimulus | Table B Response |
|---|---|
|  |  |
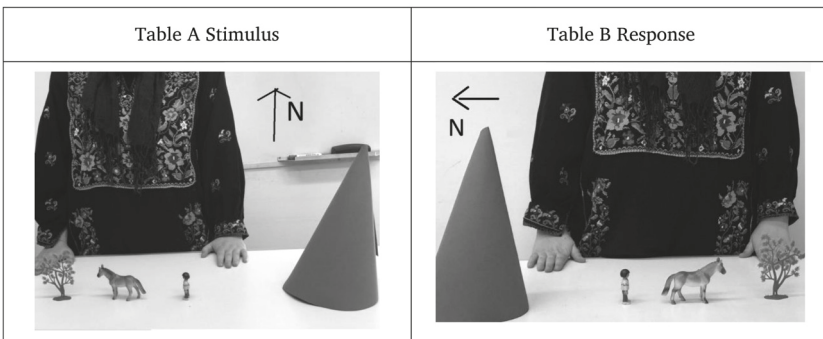
Figure 19. *Effects of the Intrinsic Primer outside the Tribal Land Area.*

While the response in Figure 18 is certainly Absolute, with the three objects consistently aligned along the east/west axis, in Figure 19 stimulus objects are placed along the east/west axis, but in the response the objects are set along the north/south axis. The mountain-like Intrinsic primer was set east and left of the informant in the stimulus table and north and right of the informants in the response table. In general, the Intrinsic primer is used to verify the presence of effects of the Intrinsic FoR. Nevertheless, the interpretation of the responses that deviated from the cardinal Absolute FoR are difficult to define as univocally Intrinsic. Indeed, performing this

experiment inside and outside the tribal lands proved to produce interesting distinctions. The efficacy of the Intrinsic primer was verified only outside the tribal lands, while it proved to be neutral within the tribal lands, where all responses were framed in terms of cardinally-oriented Absolute FoR (Figure 18).

Deviating responses were all elicited outside the tribal land area and far away from its geography, i.e., when the actual location of the real mountains was not easily reckonable. Reckoning the position of the actual mountains could indeed conflict with the position of the Intrinsic primer, seen as a landmark, a mountain.

I indeed hypothesized that informants would associate the mountain-like cone set used as an Intrinsic primer with the actual mountains they know, just as they had done when they saw mountains and rivers in some arrays administrated during the linguistic tasks (as in §7.5).

I therefore asked one of the informants who gave a deviating response why she responded in the way she did. She answered: *inno al-jabal dēyman min šarg* "because the mountain (is) always (from the) east".

The efficacy of the methodology applied by Li and Gleitman (2002) is thus confirmed so far, as the informants actually consider the Intrinsic primer as a landmark and not as part of the array, as predicted by both scholars.

Mountains are set east of the TAA tribal land area, so some informants associate the position of the Intrinsic primer with the eastern direction, especially outside the tribal land. Indeed, inside the tribal land the mountain-like landmark is ignored because the informants automatically keep track of the actual position of the mountains.

In TAA, mountains, like human and animal bodies and tents, have inherent body part systems, or armatures. Mountains have their 'nose' (*xašm*) and 'front' (*siddanih*) toward the TAA homeland, and turn their 'back' (*Ẓahr*) to the lands beyond them.

This phenomenon is shared by many Bedouin languages. For example, among the Rwala in the north of the Arabian Peninsula, the following was found:

In the belief of the Bedouins (...) there is somewhere far beyond the horizon a tall mountain on each side of the earth. One half of each mountain rests on terra firma, the other half in the sea, into which it sinks abruptly, while towards the land it sends out a sharp spur called *xašm* (nose). (Musil, 1928: 675)

Thus, some informants felt as if they were located west of the 'moun-

tain'-like Intrinsic primer that faced them from its supposed eastern location. This produced a kind of response that can be interpreted either as Intrinsic FoR or landmark-anchored Absolute FoR. The mix of both FoRs is evident in double anchors of salient objects, as explained above in the case of the tent in the linguistic experiments (§7.3).

The contiguity between Intrinsic and Absolute FoR in TAA cognition is of particular interest. The Absolute FoR strictly dominates TAA cognition, confirming that it represents the 'default perspective' as the unmarked one (§8).

The small number of 'Intrinsic'-like cognitive performances demonstrates the availability of the Intrinsic FoR in the TAA conceptual bedrock in those cases where it is similar to a landmark-based Absolute FoR, showing again some analogies between linguistic and cognitive representations.

Indeed, in salient objects, the double Intrinsic and Absolute armature produces landmark-based Absolute linguistic representations, as observed above in Figure 15.

This fact strongly supports the primeval nature attributed by a number of scholars (Johnston and Slobin, 1979; Carlson-Radvansky and Irwin, 1993; Marr, 1982) to the Intrinsic with respect to Relative representations and is confirmed by the existence of prevalently Intrinsic-framing languages, such as those of the Mayan and Totonacan linguistic families (Meara and Pérez Báez, 2011).

The almost exclusive use of the Absolute FoR in TAA cognition and its use as the 'default' or unmarked strategy in TAA linguistic representations proves its ancestral predominance. Moreover, the cultural relevance of cardinal directions in traditional narrative and poetry is attested to within and outside the Negev, in the whole Bedouin Arabic *Sprachraum*, demonstrating that the knowledge and use of the Absolute orientation is an archaic Pan-Bedouin phenomenon (Cerqueglini and Henkin, 2017a).

The very restricted use in TAA of the Relative FoR, applied exclusively by Translation, and its absence from cognition support the idea of its later development with respect to Absolute and, secondarily, to Intrinsic FoRs. Furthermore, the increasing use of the Relative FoR – applied by Reflection and Rotation – among younger aṣ-Ṣāniˁ speakers, probably due to deep socio-cultural changes and the development of the right/left axis, suggests that Relative strategies do not represent the core of the traditional referential system (Cerqueglini, 2015).

### 9.3. *Testing the Aligned Field after 180° Rotation*

In Figure 20, I show the result of the 180° rotation task with tree/stone/ sheep aligned in the center of O's visual field. All three objects are considered symmetrical in language and prompt the use of the Aligned Field. The task was performed to check the presence of the axial constraints priming the Relative FoR in cognitive representations, as in language (§7.4). Informants consistently responded in astronomically-anchored Absolute terms, without any trace of Relative FoR.

| Table A Stimulus | Table B Response |
|---|---|
| | |
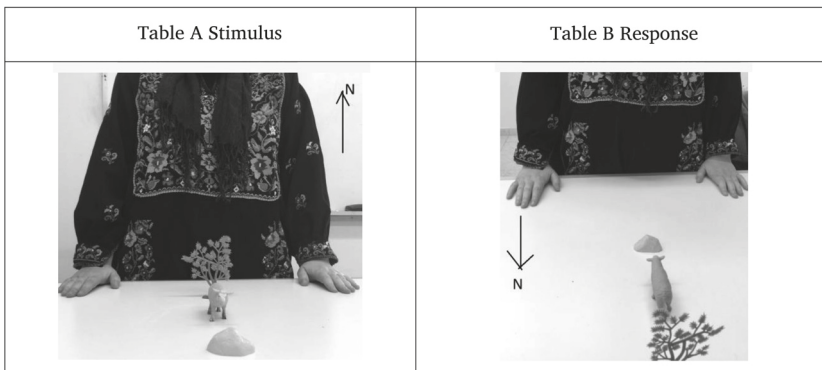


Figure 20. *Absolute Cognitive Response to the Aligned Field after 180° Rotation.*

### 9.4. *Testing the Aligned Field after 90° Rotation*

Unlike what has been shown in Figures 17 and 18, stone/tree/sheep aligned with the center of O's visual field in the stimulus produce no In-trinsic/landmark-based Absolute response after 90° rotation within tribal lands or outside them. Even the same four informants who had used the landmark-based Absolute FoR in the presence of the symmetrical Intrinsic primer outside the tribal homeland in Figure 19 resorted to the astronomical orientation in the case of stone/tree/sheep.

The results are shown in Figure 21.

As Figure 21 shows, in the stimulus I placed the Intrinsic primer both east of the array and to the right of the informant, while in Table B I placed it both south of the array and to the left of the informant. The informant had turned by 90° between stimulus and response. As shown, the informant framed the response according to the cardinally-anchored Absolute FoR, completely ignoring the relocation of the Intrinsic primer. Indeed, the stone

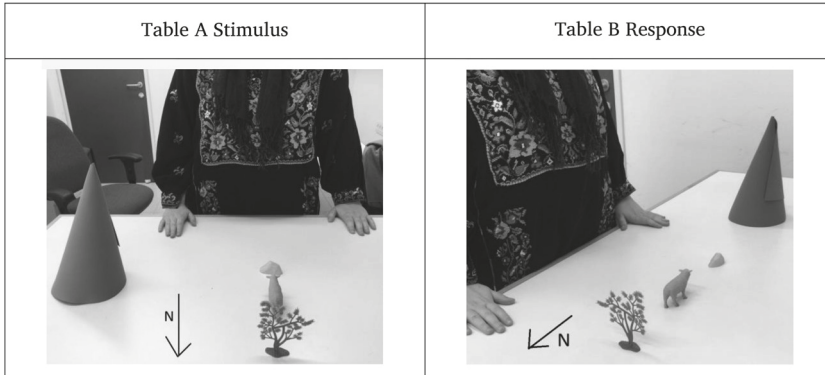| Table A Stimulus | Table B Response |
|:---:|:---:|
|  |  |

Figure 21. *Absolute Cognitive Response to the Aligned Field after 90° Rotation outside the Tribal Land Area.*

remains the southernmost object, the sheep is in the middle and the tree remains to the north.

Outside the tribal land area, the same informants who produced landmark-based Absolute responses in the experiment in Figure 19 resorted to the astronomical Absolute FoR. In this case, the position of the mountain did not affect the performance. Seeking an explanation for this kind of response, I turned my attention to the type of objects involved in the last experiment, which in fact represented the only variable with respect to Figure 19.

Figure 19 showed the 90° rotation task with a set of three objects, two of which are considered asymmetrical and attract the Intrinsic FoR in TAA language (Figure 10). All three objects in Figure 21 are considered symmetrical in TAA linguistic tasks (Figures 11 and 13).

In all probability, the orientation of the man/horse type of objects, considered asymmetrical, in relation to the Intrinsic primer in Figure 19 was easily memorized and reproduced in the response. Conversely, in Figure 21, as all three objects are considered unshaped and symmetrical, the informants did not memorize their orientation in relation to the Intrinsic primer, even in the case of the sheep. As in language (§7.4), in cognition too the case of the sheep is complex and peculiar.

In experiments where the 180° rotation paradigm is applied, informants never miss reorienting the toy sheep according to its Absolute orientation according to the stimulus, just as they do with man/horse. This means that, unlike what happens in the case of stone/tree, whose inherent asymmetries are often ignored (Figures 16 and 17), the anatomical partition of the sheep

is recognized, memorized, and reoriented properly (Figure 19).

Performing tasks under the 180° rotation paradigm is extremely easy for Absolute-thinkers, as the array has to be reassembled just as it was in the stimulus, i.e., in accordance with the same axis. This extreme ease is often exploited even by prominently Relative thinkers, and it enables TAA informants to pay attention to many particulars of the array and its components.

The 90° rotation paradigm requires shifting to a different cardinal axis. Thus, if the informant was oriented along the north/south axis in the stimulus phase, in the response phase he will be reoriented along the east/west axis.

This relocation requires a more complex angular calculation. That is why, after 90° rotation, Relative thinkers will never produce Absolute responses and Absolute thinkers require additional time.

The difficulty in the angular arrangement draws the informant's attention away from the orientation of the individual components of the array. Therefore, only those entities that are prototypically considered asymmetrical and inherently shaped will be memorized in their inherent orientation in relation to the Intrinsic primer. But the orientation of the entities that are culturally considered 'less shaped' will be perceived with much less intensity and will not produce Intrinsic responses.

The treatment of the toy sheep in the Reconstruction task after 90° rotation (Figure 21) shed light on light effects of cultural/linguistic constraints in cognitive performances, i.e., it reveals the symmetry attributed to the sheep in linguistic performances as well.

Furthermore, summarizing the findings, in cognition, just as in language, the situation of the sheep with respect to the parameter of symmetry is intermediate, between fully symmetrical objects (stone/tree, Figure 17) and fully asymmetrical ones (man/horse/dog, Figure 16). Thus, while the facing direction of asymmetrical entities is always observed and the actual asymmetries of objects considered symmetrical is always ignored, the facing direction of the sheep is represented in the 180° rotation paradigm (Figure 20), while it is ignored in the more difficult 90° rotation paradigm (Figure 21).

### 9.5. *The Picture-Recall Experiment*

The Recall Experiment consisted of showing the informants pictures that contained symmetrical and asymmetrical objects and the cascade of a wadi. The cascade was designed to clearly indicate the direction of the river flow.

As described in the methodology section, informants were asked to observe the picture and after a time delay to pick up the 'same picture' from Table B, after 180° rotation. On Table B, three possibilities were ready: astronomically-anchored Absolute, Relative, and landmark-based Absolute.

All tasks were solved by the majority of the informants in the astronomically-anchored Absolute FoR. Yet, five informants – four women and a man – resorted to the landmark-based Absolute FoR, as shown in Figure 22.
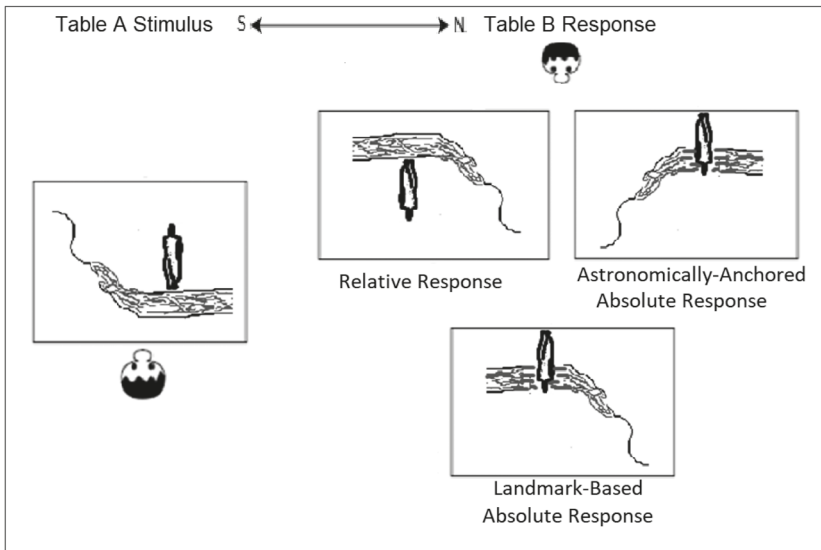


Figure 22. *The Recall Experiment after 180° Rotation.*

Interestingly, the landmark-based strategy was applied by these five informants both within and outside of the tribal land area, unlike what happened with the symmetrical mountain-like Intrinsic primer, effective only outside the tribal lands. The mountain-like Intrinsic primer was effective only far away from real landmarks, while mountains and rivers portrayed in Picture-Recall tasks attracted the landmark-based Absolute strategy in these five informants in both experimental layouts, probably because they were felt to be an inherent part of the two-dimensional portrayed array and not three-dimensional substitutes for real landmarks. Indeed, in the Picture-Recall task, after 90° rotation – described in the methodological section, yet not reported here – the mountain-like Intrinsic primer proved to be irrelevant in all cases.

## 10. *Discussion of the Cognitive Data*

Despite the fact that stimuli were selected according to the semantic distinctions and features that in language elicited the application of the three FoRs, in the cognitive experiments the Absolute FoR was demonstrated to prevail to a great extent (Figures 16, 17, 18, 20 and 21), with some traces of Intrinsic/landmark-based strategies, especially among women (Figures 19 and 22).

In the linguistic tasks described here, I selected G and F in each array, imposing my choice on the informants. In spontaneous speech, the more asymmetrical, mobile, and salient object is automatically selected as G, creating its orientation's field. In cognitive tasks, I did not hint at any G, and all objects had the same status. I therefore hypothesize that as in cognitive tasks G is not stated or named, TAA cultural features attributed to Gs in space are not evoked and therefore exert no influence on the cognitive representation. For this reason, the Absolute FoR largely prevails here.

The Absolute FoR is applied in cognition according to astronomically and landmark-based anchoring among women according to task, as seen in linguistic data (Figures 12 and 15). Landmark-based strategies are particular to women, and represent almost the only gender-based difference detected so far in TAA spatial representations.

The presence of the Intrinsic primer (Figure 19) or a natural element in the picture stimuli (Figure 22) triggered responses that deviated from the astronomically-oriented Absolute strategy. These responses could not be considered as merely Intrinsic, as they were performed only outside the tribal land area. The Intrinsic primer was associated with a landmark, more precisely, with a mountain. This was conceptualized by women according to the real location and orientation of the mountains east of the TAA tribal land. Its effects were felt only far away from the tribal lands, like the effects of the river in the Recall task (Figure 22). Indeed, within the tribal lands, the presence of the actual geographic landmarks conflicted with the presence of the Intrinsic primer, which was then ignored. Therefore, I consider the 'deviating' responses given by these women in the Reconstruction tasks after 90° rotation outside the tribal lands to be examples of landmark-based Absolute FoR.

Nevertheless, their appearance in the presence of the Intrinsic primer reminds us how salient objects associated with traditional life, such as the tent (in linguistic tasks, Figure 12) and geographic elements (Figure 15),

have multiple anchors, both Intrinsic and Absolute. In TAA a conceptual contiguity between Intrinsic and Absolute FoR is established through salient entities.

The Relative FoR, restricted to few Gs and axial constraints in language, is absent from the cognitive experiments. Symmetrical objects (G-sheep/goat/tree/stone) aligned in the center of O's visual field prime Relative responses in language, yet Absolute responses in cognition.

Nonetheless, some analogies between linguistic and cognitive representations are found in the case of sheep/goat/tree/stone in distinctive effects of the criterion of symmetry (Figure 16/Image 2, and Figure 17). Indeed, symmetrical and asymmetrical objects are treated differently to some degree in cognition as well. While man/horse are oriented in the responses according to the cardinal direction they were facing in the stimulus (Figures 16, 17 and 18), inherent asymmetries in stone/tree toys are not taken into consideration. Often these objects are reoriented inconsistently in relation to the stimulus (Figure 16/Image 2, and Figure 17) or the Intrinsic primer has no effect (Figure 21).

In cognition, just as in language, the sheep has an intermediate status between symmetrical and asymmetrical objects. Informants usually reorient it from stimulus to response with the anatomical parts oriented according to the same directions (Figure 20), just as with man/horse (Figure 16). Nevertheless, after 90° rotation, probably because of the increased difficulty of the task, informants tend to ignore the inherent orientation of the sheep and rearrange the array less precisely than with man/horse (Figure 21).


## 11. *Conclusions*

To summarize, in language TAA uses all three Levinsonian FoRs (2003), selected according to G (object-based selection; Cerqueglini, 2015) and some axial constraints:

i.   Intrinsic FoR is used to project the front/back axis onto familiar, culturally salient, culturally faceted, or asymmetrical and motor intelligent Gs (man/horse/camel/donkey/dog/carnivores/tent/coffee pot/knife), without axial constraints and independently from O's position;

ii.  Relative FoR is used via Translation with G-stone/tree/sheep/goat, when FG are aligned in the center of O's visual field;

iii.   Absolute FoR is used to solve all other cases, including the representation of the lateral axis, according to astronomically-anchored and landmark-based strategies.

Some prepositions are used only within one FoR ('prepositional split'), while others can be used within different referential frames. Each FoR can be encoded in various grammatical strategies (§§7.3, 7.4 and 7.5). In TAA Absolute FoR, the criterion of OFG Alignment determines the selection of different grammatical representations at the level of language, but is absent from cognitive processes. The mismatch of semantic expressions and cognitive structures is also suggested by the coincidence of one FoR with different G-dependent prepositional systems that combine the Aligned Field with different kinds of Gs (stone/tree/flock: *0/wara*, and sheep/goat: *minnih wjāy/minnih wǧād*).

Similar attention to criteria of axial alignment in combination with Absolute referential strategies has also been observed in other prevalently Absolute framing languages, such as Tzeltal (Mayan; Brown and Levinson, 1993) and Gawwada (Ethiopian; Tosco, 2012).

In TAA, the tent has a double armature in women's language, Intrinsic and Absolute (Figure 12). In women's language the representation of geographic elements recalls the actual orientation of the familiar elements of the Negev ecosystem, producing the use of a landmark-based anchored subtype of the Absolute FoR (Figure 15).

The comparison between TAA linguistic and cognitive data so far reported shows a clear distinction between the linguistic object-based selection of FoRs, entailing the application of all three Levinsonian FoRs, and the exclusive use of the Absolute FoR in cognition. This is true in particular for TAA men, who tend to apply the Absolute FoR only according to its astronomic anchoring.

Some women informants showed a consistently different use of the Absolute FoR, shifting between astronomically-anchored and landmark-based strategies, whose selection seems to be largely task-dependent, i.e., determined by the presence of geographic, natural elements in the array (Figure 15 for language and Figure 22 for cognition) or an Intrinsic primer (Figures 19 and 21). Positive responses to Intrinsic primer are verified only outside the boundaries of the tribal land.

Therefore, I assume that, in general, isomorphism between language and cognition is not verified in TAA, except for some minor analogies, as follows:

i.    women's double anchoring of the Absolute FoR, with geographic elements attracting the landmark-based Absolute strategy outside the tribal land;
ii.   some evidence of the distinctive saliency of the criterion of symmetry (some cases of differential treatment of G-stone/tree, G-sheep/goat, and asymmetrical Gs). Notably, the ontological distinction between symmetrical and asymmetrical entities is carried out in cognitive tests despite the actual shape of the toy objects, i.e., just by the effect of cultural constraints enshrined in linguistic representations;
iii.  the intermediate status of the sheep between symmetrical and asymmetrical objects.

Bohnemeyer's (2011) observations regarding the weakness of the relationship between linguistic and cognitive strategies in linguistic referential systems that include multiple FoRs are confirmed by TAA, which can be considered a 'referentially complementary system', as the three FoR are in complementary distribution in language (Cerqueglini and Henkin, 2017b). TAA speakers do not freely shift among FoRs, as speakers of referentially promiscuous languages do (Bohnemeyer, 2011), but rather select them according to a combination of culturally recognized semantic properties of Gs and axial criteria.

The studies of Le Guen (2011) and Bohnemeyer (2011) on Yucatecan Maya seem to openly support the divorce between linguistic and cognitive concepts in favor of less deterministic theories, such as Slobin's 'thinking for speaking' (1996), claiming that the effects of language on thought are observable only in those conceptual structures directly involved in the communication of knowledge (linguistic thought), and Landau's experimental hypothesis (2010) on the early differentiation of linguistic from non-linguistic thought due to divergent tasks.

The Absolute FoR can certainly be considered the TAA 'default' strategy, widely represented in linguistic and cognitive tasks. The cultural relevance attributed to astronomical directions across the entire nomadic Arab world, demonstrated in poetry, narratives, mythology, proverbs, and formulaic language, is in line with TAA spatial processes (Cerqueglini and Henkin, 2017a). This fact supports the hypothesis that the TAA object-based system used to select referential strategies, the matching of one FoR with different grammatical expressions, and the landmark-oriented anchoring of the Absolute FoR, frequently used among women, all represent innovations in the language in relation to an original, astronomically-anchored Absolute referential system preserved in Pan-Bedouin cultural data and still dominating cognitive processes.

According to Bohnemeyer *et al.* (2014), since the Absolute FoR is spread out across many linguistic families around the world and is also the most exploited strategy among cognitive systems of speakers of referentially promiscuous languages, it can be considered a universally available strategy ('pan-simian bias for Absolute orientation'; Bohnemeyer *et al.*, 2014) that was later superseded by other referential strategies. Today, the primeval nature of Absolute spatial representations has also been acknowledged in ancient Indo-European languages (Bartolotta, 2018) and supported by new studies on language acquisition. Indeed, contrary to the hypothesis according to which children's spatial representations are primarily egocentric, the most recent results on spatial language acquisition similarly suggest that children initially exhibit a strong bias toward Absolute rather than Relative FoRs (Shusterman and Li, 2016).

TAA Relative FoR and Relative armatures seem to be restricted to a set of a small number of objects and mainly derived by routine functional interaction between Gs and the human body. The Relative FoR is absent from cognitive representations, perhaps suggesting its late development.

At the end of §7.4, I hypothesized that TAA Relative FoR, restricted to a very scanty set of symmetrical (stone/tree/pole/cushion) or 'culturally symmetrical' (sheep/goat) objects (§§7.2, 7.3 and 7.4), may have developed late. The absence of Relative cognitive responses seems to support this idea. Light effects of the criterion of symmetry appear in the cognitive experiment, reaffirming its strong saliency in TAA (Figures 16 to 20), already shown in language (Figures 11 and 13). Traces of saliency of the criterion of symmetry in cognitive tests may testify to the potential development of the Relative FoR in cognition by means of language. In other words, before a FoR is structured in cognition, the elemental distinctive criteria that are correlated to its use in language appear. The cognitive mind is potentially open to all kinds of linguistic influence, i.e., it can develop every type of referential strategy ever found among human beings. Indeed, in line with deterministic claims, language is assumed to shape cognition. Therefore, linguistic innovations are assumed to modify cognitive structures over time.

I support the claim of Peterson *et al.* (1996) and Landau (2010) that language may intervene only to a limited extent in structuring human spatial conception and perceptual and cognitive processes, since spatial cognition is conceived as basically independent from language. As Landau (2010) affirms, linguistic and non-linguistic abilities and mental structures or 'concepts' differ according to function-specificity. Perfectly identical conceptual

doublets of language and cognition would be redundant, i.e., they would contradict the functional economy of the conceptual system.

Peterson and Landau's positions are comparable to older relativistic and lightly deterministic assumptions made by Boas, Jakobson, and Slobin. Boas enounced the concept of 'obligatoriness of expression', according to which the set of obligatory grammatical categories of a language only «determines those aspects of each experience that must be expressed» (Boas, 1938: 127). Jakobson follows him, stating: «The true difference between languages is not in what may or may not be expressed but in what must or must not be conveyed by the speakers» (Jakobson, 1959: 142). Finally, consistently with later discoveries made by Landau (2010), Slobin observes the existence of a special «kind of thinking, intimately tied to language» (Slobin, 1996: 75) and notes the dynamic priming function of the acquired language with regard to this particular cognitive device ('thinking for speaking' theory). TAA data definitely speak in favor of the original light deterministic version of the language-to-cognition correlation.

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SsL

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La Direzione desidera esprimere i più sentiti ringraziamenti
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nel corso degli ultimi quindici anni

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