The Space-to-Time Hypothesis in Language and Cognition in aṣ-Ṣāniʕ Arabic

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a. The 'Space-to-Time' Hypothesis in Language and Cognition: Background
Since in many languages, the same lexicon, prepositions, adverbs, and frames of reference serve in both the spatial and temporal domains, the human metaphorical understanding of time in terms of space is considered an obvious phenomenon (Boroditsky, Fuhrman & McCormick 2010). Cross-linguistic and cross-cultural enquiry largely support the 'space-to-time' hypothesis, emphasizing that the way people represent temporal relations differs across languages and cultures depending on the available spatial representations. In particular, people from different languages and cultures differ in the linguistic and cognitive selection in terms of 1. the spatial axis along which they represent the temporal relation of anteriority/posteriority ('before'/'after') – i.e. the horizontal (front/back, right/left), or the vertical (up/down) axes – and 2. its orientation (left-to-right, right-to-left, front-to-back, back-to-front, east-to-west, west-to-east, up-to-down, down-to-up…) (Casasanto & Boroditsky 2008). Nonetheless, the 'space-to-time' hypothesis has recently been challenged by empirical evidence that humans directly perceive the passage of time (Evans 2004).
b. Aim of this Study I tackle the question of if and how strictly spatial and temporal structures correlate, in both language and cognition, and examine the applications of Frames of Reference (Levinson 2003) in temporal representations of anteriority/posteriority across three generational varieties of aṣ-Ṣāniʕ Arabic: Traditional aṣ-Ṣāniʕ Arabic (TAA, speakers over 65 years old), Middle aṣ-Ṣāniʕ Arabic (MAA, speakers between 45 and 56 years old) and Young aṣ-Ṣāniʕ Arabic (YNA, speakers younger than 45). Aṣ-Ṣāniʕ Arabic is a tribal variety of Negev Arabic (Northwestern Bedouin Ḥijāzi Arabic).
c. Spatial Frames of Reference (FoRs) In Levinson (2003), FoRs are cognitive and semantic strategies used to project coordinate systems onto spatial arrays in order to conceptualize and linguistically describe projective spatial relations, i.e., relations that entail the criterion of 'direction.' With F (Figure) the object to be located and G (Ground) the object with respect to which F is located, projective spatial relations occur when F is to be located in a certain direction relative to G (in front of/behind/right/north). FoRs are of three types: Absolute, Intrinsic, and Relative. The coordinate system is derived as follows: 1. in the Absolute FoR, from cardinal directions, as in 'Marc (F) is north of the house (G)'; 2. in Intrinsic FoR, from G's facets, as in 'Marc (F) is in front of Michael (G)'; 3. in Relative FoR, from the body of the Observer (O). Relative FoR is applied by Reflection or by Translation. See Figure 1: F is Black Cat and G the Ball of Wool. According to **Reflection**, 'Black Cat is in front of the Ball of Wool'. **Translation** treats the X1 axial system as a direct replica of X, so now 'Black Cat is behind the Ball of Wool', as O conceives the unshaped G preceding him in a row.

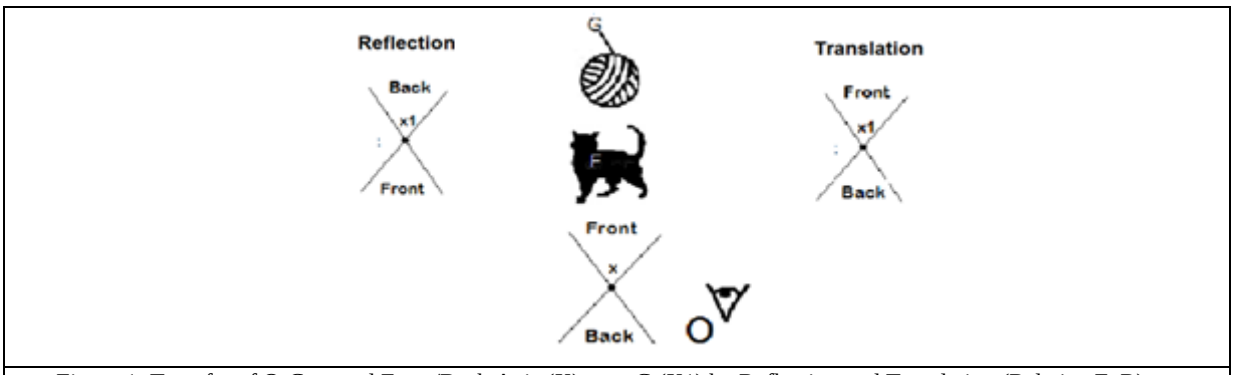

Figure 1: Transfer of O-Centered Front/Back Axis (X) onto G (X1) by Reflection and Translation (Relative FoR)

d. Methodology The methodology applied for elicitation of linguistic spatial FoRs is described in Cerqueglini & Henkin (2017). Spatial cognitive experiments apply the 180° rotation parameter in individual tasks of memory, path finding, pointing gestures, and map sketching Levinson (2003). Elicitation of linguistic temporal representations is based on analysis of spontaneous speech, while cognitive representations are based on observation of pointing gestures and on the application of stimuli in Boroditsky, Gaby & Levinson (2008). In order to verify the hypothesized similarity between spatial and temporal representations, I apply FoRs' theory to temporal representations, treating these as projective spatial relations.

e. Data Data will be presented in the talk with a number of images from the experimental sessions. Brief summary of the findings:

1. TAA space in language: front/back axis is treated according to Absolute, Intrinsic, and Relative FoRs, selected according to the semantic properties culturally attributed to Gs and some axial constraints (Cerqueglini & Henkin 2017). Relative FoR is applied via Translation.
2. TAA space in cognition: front/back axis is treated only according to the Absolute FoR.
3. TAA time in language: anteriority/posteriority is conceived along the front/back axis. Prepositions used to represent spatial Intrinsic FoR (*giddām/gabl* 'in front' and *wara* 'behind') are used in time according to Relative FoR. Relative FoR is applied as Translation in space, but as Reflection in time.
4. TAA time in cognition: Reflection is evident in temporal pointing. Temporal sequencing applies Relative (Translation) and Absolute FoRs, based on the position of the informant with respect to the narrated events (whether involved or not).
5. MAA/YAA space in language: Translation and Absolute FoR are lost. Speakers use Intrinsic FoR or Relative FoR via Reflections without predicable rules.
6. MAA/YAA space in cognition: Absolute FoR is the only frame applied in spatial cognition.
7. MAA time in language: Relative FoR is applied as Reflection.
8. MAA time in cognition: Relative FoR as Reflection in pointing, while Translation is preserved in temporal sequencing. The use of the right/left axis increases.
9. YAA time in language: Relative FoR is applied as Reflection.
10. YAA time in cognition: Relative FoR as Reflection is used in temporal pointing. In cognitive sequencing, the right/left axis is the only available strategy.

f. Conclusions None of the three generations shows neat parallelism between spatial and temporal structures in language or cognition. There is no evidence of linguistic constraints on the development of cognitive strategies across generations. On the contrary, in aṣ-Ṣāniʕ Arabic, linguistic and cognitive representations seem to develop independently across the generations and, consequently, temporal representations are independent from spatial ideas. These findings bring to mind Whorf's claim that Hopi language (Uto-Aztecan language of Arizona/New Mexico) does not apply spatial categories to temporal representations (Whorf 1956:146).

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