

The grammar of parts, places, and paths in languages of Mexico

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1

Overview

- semantic typology and formal semantics
- the language sample
- a semantics for spatial descriptions
- path-neutral ground phrases
- meronyms
- interface variations
- summary and conclusions
- acknowledgments
- appendix: key to interlinear glosses

2

Semantic typology and formal semantics

- how much crosslinguistic variation is there in compositional semantics?
 - to what extent does meaning composition vary across languages?
 - what are the dimensions/parameters of variation?
 - what factors determine the types a language instantiates along these dimensions?
- candidate loci of variation (cf. von Stechow & Matthewson in press for discussion)
 - the functional category system
 - the operations of meaning composition operative in a language in addition to function application

3

Semantic typology and formal semantics (cont.)

- the semantic type system
- the alignment between syntactic categories and semantic types
- our focus: the latter two dimensions
- our domain: the semantic composition of spatial descriptions
 - a domain that has so far attracted relatively little attention among formal semanticists
 - but see, e.g., Kracht 2002, Zwarts 2005, Zwarts & Winter 2000
- our goal: a micro-typology of the syntax-semantics interface
 - in the domain of spatial descriptions
 - in four unrelated indigenous languages of Mexico

4

Semantic typology and formal semantics (cont.)

- preview
 - in all four languages, spatial descriptions are canonically “verb-framed” (Talmy 2000)
 - yet, they exhibit a striking amount of variation in the mapping b/w syntactic and semantic types
 - what seems to be invariant across the four is the logical form of spatial descriptions

5

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6

The language sample

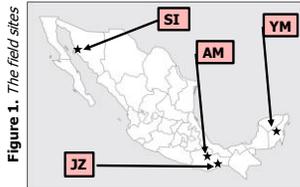


Table 1. The languages

language	id in this paper	language family	part of the Mesoamerican sprachbund?	estimated number of speakers	researcher	field site
Ayutla Mixe	AM	Mixe-Zoquean	yes	3,600	RRM	Ayutla, Oaxaca
Juchitán Zapotec	JZ	Oto-Manguean	yes	85,000	GPB	Juchitán de Zaragoza, Oaxaca
Seri	SI	(isolate,)	no	800	CO	El Desemboque, Sonora
Yucatec	YM	Mayan	yes	759,000	JB	Yaxley, Quintana Roo

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A semantics for spatial descriptions

- we focus on utterances that describe the location or motion of one entity – the **figure**
 - with respect to one or more reference entities or **grounds**
- locative descriptions
 - the space occupied by the figure – a **region** – is included in a region defined wrt. the ground

(3.1) a. *The mouse is under the table*
 b. $loc('mouse') \subseteq under('table')$

- suppose a spatial structure comprising a set of regions U_R
 - and relations of inclusion and adjacency defined over them
- the **locative function** *loc*' and the **place function** *under*' are mappings of type $\langle e, r \rangle$
 - from the set of individuals U_i into U_R



Figure 2. A mouse in space

A semantics for spatial descriptions (cont.)

- the locative function *loc*' maps entities into the regions they "occupy" at the time of evaluation
- the interpretation of place functions such as *under*' may be prototyped
 - and depend on force-dynamic notions (such as contact, attachment, and support/suspension) and frames of reference
 - » cf., e.g., Herskovits 1985; Jackendoff 1983: ch.9; Levinson 1996; Zwarts & Winter 1986; Kracht 2002; and many others
 - the term 'place function' is borrowed from Jackendoff and corresponds to Kracht's 'localizer'
 - » Kracht (2002: 190) argues that the treatment of place functions in terms of mappings to regions is too simplistic; but it will do here

- motion descriptions

- motion verbs have a semantic **path argument**
 - which like the event argument is bound by existential closure by default; cf. Krifka 1998, Zwarts 2005
- paths can be modeled as continuous functions from the real unit interval $[0,1]$ to regions (Zwarts 2005)

A semantics for spatial descriptions (cont.)

- **path functions** constrain the set of paths compatible with a given motion description
 - by fixing their beginning (*source*') or final region (*goal*'), some region passed through in between (*route*'), etc.
 - path functions are of type $\langle r, \langle p, t \rangle \rangle$, mapping regions into characteristic functions over a path argument
 - p is the type of paths
 - path functions correspond to Kracht's (2002) 'modalizers'
- path functions may be expressed
 - outside the verb root, in prepositions, adverbs, particles, and case markers => **S(atellite)-framing**
 - in the roots of 'path verbs' => **V(erb)-framing**
 - for telic descriptions (Aske 1989, Beavers 2008), V-framing is canonic in most Romance languages
 - and in Hebrew, Turkish, Japanese, ...
 - S-framing is dominant in most Germanic and Slavic languages (Talmay 2000)

A semantics for spatial descriptions (cont.)

- in S-framed descriptions, path expressions appear to be construed as secondary predicates

(3.2) a. *The mouse ran under the table*

b. $run: \lambda x \lambda h \lambda e [run '(e)(h)(x)]$
 under the table: $\lambda P \lambda x \lambda h \lambda e [P(e)(i)(x) \& goal '(under '(table'))(i)]$
 $run \text{ under the table: } \lambda P \lambda x \lambda h \lambda e [P(e)(i)(x) \& goal '(under '(table'))(i)] (\lambda x \lambda h \lambda e [run '(e)(h)(x)])$
 = $\lambda x \lambda h \lambda e [run '(e)(i)(x) \& goal '(under '(table'))(i)]$

h, i are path arguments



Figure 3. A mouse on the path

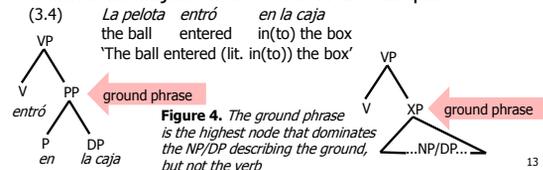
- but languages with canonical V-framing disallow combinations of path expressions w/ 'manner' verbs
 - strictly requiring path verbs such as Spanish *meterse* 'enter' in telic location change descriptions

(3.3) a. *?El ratón corrió abajo de la mesa*
 the mouse ran below of the table (acceptable only if the PP is understood to describe the location of the running event)

b. *El ratón se metió (corriendo) abajo de la mesa*
 the mouse itself inserted running below of the table 'The mouse went (running) under the table'

A semantics for spatial descriptions (cont.)

- in V-framed descriptions, the **ground phrase** is either an object of the verb or an oblique



- oblique ground phrases create a type mismatch

- e.g., in (3.4), the verb encodes a path function which requires an individual argument
- whereas the ground phrase denotes a set of paths

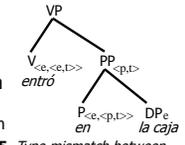
(3.4') *entrar: λyλx λhλe[move'(e)(h)(x) & goal'(in'(y))(h)]*
en la caja: λi[goal'(in'(box')(i))]

h, i are path arguments

A semantics for spatial descriptions (cont.)

- a number of options for resolving this mismatch are conceivable

- including a type-shifting operation
- and a feature unification mechanism
- unifying the path functions encoded in the verb and the preposition



- we do not further pursue this issue here
- Figure 5. Type mismatch between path verb and oblique ground phrase in (3.4)

- since path functions are not encoded outside the verb root in any of the languages of our sample

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Path-neutral ground phrases

- the form of the ground phrase reflects the path function encoded by the verb root
 - in many languages with canonical V-framing
 - including in Spanish, Turkish, and Japanese
- (4.1) *La pelota entró en la caja*
 the ball entered in(to) the box
 'The ball entered (lit. in(to)) the box'
- (4.2) *La pelota salió de la caja*
 the ball exited from the box
 'The ball exited (lit. from) the box'
- in contrast, in the languages of our sample, the ground phrase is strictly path-neutral
 - path-neutral ground phrases in fact appear to be typologically widespread
 - cf. Bohnemeyer et al. 2007

Path-neutral ground phrases (cont.)

- AM (fairly free constituent order; mixed OV/VO)

- see appendix for key to the interlinear glosses

(4.3) Luis tē y-tēk y-tēk-ojt-py
 Luis PAST 3S-enter(DEP) 3POSS-house-inside-PLACE
 'Luis entered (lit. in) his house' (constructed)

(4.4) Luis tē y-pētsēm-y y-tēk-ojt-py
 Luis PAST 3S-exit-DEP 3POSS-house-inside-PLACE
 'Luis exited (lit. in) his house' (elicited)

- JZ (VSO)

(4.5) Byuu Ana ndaani yoo
 CMP:MDP:enter Ana stomach house
 'Ana entered (lit. in) the house'

(4.6) Zaa kwee*=ka*=be* ba^7du ka* nda^ani=be*
 allow PROG:extract=PL=3 child DEM stomach=3
 'Let them extract the child out of (lit. in) her (by c-section)'

Path-neutral ground phrases (cont.)

- SI (SOV)

(4.7) Zix c-queht quij...
 thing SBJ.NMLZ-bounce DEF.SG.sit
 hant qu-ipcō i-tacl hac i-ti
 land SBJ.NMLZ-thick 3POSS-top DEF.SG.ABSTR 3POSS-on
 t-afp...
 REAL.DEF-arrive

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

Path-neutral ground phrases (cont.)

- YM (VOS, but w/ S commonly left-dislocated)

- (4.9) Le=kàaro=o' h-òòk
DET=cart=D2 PRV-enter(B3SG) ich le=kàaha=o'
in DET=box=D2 ← goal
'The cart, it entered (lit. in) the box'
- (4.10) Le=kàaro=o' h-hóòk'
DET=cart=D2 PRV-exit(B3SG) ich le=kàaha=o'
in DET=box=D2 ← source
'The cart, it exited [lit. in] the box'

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20

Meronyms

- **meronyms** are object-part designators, denoting functions of type <e,e>
 - in our simplified type system
- in spatial descriptions, these serve to select a part of the ground
 - to which a place function then may assign a region defined with respect to it
 - in Indo-European languages, meronyms often surface as relational nouns or parts of complex adpositions
 - as in *on top of*, *at the edge of*, *on one side of*, etc.
- meronyms play a pervasive role in spatial descriptions in all four languages

Meronyms (cont.)

- in JZ, SI, and YM, meronyms surface as relational nouns
 - in SI, meronyms never head the ground phrase

- (5.1) Ziix c-oqueht quij...
thing SBJ.NMLZ-bounce DEF.SG.sit
hant qu-ipcö i-tač hac i-ti
land SBJ.NMLZ-thick 3POSS-top DEF.SG.ABSTR 3POSS-on
t-afp...
REAL.DEF-arrive
'The ball (lit. thing that bounces)... arrived on top of the dune (lit. the thick land).'
- the SI ground phrase is always either an oblique PP or an object

Meronyms (cont.)

- in YM, some meronyms may head the ground phrase - e.g., *óok'ól* 'top' in (5.2)

- (5.2) Le=lúuch=o' ti' yàan y=òòk'ól le=mesa=o'
A3=top DET=table=D2
DEF=cup=D2 there EXIST(B3SG)
'The cup, it's there on the table'
- most meronyms instead require the generic preposition *ti'* as head of the ground phrase - e.g., *pàach* 'back' in (5.3)
- (5.3) Te'1 kul-ukbal u=pèek'-il tu=pàach le=nah=o'
PREP:A3=back DET=house=D2
there sit-DIS(B3) A3=dog-REL
'There the dog is sitting outside the house'
- the ground phrase is an NP/DP in (5.2), but a PP in (5.3)
- but in either case, it denotes a region, i.e., is of type r
 - this can be seen from the fact that an NP/DP of type e (in our simplified type system) cannot occur in its place

Meronyms (cont.)

- in JZ, the ground phrase is either the ground nominal itself (5.4)
 - or it is headed by a meronym such as *ike* 'head' in (5.5)
- (5.4) Nuu* ti^(g)a^ni!w bikwini na*7
EXIST INDEF=ring finger hand
'There is a ring on the finger'
- (5.5) Lii*bi beji*ga ike ti=ba*ra
tied balloon head INDEF=stick
'The balloon is tied to the end (lit. 'head') of a stick'
- there are no adpositions in this language; the ground phrase is an oblique NP/DP
 - which is of type e, since it can also be the object of an action verb - cf. Pérez Báez & Bohnemeyer 2008
- (5.6) Ka-yuluba ike!7
PROG-hurt head:1
'My head hurts'

Meronyms (cont.)

- in AM, meronyms form a special class of bound morphemes
 - they surface either suffixed to the ground nominal (5.7a) or incorporated into the verb (5.7b)
- (5.7) a. Të Pedro y-mä'äy-y mes-**pat**-kí'py
 PAST Pedro 3S-sleep-DEP table-under-PLACE
 'Pedro slept under the table.'
- b. Pedro të t-**pat**-mä'äy-y yě'ë mesa
 Pedro PAST3A-under-sleep-DEP DEM.M table
 'Pedro slept under the table.'
- when the meronym is incorporated (5.7b), the ground nominal appears as the object of the verb
 - when the ground nominal is oblique (5.7a), it must carry a member of a set of suffixes
 - including -kí'py in (5.7a) and -py in (4.3)-(4.4) above
 - we analyze these as expressing place functions (<e,r>)

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26

Interface variations

- what is invariant across spatial descriptions in the four languages
 - all four languages are V-framed and have path-neutral ground phrases
 - the general logical form of spatial descriptions
 - which can be represented as in (6.1)
 - with the simplified version (6.1') omitting the meronym
- (6.1) verb(event argument)(path argument)(figure)
 & path function(place function(meronym(ground)))(path argument)
- (6.1') verb(event argument)(path argument)(figure)
 & path function(place function(ground)))(path argument)

Interface variations (cont.)

- what is variable is the syntax and semantics of the ground phrase
 - four combinations of syntactic category, grammatical relation, and semantic type occur

Table 2. Types of ground phrases in the four languages

Ground phrase is	type-r (place-denoting)	type-e (entity-denoting)
argument NP/DP	-	AM, SI
oblique NP/DP	AM, YM	JZ
PP	SI, YM	-

- these give rise to three different types of semantic composition

Interface variations (cont.)

- type I: the ground phrase is an object of the verb
 - example: base-transitive path verbs in SI
 - cf. O'Meara 2009
- (6.3) a. Carolina quih [hast cop
 Carolina DEF.SG stone DEF.SG.stand
i-izc hac NP/DP i-y-**ao**
 3POSS-front DEF.SG.ABSTR 3>3-DPAST-pass.by
 'Carolina passed the front of the mountain.'
- b. -**ao** 'pass': λyλxλhλe[move'(e)(h)(x) & via'(at'(y))(h)]
 hast cop iizc -ao 'pass the front of the mountain':
 λyλxλhλe[move'(e)(h)(x) & via'(at'(y))(h)](front'(mountain'))
 = λxλhλe[move'(e)(h)(x) & via'(at'(front'(mountain'))))(h)]
- in AM, these must be licensed by an incorporated meronym (cf. 5.7b above) or a special applicative
 - cf. Romero Méndez 2009

Spatial descriptions in Yucatec (cont.)

- type II: the ground phrase is a place-denoting phrase
 - either a PP, as in SI ((4.7)-(4.8) above) and YM (see below), or an NP, as in AM ((5.7a) above)

(6.4) a. Le=kàaro=ó' h-**òok** **ich** le=kàaha=ó'
 DET=cart=D2 PRV-**enter**(B3SG) in DET=box=D2
 'The cart, it entered (lit. in) the box'

b. **òok** 'enter': λρλxλhλe[move'(e)(h)(x) & goal'(π)(h) & π ⊆ ρ](in'(box'))
 ich le kàahaó 'in the box': in'(box')

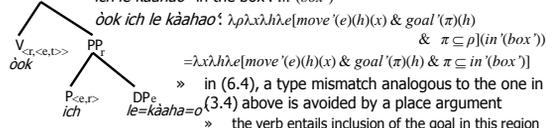


Figure 6. Semantic composition in (6.4) » evidence: ich 'in' can be replaced w/ the generic tí'in (6.4)

Spatial descriptions in Yucatec (cont.)

- type III: the ground phrase is an oblique NP/DP of type e - as in JZ

(6.5) a. **Byuu** Ana **ndaani** yoo
 CMP:MDP:enter Ana stomach house
 'Ana went inside the house'

b. **-uu** 'enter': $\lambda y \lambda x \lambda h \lambda e [\text{move}'(e)(h)(x) \ \& \ \text{goal}'(\text{in}'(y))(h)]$
ndaani yoo 'inside of the house': *inside*'(house')
-uu ndaani yoo:
 $\lambda y \lambda x \lambda h \lambda e [\text{move}'(e)(h)(x) \ \& \ \text{goal}'(\text{in}'(y))(h)](\text{inside}'(\text{house}'))$
 $= \lambda x \lambda h \lambda e [\text{move}'(e)(h)(x) \ \& \ \text{goal}'(\text{in}'(\text{inside}'(\text{house}')))(h)]$
 » in purely semantic terms, this composition is identical to type I

Figure 7. Semantic composition in (6.5)

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32

Summary and conclusions

- the four languages investigated here agree on the logical form of locative descriptions
 - and thus on the role of parts, places, and paths in it
- but they differ in the syntactic category and semantic type of the ground phrase
 - and in the alignment between the two
 - AM and YM having NP/DPs of type r and JZ having obliques of type e
- the driving force behind this variation
 - appears to be the expression of place and path functions
 - and thus differences in the lexicon and the functional category system

33

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- acknowledgments
- appendix: key to interlinear glosses

34

Acknowledgments

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 - cf. <http://www.acsu.buffalo.edu/~jb77/Mesospace.htm>
- the data presented here were collected in the field
 - partly with the help of stimuli developed at the Max Planck Institute for Psycholinguistics
 - especially Levinson (2001); Bowerman & Pederson (m₃₅.)

35

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36

Appendix: Key to interlinear glosses

– affixation; = – clisis; 1 – 1st person; 3 – 3rd person; 3>3 – 3rd person subject/actor acting on 3rd person object/undergoer; A – transitive subject/actor agreement/cross-reference; ABSTR – abstract (Seri articles); APPL – applicative; B – agreement/cross-reference ‘set B’ (transitive object/undergoer, stative subject, intransitive subject in completive and subjunctive status); CMP – completive; D2 – distal/anaphoric clause-final particle; DEF – definite; DEM – demonstrative; DEP – dependent (mood/status); DET – determiner; DIS – dispositional; DPAST – distant past; EXIST – locative/existential predicate; INDEF – indefinite; MDP – mediopassive; NMLZ – nominalizer; PAST – past tense; PLACE – place function; POSS – possessor agreement/cross-reference; PREP – generic preposition; PROG – progressive; PRV – perfective; REL – relational derivation; S – intransitive subject agreement/cross-reference; SBJ – Subject; SG – singular

37

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39