

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

SULA 5
MIT and Harvard University
May 15-17, 2009

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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

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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

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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

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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

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The language sample

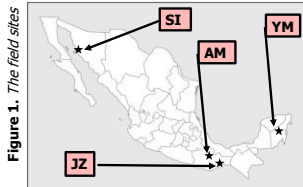


Table 1. The languages

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-Manguan	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

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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)

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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

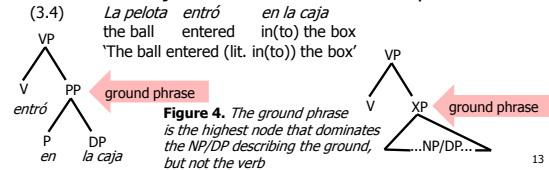
(3.3) a. *?El ratón corrió abajo de la mesa*
 the mouse ran below of the table (acceptable only if the PP is understood to describe the location of the running event)

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'

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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

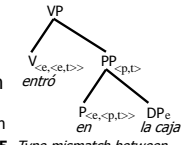
(3.4') *entrar: λyλx λhλe[move'(e)(h)(x) & goal'(in'(y))(h)]*
en la caja: λi[goal'(in'(box'))(i)]

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

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

Figure 5. Type mismatch between path verb and oblique ground phrase in (3.4)

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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 té y-tëk y-tëk-ojt-py
 Luis PAST 3S-enter(DEP) 3POSS-house-inside-PLACE **goal**
 'Luis entered (lit. in) his house' (constructed)

(4.4) Luis té y-pëtsëm-y y-tëk-ojt-py
 Luis PAST 3S-exit-DEP 3POSS-house-inside-PLACE **source**
 'Luis exited (lit. in) his house' (elicited)

- JZ (VSO)

(4.5) **Byuu** Ana ndaani yoo
 CMP:MDP:enter Ana stomach house **goal**
 '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 **source**
 'Let them extract the child out of (lit. in) her (by c-section)'

Path-neutral ground phrases (cont.)

- SI (SOV)

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

'The ball (lit. thing that bounces)... arrived on top of the dune (lit. the thick land).'

(4.8) He xepe com i-ti mhata...
source 1 sea DEF.SG.lie 3POSS-on 1.REAL.DEP.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 ich le=kàaha=o' in DET=box=D2 ← goal
 DET=cart=D2 PRV-enter(B3SG)
 'The cart, it entered (lit. in) the box'
- (4.10) Le=kàaro=o' h-hóòk' ich le=kàaha=o' in DET=box=D2 ← source
 DET=cart=D2 PRV-exit(B3SG)
 'The cart, it exited [lit. in] the box'

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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'
 DEF=cup=D2 there EXIST(B3SG) A3=top DET=table=D2
 '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'
 there sit-DIS(B3) A3=dog-REL PREP:A3=back DET=house=D2
 '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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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 kàaha 'in the box': in'(box')

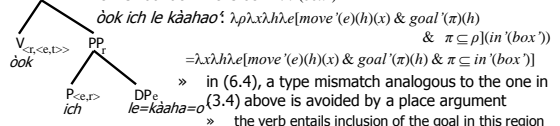


Figure 6. Semantic composition in (6.4) » evidence: *ich* 'in' can be replaced w/ the generic *tí* 'in' (6.4)

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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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

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Acknowledgments

- we are grateful to our Mixe, Seri, Yucatec, and Zapotec native speaker consultants
- O'Meara's research was funded by NSF Award BCS-0553965
- Bohnemeyer's and O'Meara's work was supported by NSF Award BCS-0723694
 - 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 (ms.)

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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

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