Space in languages in Mexico and Central America
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1. Introduction
        This chapter presents an overview of the properties of spatial representations in languages of the region. The analyses presented here are based on data from 47 languages belonging to ten language families in addition to literature on language isolates. Overall, these languages are located primarily in Mexico, covering the Mesoamerican *Sprachbund*, but also extending north to include languages such as the isolate Seri and several Uto-Aztecan languages, and south to include Sumu-Mayangna, a Misumalpan language of Nicaragua. Table 1 provides a list of the languages analyzed for this chapter.

Table 1.   Languages examined in this chapter[1]

Family / Stock	Relevant sub-branches		Language
Mayan	Yucatecan	Yucatecan-Lacandon	Yucatec
		Mopan-Itzá	Mopan
	Greater Tseltalan	Cholan	Yokot'an (Chontal de Tabasco)
		Tseltalan	Tseltal
			Zinacantán Tsotsil
	Q'anjob'alan-Chujean	Q'anjob'alan	Q'anjob'al
			Jacaltec
Otomanguean	Otopame-Chinantecan	Otomí	Eastern Highland Otomí
			Ixtenco Otomí
			San Ildefonso Tultepec Otomí
			Tilapa Otomí
		Chinantec	Palantla Chinantec

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[1] In most cases, we have reproduced the language name as used in the studies that we cite. However, we diverge from this practice in a few cases. One such case would be one in which we know firsthand what the preferred language name is among members of the language community. Another case would be one in which more than one language label is used and for the sake of consistency one single label needs to be favored. In these cases, we list in Table 1 all language names encountered in the cited literature with the selected language name followed by alternated names in parentheses.

	Tlapanec-Manguean	Subtiaba-Tlapanec	Azoyú Me'phaa (Azoyú Tlapanec)
	Zapotecan	Zapotec	Tlacolula Zapotec
			San Lucas Quiaviní Zapotec
			San Bartolomé Zoogocho Zapotec
			Zaniza Zapotec
			Colonial Valley Zapotec
			Diidxazá (Juchitán or Isthmus Zapotec)
			Santa Ana del Valle
			San Juan Yaeé Zapotec
			Texmelucan Zapotec
			Quiegolani Zapotec
			San Marcos Tlapazola Zapotec
		Chatino	San Juan Quiahije Chatino
			Tataltepec Chatino
			Zenzontepec Chatino
			Teotepec Chatino
	Mixtecan	Mixtec	Chalcatongo Mixtec
			Diuxi Mixtec
		Triqui	Copala Triqui
Mixe-Zoquean	Mixean	Oaxaca Mixean	Ayutla Mixe
			Soteapanec
			Olutec
Totonac-Tepehua	Totonac		Totonac (Papantla and Coatepec)
	Tepehua		Huehuetla Tepehua
			Tlachichilco Tepehua

Uto-Aztecan	Southern Uto-Aztecan	Pimic	Pima Bajo
			O'odham
		Tepehuan	Southeastern Tepehuan
		Cora-Huichol	Cora Meseño
			Huichol
		Taracahitic	Tarahumara
			Yaqui
Isolates			Cmiique Iitom (Seri)
			P'orhépecha (Tarascan)
			Chontal of Oaxaca
Misumalpan			Sumu-Mayangna (Tuahka, Panamahka)

As with many domains of research on languages of Mexico and Central America, the Mayan language family has been well represented in research on spatial semantics. Bohnemeyer (2017) provides a synopsis. Areal commonalities in the domain of spatial representation have long been identified for the Mesoamerican linguistic area, including notably the use of body-part meronyms in reference to regions of space and the concomitant scarcity of spatial adpositions. We review these features and examine possible implications for other properties of spatial representations. This chapter also reviews what is known about the lexicalization of postures and other spatial dispositions and about the grammar of motion event descriptions, which have received attention for certain languages, in particular Mayan, but which remain an understudied topic for other languages of the area. We also shed light on topics such as semantic approaches to deixis, which are noticeably absent in the literature.

Section 2 focuses on spatial deixis. Section 3 covers locative predication broadly, with detailed discussions on the semantics of spatial relators, projective relations and frames of reference, and dispositions (including postures). Motion descriptions are discussed in Section 4. The chapter closes with a discussion on research potential in spatial description that remains untapped.

2. Spatial deixis

Deixis (Bohnemeyer 2015; Bühler [1934] 1990; Fillmore [1975] 1997) is a special case of linguistic indexicality (Kaplan 1989; Peirce 1867). It involves verbal expressions whose symbolic meanings designate a particular element of the extra-linguistic context in which the utterance occurs, i.e., the *speech situation*. Examples are first- and second-person pronouns, which designate the speaker and addressee of the utterance, respectively. Such pronouns are *person-deictic* expressions. *Spatial-deictic* expressions designate elements of the speech situation defined in terms of spatial properties. Thus, pronominal demonstratives (*this/that*), as well as

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noun phrases or demonstrative phrases that carry adnominal demonstratives (*this/that hat*) refer to individuals designated in terms of their distance from a *deictic center* (except for non-spatial uses). Depending on the semantics of the individual deictic expression and possibly properties of the particular discourse situation, the deictic center can be the location of the speaker, that of the addressee, or that of both. Adverbial demonstratives designate places in terms of their distance from the deictic center (*here/there*) and deictic motion verbs and directional particles designate the deictic center as the beginning (*go; thither*) or endpoint (*come; hither*) of a motion path.

Spatial deixis has not received much attention in research on the languages spoken in Mexico and Central America. For the overwhelming majority of the languages analyzed, there is no scientific record of the spatial-deictic system beyond, at most, a brief section in selected grammars. And if a language description contains a discussion of spatial-deictic expressions, it will generally focus on morphosyntactic properties and offer little information about the semantics beyond Spanish or English glosses. To our knowledge, the only authors who report the results of systematic research in spatial deixis in the region under question are Bohnemeyer (2015, 2018), Bohnemeyer and Stolz (2006) and Hanks (1990, 2005) on Yucatec Maya; Brown (2006) and Brown and Levinson (2018) on Tseltal Maya; Danziger (1994) on Mopan Maya; Wichmann (1993) on Azoyú Me'phaa; O'Meara (2010) on Cmiique Iitom (isolate); and Mesh et al. (2021) on San Juan Quiahije Chatino (Otomanguean). In the following, we survey both notable morphosyntactic properties as well as semantic distinctions that have been reported.

One intriguing trait of spatial deictics that appears to be recurrent is morphological complexity. Some of the surveyed languages have spatial deictics with a bipartite internal structure. As a first illustration, consider the deictic place adverb *te'l* of Yucatec. This translates both as 'here' and 'there', depending on whether it combines with the clitic particle *=a'* for proximal reference, as in (1), or *=o'* for distal reference, as in (2):[2]

(1)   *U=hòol+nah   ken   u=bin   te'l   t-u=mòoy=a'.*
        A3=hole+house SR.IRR   A3=go there PREP-A3=apse=CFP
        'The door is what will end up here in the apse'

(2)   *le=lìibro   yàan   te'l=o'*
        DEF=book   EXIST(B3SG)   there=CFP
        'The book (that's) (over) there'

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[2]Abbreviations: 1 1st person; 3 3rd person; A subject of a transitive verb; A Cross-reference 'Set A' (ergative/possessor); ABS absolutive; ABSTR abstract; ACAUS anticausative/middle voice; ADJN adjunct; ALD already; AN animate; AND andative; ART article; B Cross-reference 'Set B' (absolutive); CAE2 uphill axis; CAU causative; CFP clause final position; CL classifier; CL clitic; CMP completive; COMI completive for independent; CONT continuative; D determiner; D2 distal/anaphoric particle; DECL declarative; DEF definite; DEIC adverbial demonstrative; DEM demonstrative (adnominal or pronominal); DEP dependent; DEPN neutral dependent aspect-mood; DET determiner; DETRANS detransitivizer; DIM diminutive; DIR directional; DIST distal; DVB deverbalizer; ERG ergative; EV echo vowel; EXIST existential; EXPL explicative; EXP experiencer; F feminine (or endearing prefix for the case of Yucatec Maya); GEN genitive; HAB habitual; HESIT hesitation; I inanimate; ICP incompletive aspect prefix; IMPF imperfective; IN inanimate (classifier); INCH inchoative; IND indicative; IRR irrealis; IT itive; LNKR linker; LOC locative; M masculine; MDP mediopassive; MED medial; NEG negative; NDF indefinite; NEU neutral; NMLZ nominalizer; NOM nominative; NP noun phrase; OBL oblique; PAST past tense; PCN past continuative; PERD perdurative; PFV perfective; PL plural; PLACE place; POSS possessive; POT potential; PREP preposition; PRF perfect; PRG progressive; PRS present; PRT preterite; PRV perfective; PSV passive; REAL realis; RES resultative derivation; RP recent past; S singular; SBJ subject; SG singular; SINTR intransitive subject agreement; SR switch reference; STAT stative; UNSPEC unspecified.

As illustrated in (1), the particle always appears in clause-final position. The same two clitics also occur with adnominal and pronominal demonstratives and presentatives. This combination of distance-neutral demonstrative stems and clitic distance markers is strikingly similar to the French *ce*(*tte*) N-*ci/là* family of constructions (see Diessel 1999: 36-39 for a typological discussion of this and similar patterns).

The precise meaning of the Yucatec clause-final indexical particles is discussed below. They form a paradigm with three other particles, which occupy the same clause-final position and likewise form combinations with expressions elsewhere in the clause: *=e'*, which largely overlaps with *=o'* in meaning and appears to be a variant of it required in certain contexts; *=i'*, which is restricted to anaphoric reference; and *=be'*, which is only attested in the dialect Hanks (1990, 2005) is based on and is used for referents that are audible, but not visible (for the full paradigm see Hanks 1990: 18-19 and a reinterpretation in Bohnemeyer 2015 and 2018).

Thus, the second element of Yucatec spatial deictics (and other deictic expressions in this language) is a clause-final particle that distinguishes between different types of indexical semantics –in particular, proximal, distal, and anaphoric reference. In contrast, the first element indicates the lexical and syntactic category of the complex deictic expression and thus indirectly shows the role of the referent in the proposition expressed by the clause.

Patterns similar to the Yucatec ones are reported in Brown (2006) for Tseltal and Danziger (1994) for Mopan, suggesting that the phenomenon may be widespread in Mayan languages. But structures reminiscent of the Mayan bipartite deictics are also documented in several varieties of Otomí (Otomanguean), including Eastern Highland Otomí (Voigtlander and Echegoyen 1985) and Ixtenco Otomí (Lastra 1997), as well as in Cmiique Iitom (O'Meara 2010). The adnominal demonstratives of Cmiique Iitom derive from nominalizations of posture and motion verbs, creating a system of demonstrative classifiers (more on this below). The nominalizations themselves form definite articles. They produce the adnominal demonstratives in combination with one of three morphemes that are the primary locus of the expression of spatial deixis, not unlike in Mayan languages. Compare the second and third column of Table 2 to the three columns on the right:

Table 2: Definite articles and demonstrative adjectives in Cmiique Iitom (based on O'Meara 2010: 66, after Moser and Marlett 2005: 843)

Property of referent classified by the verb root	Definite article singular	Definite article plural	Proximal demonstrative	Medial demonstrative	Distal demonstrative
'Standing' (support at end of dominant vertical axis)	*cop*/*cap*	*coyolca*	*hip-cop*, *hiz-cop* [liquid]	*ti-cop*, *tacop* [liquid]	*him-cop*
			hiz-coyolca	*ta-coyolca*	*him-coyolca*
'Sitting' (support at end of non-dominant vertical axis)	*quij*	*coxalca*	*hip-quij*	*ti-quij*	*him-quij*
			hiz-coxalca	*ta-coxalca*	*him-coxalca*

'Lying' (support along dominant vertical axis)	*com*	*coitoj*	*hip-com*	*ti-com*, *ta-com* [group]	*him-com*
			hiz-coitoj, *hiz-com* [group]	*ta-coitoj*	*him-coitoj*
Unspecified	*quih*, *cah* [focus]	*coi*	*hiz-quih*	*ta-quih*, *ti-quihtim* [movement]	*him-quihtim*
			hiz-coi	*ta-coi*	*him-coi*
Flexible material			*hip-quih*	*ti-quih*, *ti-cah* [focus]	*him-quih*
			hiz-quihtolca	*ta-quihtolca*	*him-quihtolca*
Referent is a place	*hac*		*hiz-ac*	*ta-hac*	*him-cac*
				ta-cahjoj	*him-cahjoj*
Moving toward a goal			*hip-moca*	*ti-moca*	*him-moca*
			hiz-mocat	*ta-mocat*	*him-mocat*
Moving away from a source			*hip-intica*	*tintica*	*him-intica*
			hip-inticat	*tanticat*	*him-inticat*

As in the case of the Mayan spatial deictics, these forms in Cmiique Iitom have one morphological component that indicates the type of deictic reference, in this case in terms of proximity to the deictic center, while the other component determines the expression's syntactic privileges and thus the place in the semantic composition of the sentence at which they contribute the referent. This particular kind of 'bipartite' structure should not be confused with morphological complexity in general. For example, the Zoogocho Zapotec (Otomanguean) paradigm of demonstratives in (3) exhibits a systematic dimorphic structure (Sonnenschein 2005) very similar to the paradigm of Cmiique Iitom in Table 2. As it happens, in both cases, one of the elements involved in the structure has (partially) a kind of classificatory function (a noun-class marker in (3); a classifier of spatial configuration and shape derived from positional roots in Table 2). However, the lexical category of the elements in (3) is uniform, not variable as in the Mayan and Cmiique Iitom cases. The Zoogocho Zapotec demonstratives are morphologically complex, but their demonstrative meaning is expressed solely by the second element, not by a combination of two elements as in the cases discussed above.

(3)   *bi=ni*   'this one (proximate) (used for small things)'

bi=nga	'this one (medial) (used for small things)'
bi=na'	'this one (distal) (used for small things)'
be=ni	'this one (proximate) (used for animates)'
be=nga	'this one (medial) (used for animates)'
be=na'	'this one (distal) (used for animates)'
da=ni	'this one (proximate) (used for inanimates)'
da=nga	'this one (medial) (used for inanimates)'
da=na'	'this one (distal) (used for inanimates)' (Sonnenschein 2005: 185-186)

Turning to the semantics of spatial deictics, there appears to be a northwest-southeast split in the region in terms of the number of distance distinctions expressed with binary contrasts among Mayan languages and ternary or more complex systems found in the Chatino region and beyond. Both binary and ternary systems are found in the languages in between these two regions. Yucatec, with just two degrees (a marked proximal term *=a'* in opposition to an unmarked *=o'/=e'*), is representative of the apparent prevalence of binary distance distinctions in southeastern Mesoamerica. Binary distance systems are also found in the other two Mayan languages for which we have detailed information regarding spatial deixis –Mopan and Tseltal; in various Valley Zapotec varieties (Benton 2012: 66, 1992: 83; Lillehaugen 2006: 49; Munro and Lopez 1999); and in Totonac (McQuown 1990: 197).

In the Cmiique Iitom, Yucatec, and Zoogocho Zapotec paradigms described above, distance is conflated with other semantic distinctions, yielding systems of considerable complexity. There appears to be a tendency to assume that such complex systems distinguish more than two distance categories, as illustrated by the *proximal-medial-distal* labels in Table 2 and in (1). However, this assumption is often not strongly empirically supported and should perhaps be treated with skepticism in the absence of such support. Sonnenschein's (2005: 119) use of the glosses proximal, medial and distal suggests that the use of the Zoogocho Zapotec demonstratives, observed in elicitation and as illustrated in (4), is compatible with relative distance rather than absolute distance interpretations. Relative, but not absolute, distance interpretations are also compatible with the labels in Table 2 in light of the Cmiique Iitom data presented in O'Meara (2010: 99–110). In contrast, proximity as licensing the use of the *=a'* forms of Yucatec is absolute. The particles *=a'* and *=o'/=e'* are not used contrastively within the speaker's zone of proximity. If two referents are referred to contrastively and both are within easy manual reach of the speaker, but one is closer than the other, *=a'*-terms will be used for both.

(4)   *Bi*   *dx-een=da'*   *be=nga*   *dx-een=da'*
      NEG   CONT-want=1SGEXP   CL.AN=DEM.MED   CONT-want=1SGEXP
      be=na'
      CL.AN=DEM.DIST
      'I don't want this one, I want that one.'
      (Sonnenschein 2005: 186)

Several languages spoken in Mexico have been described as having ternary or quaternary distance distinctions. Examples are found among Otomanguean languages including several varieties of Chatino (such as San Juan Quiahije Chatino, based on Cruz 2014); Diidxazá (Pickett et al. 2001: 75); San Ildefonso Tultepec Otomí (Palancar 2009: 341); Ayozú Me'phaa

(Wichmann 1993: 114); and the Uto-Aztecan languages O'odham (Casad 2012) and Southeastern Tepehuan (Willett 1991: 187).

An important issue in the typology of spatial deictic systems is the contrast between speaker- and addressee-based proximity. Distinguishing between speaker-distal and addressee-proximal semantics can be difficult without controlled elicitation, as the prototype (or at any rate, the great majority of observed uses) of speaker-distal reference in dyadic interactions will probably always happen to fall in the addressee's zone of proximity. An instructive example of this difficulty comes from Hanks' (1990) study of deixis in Yucatec, which is based purely on the observation of spontaneously occurring speech events. This work is in fact the largest-scale and most thorough anthropological study of the use of deictic expressions ever conducted. Based on his observations, Hanks (1990: 437–438) suggests that the =*a'* forms of Yucatec in (1) are speaker-centered, whereas the =*o'* forms are addressee-centered in (2). However, based on data obtained through controlled elicitation with the elicitation scheme developed by Wilkins (1999), Bohnemeyer (2018) shows that the distance of the referent from the addressee has actually no impact on the use of =*a'* and =*o'*. Hanks (2005) concedes that the association between =*o'* and the addressee's zone of proximity may be pragmatic rather than semantic. Bohnemeyer (2018) notes that =*o'* is also used for anaphoric reference and with definite descriptions. He argues that it is a kind of general-purpose indexical that receives a default speaker-distal interpretation in exophoric usage from the contrast to the informationally more specific =*a'* via preemption implicatures licensed by Grice's (1975) first maxim of quantity ("Make your contribution as informative as is required"). The only other languages in the region for which addressee-proximal terms have been reported are San Juan Quiahije Chatino (Cruz and Sullivant 2012) and Tataltepec Chatino (J. Ryan Sullivant, personal communication).

A semantic feature frequently conflated in the semantics and/or pragmatics of spatial deictics is visibility. This is readily explainable with reference to the attention-directing function of spatial deictics (e.g., Bohnemeyer 2015; Diessel 2006), given that directing an interlocutor's attention toward a referent that is not visible in the speech situation imposes distinct cognitive and interactional demands. Visibility sensitivity has been noted as a semantic feature in the spatial-deictic system of Chichicapan (Valley) Zapotec (Benton 1992: 83; 2012: 66); several varieties of Chatino (Eric Campbell, personal communication, for Zenzontepec Chatino; Cruz and Sullivant 2012 for San Juan Quiahije Chatino; Mesh et al. 2021 for San Juan Quiahije Chatino); Eastern Highland Otomí (Voigtlander and Echegoyen 1985); Totonac (McQuown 1990: 197); Ayozú Tlapanec (Wichmann 1993: 114); and Yucatec Maya (Bohnemeyer 2018; Hanks 1990).

Other semantic distinctions found in the spatial deictic systems in Mexico and Central America include the relative position of the referent in the vertical vis-à-vis the deictic center (Benton 1992: 83; 2012: 66 for Chichicapan Zapotec; Willett 1991: 187 for Tepehuan) and the classificatory properties of the referent incorporated in the demonstratives in Cmiique Iitom (cf. Table 2). Demonstrative classifiers are also known as *deictic classifiers* or *article classifiers* in the literature as in O'Meara (2010) for Cmiique Iitom.[3] In Cmiique Iitom, definite articles and adnominal demonstratives derive from nominalized forms of posture and motion verbs, as was shown earlier in Table 2. For example, *quij* in (5) derives from -*iij* 'sit' and *com* from -*oom* 'lie'.

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[3] See also Klein (1979) on the Guaycuruan language Toba, Barron and Serzisko (1982) on Siouan languages, and Hellwig (2003) on the Chadic language Goemai, the last two with cases similar to those in Cmiique Iitom (O'Meara 2010).

(5)   *Ziix*   *an*   *i-c-oosi*   *quij*

thing 3POSS.in   3POSS-UNSPEC.SBJ-DETRANS.drink   DEF.ART.SG.sit

hehe   *i-ti*   *i-c-oohitim*   *com*

wood 3POSS-on   3POSS-UNSPEC.SBJ-eat.PL   DEF.ART.SG.lie

i-ti   *qu-iih*   *iha*

3POSS-on   SBJ.NMLZ-sit   DECL

'The cup (lit. thing from which one drinks) is on the table (lit. wood on which one eats).' (O'Meara 2010: 147)

The classificatory effect is the result of the selectional restrictions of the verb roots. In canonical orientation, cups 'sit' and tables 'lie' in Cmiique Iitom as a function of their geometry. However, the articles are selected according to the actual spatial disposition of the object –if the objects described in (5) were not in canonical orientation, different articles would have to be chosen.

3. Locative predication

Locative predications ascribe to a theme or *figure*, a "moving or conceptually movable entity" (Talmy 2000a: 184), a region of space that may (but need not) be defined with respect to a reference entity or *ground*. For instance, in the sentence *The man is on top of the mountain*, the man is the figure and the mountain is the ground. Locative predication may describe topological or projective relations between a figure and a ground. Projective relations are those in which a frame of reference such as that projected from the perspective of a speaker, is used in the description of the location of a figure with respect to a ground. In contrast, topological relations, as per Piaget and Inhelder (1956), are those in which the location of a figure can be established in direct reference to the ground without the use of a reference frame, i.e. they are non-projective relations. Examples include cases of containment as in the case of a fish in a fishbowl, support as in the case of a bookshelf supporting the books on it, and proximity or distance between a figure and a ground. Locative predication may include reference to the position of the figure, whether as a means to enhance the description or as an obligatory feature of locative predication. This section provides an overview of these topics. Morphosyntactic properties of topological stative locative predication in Mayan, Otomanguean, Mixe-Zoquean, Totonac-Tepehua and Uto-Aztecan languages have been previously summarized in O'Meara and Pérez Báez (2019).

3.1.Spatial relators

Spatial relators, as their name suggests, relate terms that refer to entities whose spatial arrangement is being described. In Mesoamerican languages, *meronyms* –terms which refer to a part of a whole– are a common resource used as spatial relators and heads of *ground phrases* – the phrases that denote the ground. Body-part terms are the prototypical meronyms (Svorou 1994) and in many Mesoamerican languages they function as spatial relators. Some of the earliest descriptions of meronyms in Mesoamerican languages include those for the Otomanguean languages Chalcatongo Mixtec (Brugman 1983), Copala Triqui (Hollenbach 1988) and Ayoquesco Zapotec (MacLaury 1989) and more recently for Diidxazá (Pérez Báez 2012, 2016).[4] These studies coincide in describing a productive use of a small set of body part terms to refer to parts or features of an object. This is done by analogy between the anatomy of the human

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[4] See also the work on meronyms in P'orhépecha (e.g., Foster 1969; Friedrich 1971; Capistrán Garza 2016).

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body as the *base domain* for the analogy, and the geometry of an object as the *target domain*. Further, an abstraction of the relation between certain body parts, notably the head, buttocks or lower extremities, face, back, flanks, and belly or stomach can be mapped onto most objects and spatial configurations. This allows languages such as Diidxazá to assign body part-derived meronyms to simple objects such as spheres to name, for instance, the point of a ball in contact with the floor as *zha'na* 'buttocks' and an opposite point in the vertical axis as *ike* 'head' (Pérez Báez 2012, 2016, 2019). An alternative to these analogy-based analyses is offered for Tseltal in Levinson (1994). This analysis proposes that meronyms are assigned based on a detailed analysis of objects and their geometrical properties. This approach would allow for the mapping of meronyms independently of certain dependencies related to the particulars of the human anatomy such as number of parts or canonical orientation. Pérez Báez (2012, 2016, 2019) based on a Structure Mapping Theory (Gentner 1983; Gentner and Markman 1997; Gentner et al. 2001) approach, suggests that both systems may co-exist in one language and may in fact correspond to two different processes of comparison. Tilbe et al (ms.) presents the results of experimental research in the field with speakers of Tseltal and Diidxazá to further elucidate on the cultural aspects involved in the cognition of object parts.

Ike 'head' is a Diidxazá body part term that refers to the heads of people and animals. In (6), *ike* designates the top-most part of the ground, the house, and a spatial region defined with respect to it based on an analogy to an abstract model of the human body. Whether the superior or inferior region of the house is projected depends on the verb, the figure, and pragmatics. The intended interpretation in (6) was 'on the ceiling' (inferior region), but the interpretation 'on the roof' (superior region) is also available.

(6)   *Bídxǐ=gi*   *dxí'ba*   [*ike*   *yoo*]GROUND PHRASE
       call=fire   mounted   head   house
       'The spider is on the ceiling (/on the roof).'
       (Pérez Báez 2012: 14)

Example (7) from Yucatec illustrates a meronym heading the ground phrase, *óok'ol,* that is not a body part term. Rather, it has an abstract geometric meaning: it designates the top surface of the ground and the region of exterior space projected from it, i.e., the region above the ground:

(7)   *Le=lùuch=o',*   *ti'*   *yàan*   [*y=óok'ol*   *le=mesa=o'*]GROUND PHRASE.
       DEF=cup=D2   there   EXIST(B3)   A3=top   DEF=table=D2
       'The cup, it's there on the table.'

What (6) and (7) have in common is that the ground phrase is a possessed nominal whose primary referent is a part of the ground and which only secondarily also refers to a region defined with respect to this part. The ground phrase in (6) follows the possessed-possessor structure of possession constructions in Diidxazá. The lack of a marker of possession owes to the nature of most body part terms in the language as inalienably (i.e., obligatorily) possessed. In (7), *=óok'ol* designates the top surface and the region projected from it. The semantic and pragmatic processes involved in arriving at an interpretation of a spatial region from a part term deserve and require further study.

The categorical status of meronyms that function as spatial relators has been a matter of discussion among Zapotec scholars. Descriptions vary in analyzing meronyms which head a

ground phrase as nouns or rather as adpositions. For instance, both Ayoquesco Zapotec and Diidxazá have been described as languages in which meronyms are considered to be nouns (MacLaury 1989, Pérez Báez 2012). In Diidxazá, specifically, it has been shown that one and the same meronym may be used to describe different locative relations, as illustrated by (6) above, the details of this vague semantic construal being left to be specified by pragmatics. This vagueness is one piece of evidence against analyzing Diidxazá spatial meronyms as prepositions but rather as nouns that refer to a concrete part of a ground. In contrast, meronyms heading ground phrases in Tlacolula Valley Zapotec have been described as prepositions. This analysis is based on syntactic tests and on the use of meronyms in descriptions of spatial configurations that involve a projection from a ground independently of its orientation (Lillehaugen 2006). Therefore, the meronyms are not considered to refer to a concrete part of a ground.

3.2. Projective relations and frames of reference

Frames of reference are axis systems that define regions and directions in space. They can be compared to the coordinate systems of analytical geometry. In describing the orientation of a figure, the origin of the coordinate system is the center of the figure itself as in *the house faces North*. Frames used in describing the location or motion of a figure with respect to a ground are centered on the ground as in *the ball is behind the chair*. The *anchor* of the frame is a contextual entity or environmental gradient from which the axes of the frame are derived as in *the house is upstream from the village* where the house is the figure, the village is the ground, and the direction of the river flow serves as an anchor. Based on the configuration of these elements, up to six frame types can be identified (Bohnemeyer 2012; Bohnemeyer and O'Meara 2012; O'Meara and Pérez Báez 2011). This classification goes beyond several earlier binary or ternary classifications, such as the one proposed by Levinson 1996. It incorporates the direct frame type proposed by Danziger (2010) and in addition postulates a geomorphic a landmark-based frame type. O'Meara and Pérez Báez (2011) provides a detailed description of the six frame types along with a comparison table to illustrate the correspondences between three approaches to frame of reference classification. Brief examples are provided in Table 3.

Table 3. Six-way classification of frame of reference types (adapted from O'Meara and Pérez Báez 2011: 843)

Frame of reference type	Description	Example
Relative	Projection of the axes of the observer's body onto the ground or figure	*The ball is to the right of the chair.*
Direct (Danziger 2010)	Anchored to the body of an observer; no projection of the observer's body axes onto an external ground	*The ball is in front of us.*
Object-centered	Projection of the axes of the ground onto surrounding space	*The ball is in front of the chair.*

Geomorphic	Projection of one or more (half-) axes modeled after environmental gradients/features onto the ground or figure	*The ball is upstream from the chair*
Landmark-based	Computation of one half-axis as a vector pointing from the ground/figure onto a landmark	*The ball is toward the church from the chair*
Absolute	System of invariant bearings abstracted from geomorphic or landmark-based systems	*The ball is north of the chair*

Levinson (1996, 2003) introduces a distinct ternary classification taking into account not only the type of the anchor, but also the operations involved in deriving the axes. The *relative* and *absolute* frame of reference types above are compatible with those proposed by Levinson. The *direct*, *object-centered*, *geomorphic* and *landmark-based* frames of reference listed above represent a refinement of the *intrinsic* type proposed in Levinson (1996).

Variation in reference frame use across languages and cultures is rampant in small-scale space, i.e., at a scale at which objects are easily manipulated. Speakers of European languages and of standard Japanese show a preference for the relative and direct frames in this domain and generally disprefer geomorphic, landmark-based and absolute ones. In contrast, members of a diverse range of cultures in Africa, the Americas, Asia, and Australasia have been found to prefer geomorphic, landmark-based and absolute frames and make no more than marginal use of relative ones (see Bohnemeyer et al. 2015 for an overview).

The fine-grained distinction in Table 3 follows the findings of cross-linguistic work carried out by the Spatial Language and Cognition in Mesoamerica Project (MesoSpace) in which the use of linguistic frames in 11 populations was studied (Bohnemeyer et al. 2015).[5] This study looked at data from speakers of six Mesoamerican languages (Tseltal and Yucatec for the Mayan language family; and Diidxazá and San Ildefonso Tultepec Otomí for the Otomanguean language family; Southeast Highlands Mixe for Mixe-Zoquean; and P'orhépecha, an isolate), and for control purposes, two non-Mesoamerican indigenous languages spoken nearby (Cmiique Iitom, and Sumu Mayangna, a Misumalpan language of Nicaragua), and three varieties of Spanish: Mexican and Nicaraguan Spanish, and European Spanish spoken in Barcelona. The articles in O'Meara and Pérez Báez (eds. 2011) present descriptions of frame use in the eight indigenous languages and one additional language outside the MesoSpace sample, Mopan. The data from participants clustered heavily by language and differed from one another mainly in the use of relative and geocentric frames.

3.2.1.   Bias against the use of relative frames of reference

It has long been hypothesized that relative frames may be dispreferred areally throughout Mesoamerica. This hypothesis is supported by the MesoSpace studies and by additional studies reported in the literature. There are published accounts of reference frame use in the following

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[5] The project Spatial language and cognition in Mesoamerica was funded by the National Science Foundation (Award No. BCS-0723694; principal investigator J. Bohnemeyer; http://www.acsu.buffalo.edu/~jb77/.htm).

Mayan languages: Mopan (Danziger 1996, 1999, 2001, 2011); Tseltal (Brown 2006; Brown and Levinson 1993, 2000; Levinson 1996, 2003; Levinson and Brown 1994; Polian and Bohnemeyer 2011); Tsotsil (de León 1991, 1994); and Yucatec (Bohnemeyer 2011; Bohnemeyer and Stolz 2006; Le Guen 2011). In these languages, relative frames play a marginal role. Yucatec differs in that it shows a considerably greater incidence of relative frames (Bohnemeyer 2011; Bohnemeyer and Stolz 2006; Le Guen 2011) although even in Yucatec, relative frames are not dominant. Yucatec speakers as a population do not show any clear bias for one frame type. The greater use of relative frames among Yucatec speakers might, by hypothesis, be explained by long-term contact between Yucatec speakers and Spanish speakers. Yucatec speakers also frequently switch between strategies or combine multiple strategies in a single utterance, as illustrated in (8):

(8) *T-u=tséel,*   *te=x-ts'íik*   *te-estée-le=chik'in=o'*
     PREP-A3=side   PREP:DEF=F-left   PREP:DEF-HESIT-DEF=west=CFP
     hun-p'éel   *bòola*   *yàan=i',*   *ch'uy-k'ah-a'n (...).*
     one-CL.IN   ball   EXIST(B3SG)=CFP   hang-ACAUS-RES(B3SG)
     'On the (chair's) side, on the left in the, uh, the west, there is a ball, it is suspended (…).'

Capistrán Garza (2011) reports a dispreference for relative frames in P'orhépecha. Three studies have reported on frame preferences in Otomanguean languages. Speakers of San Ildefonso Tultepec Otomí (Hernández-Green, Palancar and Hernández-Gómez 2011) and Diidxazá (Pérez Báez 2011) are reported to strongly disfavor the use of relative frames.[6] This is in contrast with Tlacolula Valley Zapotec (Lillehaugen 2006). In this variety the use of the absolute frame of reference is reported to be rather limited, except when optionally used to locate large geographical entities in relation to other large geographical entities. In the tasks employed by Lillehaugen, speakers utilized instead either the intrinsic or relative frames (and in some cases both). However, for some types of ground objects, only the intrinsic frame is used. When the ground object is an animal or a human, the relative frame of reference is not used. See (9) for a relative description where *behind* is not based on the back part of the car but the configuration of the speaker with respect to the car and example (10) for what Lillehaugen (2006) analyzes as an intrinsic frame of reference where *cwe'eh* 'beside' appears to be referring to the side of the car.

(9) *Mnnààa'*   *zuu*   *dehts*   *co'ch*
     woman   NEU.stand   behind   car
     'The woman is standing behind the car.'
     (Lillehaugen 2006: 174)

(10) *Mnnààa'*   *zuu*   *cwe'eh*   *co'ch*
     woman   NEU.stand   beside   car
     'The woman is standing beside the car.'
     (Lillehaugen 2006: 174)

3.2.2. Geocentric frames of reference preferences

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[6] For slightly different results, see the study by Marghetis, McComsey, Cooperrider (2020) on the use of co-speech gestures in Diidxazá-dominant speakers and Diidxazá-Spanish bilinguals while producing speech that requires a frame of reference for its accurate interpretation.

Tseltal speakers in the hamlet of Majosik', Chiapas, prefer frames of the type that Levinson (1996) termed 'absolute' (Brown and Levinson 1993). In this language these frames are abstracted from a system based on mountain slopes, with *up(hill)/down(hill)/across* distinctions. Their abstraction manifests in the fact that a member of this speech community will theoretically use the same 'up(hill)', 'down(hill)', or 'across' term for labeling a given direction regardless of the location of the reference point or ground, similar to how cardinal direction terms are used in other languages. Tenejapa, for example, is uphill from Majosik'. But speakers from Majosik' would continue to refer to this direction as *ajk'ol* 'up(hill)' even beyond Tenejapa and on the other side of the mountain, in places that might be construed as downhill from Majosik' in terms of the physical terrain. This contrasts with de León (1991), a description of the use of slope-based reference frames in Zinacantán Tsotsil which does not report an abstract use.

Absolute frames (along with intrinsic frames) have been reported as the preferred option in Totonac in addition to Tseltal (Majid et al. 2004). Meseño Cora speakers show a preference for geomorphic frames (Vázquez Soto 2011), while Diidxazá speakers show a dominant preference for the absolute frame type (Pérez Báez 2011). This type appeared to be particularly favored when orienting a figure. See examples (11) and (12) below.

(11) *ti   asyĕntu   n-u=dxii   lu=gyă²*
      NDF   chair   STAT-CAU=face   face=up
      'A chair is facing north'
      (Pérez Báez 2011: 952)

(12) *n-u=dxii   lu=nĭ   lădu   geté²*
      STAT-CAU=face   face=3I   side   down
      'It is facing the south side'
      (Pérez Báez 2011: 952)

A preference for geomorphic or landmark-based frames (in addition to intrinsic and direct frames) has been documented for P'orhépecha (Capistrán Garza 2011). The use of the landmark-based frames is shown in (13).

(13) *Pelóte xiníani xwáta-rhu   ísï   xarhá-s-Ø-ti=ni*
      ball   thither mountain-LOC region be-PRF-PRS-3IND=EXPL
      'The ball is thither in the region of the mountain.'
      (Capistrán Garza 2011: 1016)

With methods similar to those used by Brown and Levinson (1993), Polian and Bohnemeyer (2011) studied the use of reference frames in three Tseltal communities (Ch'ajkoma, Mesbilja', and Tenejapa (Lum in Tseltal)). They found that speakers in all three communities showed a preference for intrinsic and landmark-based frames. An example is provided in (14):

(14) *Jich p'ekel bel ta   stojol   mukinal   i   pelota-i*
      thus lying   DIR PREP toward   cemetery the   ball-CL
      'The ball is placed toward the cemetery [with respect to the chair].'
      (Polian and Bohnemeyer 2011: 878)

These preferences are in contrast to data from Cmiique Iitom. Speakers of Cmiique Iitom used a variety of frames, but showed preferences for intrinsic and direct frames, used landmark-based frames to a lesser extent (including the use of environmental gradients as anchors) and in general dispreferred absolute frames (O'Meara 2011). The direct frame is shown in (15) and an instance of a landmark-based frame is shown in (16).

(15) *Hehe i-ti   iquiicolim   quij*
      wood 3POSS-on 3POSS.UNSPEC.SBJ.OBL.NMLZ.sit.PL   DEF.ART.SG.sit
      hiiqui   t-iizc   ma...
      1POSS.toward   REAL.DEP-face   SR
      'The chair (lit. wood on which one sits) is facing me [and the ball is in the corner]...'
      (O'Meara 2011: 1040)

(16) *Heen iicp   hac   i-iqui   qu-iizc   iha.*
      desert 3POSS.side DEF.ART.SG.LOC   3POSS-toward SBJ.NMLZ-face DECL
      'It [the chair] is facing toward the desert.'
      (O'Meara 2011: 1042)

Similarly, speakers of Sumu-Mayangna also used several frame strategies, but preferred direct and intrinsic ones, employing relative, landmark and absolute strategies the least in small scale space (Eggleston 2012: 40). Two instantiations of the direct frame are shown in (17) and (18).

(17) man   sait sak   ki,   dauk   bin
      2S.PRN.POSS   side sak.AUX.CLS   PTC:3S   DISJ   DIM
      nayas   yakat balni   kidi   sak   ki
      far.NEG   P   ball.N.CS   DET   sak.AUX.CLS   PTC.3S
      'On your side, but not very far, the ball is there.'
      (Eggleston 2012: 112)

(18) yalahdarang   tem   kidik mâ   mûk   kidika
      sit.V.FUT:1P.INCL   when DET   1P.INCL face.N.POSS.1P.INCL   DET
      tingramh   saitni   yakat kiunin   awi   yuldarang
      righthand   side.N.CS   P   go.V.INF   AUX:3   say.V.FUT.1P.INCL
      kat   windar   sait yakat ki
      CONJ   window   side P   PTC.3S
      'If we sat, our face would go to the right-hand side, so to say, toward the window side.'
      (Eggleston 2012: 113)

Taking a rather novel approach, Moore (2018) carried out field research in three different towns of the Diidxazá-speaking region with distinct topographic features, and also in different neighborhoods within individual towns. The strikingly dominant preferences reported in Pérez Báez (2011) were documented in the northern side of the *agencia* of La Ventosa. The data presented in Moore (2018) shows patterns of variation in frame of reference preferences at the hyper-local level, i.e. not only from one town to another but even at the level of neighborhoods within individual towns including La Ventosa.

3.2.3. Considerations for future studies

Comparative cross-linguistic analysis of frame use is hampered by the particulars of the design of any given elicitation or experimental task. The cross-linguistic study carried out by the MesoSpace project is noteworthy as all researchers implemented a standardized set of verbal and pre-verbal tasks (cf. Bohnemeyer 2008). Issues such as scale, among others, were also controlled for in the field protocol. The scale at which a study might have been conducted may bias the preferences that speakers might exhibit. For Mopan, for instance, Danziger (2011) reports that speakers use exclusively intrinsic frames in small-scale space. In contrast, and as reported above, Diidxazá speakers heavily resort to the use of the absolute frames even in table-top matching tasks. Romero Méndez (2011), the only work of its kind on a Mixe-Zoquean language, reports that absolute and geomorphic frames were not used by Ayutla Mixe speakers. Further, Romero Méndez cannot point to an absence of appropriate ambient topography (as does Bohnemeyer 2011) as a reason for the dispreference for these strategies. Instead, Romero Méndez offers the possibility that in Ayutla Mixe absolute and geomorphic FoRs might only be employed over long distances and not in table-top space. Examples (19) and (20) illustrate the use of an intrinsic and a landmark-based frame of reference, respectively.

(19) *ja'a*   *ëx-ki'py*   *ja'y* *y-ak-tan-y*   *ja'a*   *y-eejk*
     DEM.DIST   back-LOC   just   3S-CAU-stand-DEPN   DEM.DIST   3POSS-toy
     'The toy (i.e. the ball) was put behind [the chair]...'
     (Romero Méndez 2011: 926)

(20) *jam*   *tsëën-nay-pajt*   *jam*   *t-ex-y*
     DEIC.DIST sit.down-PERD-LOC DEIC.DIST 3A-see-DEPN
     mää   *yë'ë*   *tëëjk-ää=ë'n*
     where   DEM.DIST   house-mouth=ADJN
     'The chair is [facing] there, it's looking toward the door.'
     (Romero Méndez 2011: 926)

Comparative work is also hampered by a paucity of in-depth studies. Mayan languages have been privileged and a number of studies on preferences in frames of reference use exist. In contrast, studies for the Totonac-Tepehua family are limited to Levy (2008) on Papantla Totonac which reports a preference for intrinsic frames in describing the location of objects in the front-back dimension and for relative frames when a ground has facets. There are a few studies known to us for Uto-Aztecan languages. In addition to Vázquez Soto (2011) reporting on Meseño Cora, Gómez (2014: 880) reports on the use of intrinsic and relative frames in Huichol, another Corachol (Uto-Aztecan) language. Hernández Vázquez (2014: 132–139) reports the use of intrinsic, absolute and relative frames among speakers of Hueyapan Nawat.[7]

A valuable line of research lies in the investigation of the impact of language contact in frame preferences, notably in terms of contact with the region's dominant language, Spanish. As mentioned above, contact with Spanish is suspected in accounting for a higher frequency of use of relative frames in Yucatec. A series of mixed-models logistic regression analyses showed that

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[7] See also the Nahuatl Space Project described by Pharao Hansen and O'Meara (2020), which aims at comparing the spatial language, including spatial frames of reference, of four Nahuan varieties spoken in Mexico.

a significant predictor in almost all models was language group (Bohnemeyer et al. 2015). L2-Spanish use was a significant factor in models of relative frame use. The more frequently speakers of the indigenous languages used Spanish as a second language, the more often they also used relative frames in their native language.[8] Further studies in this vein would be welcome contributions both in terms of understanding synchronic frame preferences as well as in developing an understanding of diachronic preferences and dynamics within the context of language shift pressures and language endangerment.

3.3. Posture and disposition

       The term *positionals* is used in this chapter to accommodate the diversity in lexical categories and analyses proposed for the description of morphemes that encode complex spatial configurations of a figure or between a figure and a ground. This semantic category includes the postures of animate beings, such as sitting, squatting, or kneeling, but also *dispositions* of inanimate objects, such as leaning against something, being in a pile, being crumpled up, etc. The term positionals has also been used in Mayan linguistics to refer to morphemes that encode the position of an entity in space. Bohnemeyer and Brown (2007) introduce the term *dispositionals* in reference to roots and stems that encode not only posture but rather disposition defined as the spatial properties of a figure without reference to a ground or place. These terms should be understood as neutral in terms of lexical (i.e., part-of-speech) category of the relevant morphemes. The roots in Mayan languages encoding the posture of an entity may surface as verbs, stative predicate stems, classifiers and other lexical categories. Some languages have a large class of lexical items that lexicalize dispositional information, such as the Mayan languages described above, while some languages contain a more limited set of posture or positional verbs, similar to what we have in European languages, for instance (e.g., *sit, stand, lie* and *hang*). A smaller set of positional verbs is found in languages like Cmiique Iitom (O'Meara 2008), Yaqui (Dedrick and Casad 1999), Huichol (Gómez 2014), Huehuetla Tepehua (Smythe Kung 2007) and Soteapan Zoque (Boudreault 2009), as well as in Zapotecan languages (Campbell 2014 and Cruz 2014 for Chatino languages; Galant 2012, Lillehaugen and Sonnenschein 2012, Operstein 2012, Rojas Torres 2012 for Zapotec languages) and other Otomanguean languages (Brugman and Macaulay 1987 and Hollenbach 2013 for Mixtec languages; Hollenbach 2008 for Copala Triqui).

       Mayan languages are known for their very large inventories of positional roots, ranging from upwards of 150 in Yucatec (Bohnemeyer and Brown 2007) to as many as 600-700 in some highland languages such as Q'anjob'al (Martin 1977; Mateo Toledo 2004). Bohnemeyer and Brown (2007) propose four semantic subclasses of disposition based on a comparison of the Tseltal and Yucatec inventories:

- Support/suspension, (e.g., *sit, stand, lie, hang, kneel, lean, droop, dangle, be mounted on top of something*);
- Blockage of motion (e.g., *be stuck to something, be stuck between two things*);
- Orientation in the gravitational field (e.g., *lie face up, lie face down, lie on side, be tilted at an angle*);
- Configurations of parts of an object with respect to one another (e.g., *be lined up in a row, be bulging*).

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[8] Marghetis, McComsey and Cooperrider (2021) argue that relative frame use by Diidxazá speakers in the tasks they conducted was predicted by participants' proficiency of the Spanish terms 'left' and 'right' and the type of event being described.

Literature on inventories of positionals in languages outside of the Mayan family are generally not exhaustive or do not explicitly claim to be so. Descriptive literature consulted on 15 non-Mayan languages confirms that inventories of positionals in non-Mayan languages are smaller than those found in Mayan languages. A summary of consulted data on non-Mayan Mexican languages is summarized in Table 4 below. Glosses are as provided in the consulted literature. A gap in the table should be interpreted as a gap in the data available in the literature rather than confirmation that the distinction is not made in the language in question.

Table 4. Positionals in 12 non-Mayan languages (**INSERT PositionalsChart.pdf**)

All of the 12 non-Mayan languages summarized in Table 4, have roots that encode properties conceptualized along the support and suspension dimension with the basic sit, stand and lie distinctions well attested in the sample. Chalcatongo Mixtec has roots that not only encode postures such as lying and standing but encode part naming and projective relation descriptions (Brugman and Macaulay 1987). Roots are marked with the letters R and P respectively in Table 4. Zoogocho Zapotec is reported to have roots encoding properties along all four dimensions (Lillehaugen and Sonnenschein 2012). Diidxazá shows roots that encode properties along three of the dimensions and uses lexical compounds such as -*a'ta=ri lu* 'face down' and -*a'ta=sa* 'face up' to encode orientation in the gravitational field (Pérez Báez and Kaufman ms.). Foreman and Lillehaugen (2013, 2017) survey 10 Zapotec languages across four language areas (including Zoogocho Zapotec) and Colonial Zapotec, respectively. The data provided includes roots that encode properties along the support/suspension dimension. The data is much more sparsely distributed across the other three dimensions with a noticeable gap across all languages along the orientation of the gravitational field dimension.

Whereas the typological literature has focused mostly on expressions of the animate postures familiar in European languages, Bohnemeyer and Brown (2007) report that a large portion of the positional inventories in Mayan languages select for inanimate arguments. Selection of inanimate arguments in locative constructions with positionals is also found in Cmiique Iitom (O'Meara 2008), as mentioned above, Huehuetla Tepehua (Smythe Kung 2007), Texmelucan Zapotec (Speck 2012), San Juan Yaee Zapotec (Galant 2012) and Zoogocho Zapotec (Lillehaugen and Sonnenschein 2012). Selection of positional predicates dependent upon the animacy of argument referents can manifest itself in different ways, as in the case of Zoogocho Zapotec, where *zoa* 'is standing' is used with inanimate subjects in positional predication and with animate subjects in existential constructions, whereas *zee*, glossed as 'is standing', is restricted to use with animate subjects.

Analogous to what is reported in the discussion on deixis in Section 2, scholarly work on the semantics of positionals in Mexican languages, especially if we exclude the Mayan languages, is limited. Further work is needed not only for the sake of exhaustive or at least extensive descriptions of the system of spatial reference in languages belonging to a region of significant linguistic diversity and areal diffusion but also for the purpose of advancing theories on spatial language and cognition. Bohnemeyer and Brown (2007) point out that the extensive inventories of positionals in Mayan languages do not support Landau and Jackendoff's (1993) generalization that spatial representation is more sensitive to the properties of grounds than to those of figures. As has been the case historically, theories of language benefit from cross-

linguistic diversity of data and analyses and would likely be the case should descriptions of the semantics of positionals were to grow in numbers.

4. Motion

Previous typological and theoretical research (e.g., Fillmore [1975] 1997: 50-69; Jackendoff 1983: 161–187; Talmy 2000b: 21–146) has identified the following conceptual properties of motion events that are commonly lexically and/or morphosyntactically distinguished in their linguistic representations:

- The moving entity or figure;
- The trajectory or *path* covered by the figure during the motion event;
- One or more reference entities or grounds with respect to which the path is defined;
- A set of semantic roles that relate the grounds to the path:
  - *Source* and *goal*, for grounds that occupy the beginning and endpoint (respectively) of a *bounded path*;
  - *Route* grounds that fall on the path between beginning and endpoint;
  - *Directional* grounds toward or away from which the figure is moving at a given point along the path;
- The *manner* of motion, an action or activity that involves the figure and prototypically causes it;
- A perspective or *vantage point* from which the motion event is described.

The property of motion event representations that has attracted the most attention among typologists is the respective locus of the expression of manner and path in the clause (to the extent that a language allows the expression of both in a single clause), following the lead of Talmy's (2000b: 21–146) typology of *lexicalization patterns*. Talmy distinguished two broad types. In *verb-framed* descriptions, the path information is lexicalized in verb roots that describe location change with respect to a single ground, with meanings such as 'enter', 'descend', and 'go'. The representation of manner is optional in such descriptions and requires a separate verbal projection (see below for examples). In contrast, in *satellite-framed* descriptions, path information is encoded outside the main verb root, by a verb particle or secondary predicate (what Talmy calls a *satellite*), an adposition, or a case marker on a noun phrase that refers to a ground. The main verb root of a satellite-framed description encodes manner information. The grammar and lexicon of a language may license one type of description or both. Serial verb constructions in which manner and path are encoded by verbal projections that form a single clause and neither of which is syntactically dependent on the other have been identified as a third option (Ameka and Essegbey 2001; Zlatev and Yangklang 2004).

The languages of Mexico and Central America present various framing types. Motion event descriptions in some Mayan languages instantiate exclusively the verb-framed type, albeit with a number of twists. These languages have verb roots that lexicalize notions of location change and thus resemble path-conflating verbs with meanings such as 'enter', 'come', and 'ascend',[9] and they do not express path functions outside these verb roots. Example (21) illustrates one way of combining manner and location change verbs in Yucatec sentences.

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[9] However, as discussed below, despite being pragmatically equivalent to path verbs, there is evidence that these Mayan verbs do not necessarily lexicalize path relations.

(21) *Le=ch'iich'=o'* *h-èem* *u=xíiknal* *te=che'=o'*.
DEF=bird=CFP PRV-descend(B3SG) A3=fly PREP:DEF=wood=CFP
'The bird, it flew down from the tree [lit. it descended from the tree flying].'

Cmiique Iitom and Ayutla Mixe can also best be described as verb-framing languages (O'Meara 2010, 2014; Romero Méndez 2007, respectively). In contrast, prototypical satellite-framing in motion event descriptions has been attested in several Uto-Aztecan languages. For instance, Yaqui, a Uto-Aztecan language spoken in Sonora, Mexico, has been reported as a predominantly satellite-framing language (Guerrero 2012, 2014). Example (22) illustrates cliticization of the satellite *yeu* 'outside' to the verb:

(22) *Si'ime=te* *[Teta Kawi-u]* *yeu=kat-ne*
all=1PL.NOM rock hill-DIR outside=walk.PL-POT
'We all will walk to the hill Tetakawi'
(Guerrero 2012: 95)

Huichol has also been described as having verbal prefixes that lexicalize path (Gómez 2014: 881). Southeastern Tepehuan has been described as a predominantly satellite-framing language (García Salido 2014: 184). Most of the satellites in Southeastern Tepehuan are free and some lexicalize directional path information, something that has also been described for Cora. An example is (23), where *o'u-* lexicalizes direction away from deictic center.

(23) *h-o'u-tá-me*
S3SG-IT-CAE2-move
'He is going uphill.' (e.g., from Ixcatán to Presidio)
(Vázquez Soto 2014: 933)

A rather different manifestation of satellite-framing occurs in many (though not all) Mayan languages. In these languages, the location-change verbs function not only as main verbs, but also as non-finite forms that modify the main verb. These adverbial location-change verb forms are known as *directionals* in Mayan linguistics. As illustrated by the Tseltal example in (24), the main verb in such structures can encode manner information (although directionals also occur modifying other location change verbs). This configuration instantiates satellite-framing.

(24) *Ya* *x-ben* *jelaw-el* *mut* *ta* *ch'ajan* *tak'in*.
ICP IMPF-walk(3A) cross-DIR bird PREP cord metal
'The bird walks across the electric wire.'
(Brown 2006: 253)

More generally, the term 'directional' is commonly used in the typological literature for backgrounded - often morphologically bound, quasi-inflectional - expressions of path information. Constructions that combine such expressions with non-motion descriptions are known as 'associated motion' constructions (Dryer 2021a and references therein). Dryer (2021b) and Hernández-Green and Palancar (2021) discuss associated motion constructions in languages of Mexico and Central America. The andative auxiliary-like marker in the example from Tilapa Otomí in (25) illustrates this.

(25) *Tár=htsi='a*
      1SBJ.AND=eat=3SG
      'I'm eating it as I go'
      (Hernández-Green and Palancar 2021: 531)

Serialization has likewise been argued to be a framing option available in some languages of the region. Consider for instance the Olutec (Mixe-Zoquean) structures illustrated in (26)-(27). These can be described as involving serialization of path and non-path verb roots inside a single finite syntactic verb form.

(26) *ø=piyüʔk-tak-pitzüm-u   jaʔ*
      B3(ABS)=run-LNKR-exit-COMI   he
      'He went out running.'
      (Zavala Maldonado 2010: 148)

(27) *Siga:rru=k   ʔi-juʔk-tak-mi:nʔ-u*
      cigarette=an A3(ERG)=smoke-LNKR-come- COMI
      'He came smoking a cigarette.'
      (Zavala Maldonado 2010: 149)

However, Zavala Maldonado (2010) suggests that the path verb forms in these configurations have undergone a grammaticalization process that would render them more similar to the Uto-Aztecan satellites illustrated in (22)-(23) above. Depending on how far this process has progressed, the constructions in (26)-(27) might be properly viewed as assuming an intermediate position between serialization and satellite framing.

An important point of departure between verb framing in Mesoamerican languages and better-studied cases such as Spanish and Turkish is the distinction between the *radical verb framing* and *double-marking* subtypes introduced in Bohnemeyer et al. (2007). In double-marking languages, such as Japanese, Spanish, and Turkish, path information is not solely expressed in the verb, but is to some extent also reflected by the morphosyntactic form of the ground phrases, i.e., co-constituents of motion verbs that designate regions of space defined vis-à-vis the reference entities (grounds) of the motion description. While there may be some amount of conflation between the form of goal (or *allative*) phrases and stative locative phrases in these languages, the form of source (or *ablative*) phrases is distinct. For example, in Spanish, both descriptions of location in an enclosure and descriptions of entry into it are compatible with the preposition *en*, whereas descriptions of exits from the same enclosure require the ablative preposition *de*. In contrast, ground phrases in radically verb-framing languages lack any formal reflex of path information. Such path-neutral ground phrases are widespread among the languages of the region. In (28)-(29), there are examples of such ground phrases in Ayutla Mixe, (30)-(31) from Diidxazá, (32)-(33) from Cmiique Iitom, and (34)-(35) from Yucatec.

(28) *Luis të   y-tëk   y-tëk-ojt-py*
      Louis PAST 3SINTR-enter(DEPN) 3POSS-house-inside-PLACE
      'Louis entered (lit. in) his house' (constructed)
      (Bohnemeyer et al. 2009)

(29) *Luis   të   y-pëtsëm-y   y-tëk-ojt-py*
     Louis PAST 3SINTR-exit-DEPN   3POSS-house-inside-PLACE
     'Louis exited (lit. in) his house' (elicited)
     (Bohnemeyer et al. 2009)

(30) *Byuu   Ana   ndaani   yoo*
     CMP:MDP:enter   Ana   stomach   house
     'Ana entered (lit. in) the house'
     (Bohnemeyer et al. 2009)

(31) *Zaǎ   kweě=ka'=bě   ba'du   ka   ndaani=bě*
     allow   PRG:extract=PL=3   child   DEM   stomach=3
     'Let them extract the child from inside her' (lit. let her have a c-section)
     (Bohnemeyer et al. 2009)

(32) *Ziix   c-oqueht   quij   hant   qu-ipcö   i-tacl*
     thing   SBJ.NMLZ-bounce   DEF.ART.SG.sit   land   SBJ.NMLZ-thick   3POSS-top
     hac   i-ti   t-afp...
     DEF.ART.SG.LOC   3POSS-on   REAL.DEP-arrive
     'The ball (lit. thing that bounces) arrived on top of the dune...'
     (Bohnemeyer et al. 2009)

(33) *He   xepe   com   i-ti   mhata...*
     1   sea   DEF.ART.SG.lie   3POSS-on   1.REAL.DEP.come
     'I came from the sea...'
     (Moser and Marlett 2005: 76)

(34) *Le=kàaro=o'   h-òok   ich   le=kàaha=o'*
     DET=cart=D2   PRV-enter(B3SG)   in   DET=box=D2
     'The cart, it entered (lit. in) the box'
     (Bohnemeyer et al. 2009)

(35) *Le=kàaro=o'   h-hòok   ich   le=kàaha=o'*
     DET=cart=D2   PRV-exit(B3SG)   in   DET=box=D2
     'The cart, it exited [lit. in] the box'
     (Bohnemeyer et al. 2009)

The widespread presence of path-neutral ground phrases in Mayan languages was also noted by Grinevald (2006). Grinevald relates path-neutral ground phrases to the occurrence of directionals, suggesting that directionals express path information in lieu of ground phrases in these languages. This hypothesis seems typologically problematic, since many languages have path satellites that express information comparable to that conveyed by Mayan directionals, yet at the same time also reflect the path information in the ground phrase. The German example in (36) illustrates this. The source path function is expressed simultaneously by the satellite *heraus*

'out' and by the ablative preposition *aus* 'out of', and is moreover reflected by the genitive case that *aus* governs.

(36)   *Der*   *Wagen*   *fuhr*   *aus*   *der*   *Garage*   *heraus.*
          the   car(NOM.SG.M)   drove(PRT)   out.of   the   garage(GEN.SG.F)   out
          'The car exited the garage.'

Conversely, there are Mayan languages that have path-neutral ground phrases, yet lack directionals. Yucatec is a case in point.[10] The complete absence of path information from the ground phrase has important consequences for the representation of motion events. It makes it difficult to represent location change with respect to multiple grounds in a single verbal projection. Only one such ground can actually be encoded by a ground phrase. As a result, the representation of motion is reduced to the representation of location change.[11] Continuous locomotion along a multi-ground path is only represented at the discourse level, relying heavily on conversational implicature. Bohnemeyer (2010) argues that path functions are systematically absent from the semantics of Yucatec. Specifically, he shows the following:

- Ground phrases are without exception path-neutral (see (34)-(35)).
- Yucatec clauses never contain multiple ground phrases.
- 7 of the 12 location-change verb roots of the language (all of which also produce derived causative stems) are compatible with scenarios in which the figure undergoes location change with respect to a ground without actually moving –by the ground moving instead or by the figure or the ground emerging into or disappearing from the configuration (i.e., teleportation).[12]
- The remaining 5 location change verb roots can be argued to be incompatible with such uses, not because they express motion paths, but because they require the ground to be static.
- Yucatec lacks *fictive motion* metaphors (Talmy 2000a: 99-175), using instead location-change metaphors. For instance, rather than to say a road 'leads from Cancun to Chetumal,' Yucatec speakers would say that it 'exits Cancun and arrives in Chetumal.' Instead of 'seeing through a window', Yucatec speakers 'look at a window and see what's inside the house'.

A widespread distinction in the semantics of deictic path verbs across Otomanguean languages is that between the deictic center and the figure's *base*. The base is a location understood in context that plays a significant recurrent role in the figure's activities. Most commonly, it is the place at which the figure resides. Base-related deictic path semantics seems to be a particularly common phenomenon in Otomanguean languages. For instance, consider some of the motion verbs of Diuxi Mixtec listed below (from Kuiper and Merrifield 1975):

(37)   *ki*   move to non-base toward deictic center, and return away from deictic center
       vowa   move to non-base toward deictic center
       ndisi   move to base toward deictic center
       šé?ę́   move to non-base away from deictic center, and return toward deictic center

---

[10] Yucatec has a construction that involves dependent uses of location change verbs in a non-finite form but does not admit manner main verbs.

[11] Levinson and Wilkins (2006: 527–537) suggest the same for Tseltal.

[12] This research was inspired by Kita's (1999) work on the verbs *hairu* 'enter' and *deru* 'exit' of Japanese.

hí?į̃   move to non-base away from deictic center
nu?ú   move to base away from deictic center

Another detailed analysis of a complex deictic motion lexicon involving the notion of base was proposed by Macaulay (1985) for Chalcatongo Mixtec. The lexicalization of base in motion predicates has also been described for Zapotec languages (Speck and Pickett 1976 for Texmelucan Zapotec and Pickett 1976 for Diidxazá), Palantla Chinantec (Merrifield 1992) and Chatino (Cruz 2014). Outside Otomanguean, the notion of base also occurs in the lexicon at least in Mayan languages, Yucatec being again a case in point. Finally, some languages lexicalize environmental variables in their motion verbs. This has been described for Ayutla Mixe (Romero Méndez 2007).

5.   Closing Remarks
      A review of relevant literature on 47 languages belonging to ten language families in addition to three isolates located in Mexico and Central America, provides an opportunity to refine our knowledge of the typological trends in the domain of spatial description in this region. This review has shown, for instance, that bipartite internal structures of spatial deictics are common in languages across various families. It also points to a contrast between speaker- and addressee-based proximity, contrasts based on visibility and a possible split in the region with binary distance systems described for southeast languages and ternary and quaternary distinctions in northwest languages. The paucity of semantic studies of spatial deictics in the languages of Mexico and Central America is undoubtedly partly due to the methodological and theoretical challenges such studies face (Bohnemeyer 2015, 2018).
      The use of body part-derived spatial relators in locative descriptions has been identified as a feature of numerous languages of the region and is a frequent topic in the literature. Issues remain unresolved pertaining to the categorical status of these relators, with implications for the study of the lexical category system (the paucity of adpositions in many languages) and the dynamics of grammaticalization in the region. Frames of reference use has been studied in a systematic and cross-linguistic way in some of the languages of the area showing a bias against the use of relative frames of reference and perhaps a preference for geomorphic, landmark-based and absolute frames. A review of 12 non-Mayan languages show the prevalence of four semantic subclasses of support/suspension, blockage of motion, orientation and configurations. However, in most of the 12 languages, the data sets consulted do not include roots encoding properties along all four dimensions. This may be an artifice of the limitations on the available data.
      Indeed, the survey conducted for this chapter has made evident that significant gaps exist in the description and analysis of interesting features of the languages of the region. For instance, we show that for most languages surveyed, a description of deixis is limited to brief descriptions of morphosyntactic structures. This gap indicates the lack of a much-needed crosslinguistic analysis on the topic. In-depth studies on speaker- and addressee-based proximity seem limited to two studies, both on Yucatec. Other topics are better represented in the literature and may be ready for higher-level theoretical analysis. This may be the case of the conceptual basis of the mapping of body part-derived terms onto the geometry of objects for the purposes of identifying parts and regions projected from them that are of relevance to locative description. With studies done only on Mayan and Zapotec languages, much remains to be explored. Within the better-attended topic of locative descriptions, a cross-linguistic analysis of semantic distinctions of topological relations constitutes a noticeable gap. Even the relatively better studied domain of

frames of reference use is marred by a dearth of language-specific in-depth studies. For instance, these kinds of studies have only been done on one language of the Mixe-Zoquean family, Ayutla Mixe, and lack of studies on the topic is quite apparent for Uto-Aztecan languages. Studies on positionals are well known for Mayan languages, yet they remain scarce for most other language families. As such, what is known about the semantic typology of positionals is almost limited to what has been reported for Mayan languages. More broadly, and with regards to all the topics presented in this chapter, the impact of language contact especially (but certainly not exclusively) with the region's dominant language, Spanish, requires much attention. These remarks offer some hints as to the rewards that may await researchers who confront these documentary, descriptive and theoretical challenges in the region.

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