



## Overview

- meronymy
- the MesoSpace project
- MesoSpace meronym tasks
- Yucatec
- findings
- conclusions

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## Meronymy

- **meronyms** - object-part designators
- artifacts
  - Indo-European languages: labeling by function
  - Mesoamerican (MA) languages: labeling by form

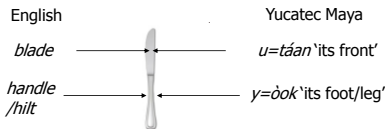


Figure 1. Categorizing parts by function vs. form

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### Meronymy (cont.)

- meronyms in Mesoamerica: productivity
  - used across large heterogeneous classes of objects
  - labeling any arbitrary geometrically defined part of any arbitrary object
    - cf. MacLaury 1989 for Ayoquesco Zapotec and Levinson 1994 for Tenejapa Tzeltal (Mayan)

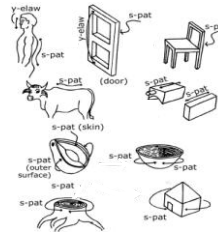


Figure 2. Productivity of MA meronyms: some uses of s=pat 'its back' in Tzeltal (Levinson 1994: 811)

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### Meronymy (cont.)

- what makes this productivity possible?
  - two proposals
    - **global analogies** (MacLaury)
    - **shape-analytical algorithms** (Levinson)

### Meronymy (cont.)

- MacLaury: Ayoquesco Zapotec meronymy operates on global analogical mapping
  - a set of seven body part terms are freely extended to non-human bodies and inanimates

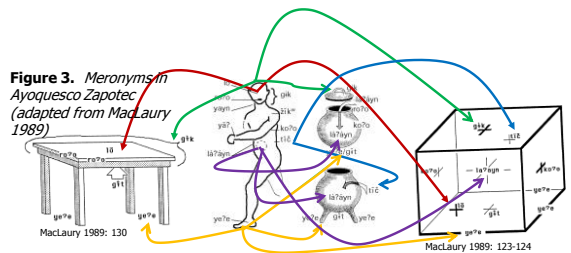


Figure 3. Meronyms in Ayoquesco Zapotec (adapted from MacLaury 1989)

MacLaury 1989: 130

MacLaury 1989: 123-124

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Meronymy (cont.)

- Levinson: the case against global analogy in Tzeltal
  - all parts may be named non-uniquely
    - so any object can have an arbitrary number
      - of 'legs', 'noses', 'heads', 'backs', etc.
  - parts are named on the basis of shape
    - regardless of place in the structure of the object
      - so 'arms' can be assigned growing out of 'heads'
      - 'noses' out of 'buttocks', etc.
  - the place of the labeled part in the structure of the object varies across classes of objects

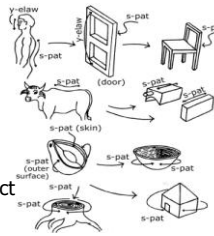


Figure 4. *S=pat* 'its back' revisited: Apparent local body part analogies in Tzeltal (Levinson 1994: 811)

Meronymy (cont.)

- Levinson's alternative
  - meronymy operates on shape-analytical algorithms
  - starting point: visual analysis of the object's outline
    - segmenting it into volumes based on curvature discontinuities
    - and assigning axes to these volumes
      - that generate them following Marr's (1982) theory of shape recognition

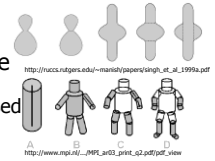


Figure 5. Segmentation by shape

Meronymy (cont.)

- the parts on the ends of the axes of each volume are then labeled on the basis of their shape
  - e.g., *s=pat* 'its back' really designates
    - the flatter and less featured end on an axis orthogonal to the one that generates the main volume

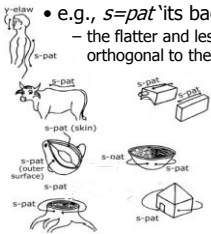


Figure 6. Generating the uses of *s=pat* 'its back' in Tzeltal (Levinson 1994: 811)

Meronymy (cont.)

- Levinson's algorithm and body part terms
  - the algorithm governs applications of body part terms to animate as much as to inanimate entities
  - hence, there is no semantic transfer involved
  - even the 'buttocks' of a person are just the less convex end of the generating axis of the torso

Meronymy (cont.)

- questions
  - to what extent is it really possible across MA languages to label arbitrary parts generatively?
  - what is the distribution of global analogical mapping and shape-analytical algorithms across MA?
  - do these really exclude one another, as Levinson claims, or can they co-exist in one meronymy?
  - are the shape-based algorithms really non-metaphorical?

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### The MesoSpace project

- NSF award #BCS-0723694 "Spatial language and cognition in Mesoamerica"
- 15 field workers
- 13 MA languages



- Mayan
  - Chol (J.-J. Vázquez)
  - Q'anjob'al (E. Mateo Toledo)
  - Tzeltal (G. Polian)
  - Yucatec (J. Bohnemeyer)
- Mixe-Zoquean
  - Ayutla Mixe (R. Romero Méndez)
  - Soteapanec (S. Gutierrez Morales)
  - Tecpatán Zoque (R. Zavala Maldonado)
- Oto-Manguéan
  - Otomí (E. Palancar; Néstor H. Green; Selene Hernández-Gómez)
- Juchitán Zapotec (G. Pérez Báez)
- Tarascan
  - Purepecha (A. Capistrán)
- Totonacan
  - Huehuetla Tepehua (S. Smythe Kung)
  - Uto-Aztecan
    - Cora (V. Vázquez)
    - Pajapan Nawat (V. Peralta)

Figure 7. MesoSpace field sites

The MesoSpace project (cont.)

- 3 controls
  - Seri (C. O'Meara)
  - Mayangna (E. Benedicto, Alyson Eggleston in collaboration with the Mayangna Yulbarangyang Balna)
  - (rural central) Mexican Spanish (R. Romero Méndez)
- 2 (interrelated) domains
  - **meronyms** – labels for parts of entities
    - including, but not restricted to, *body part metaphors*

Figure 8. MesoSpace field sites

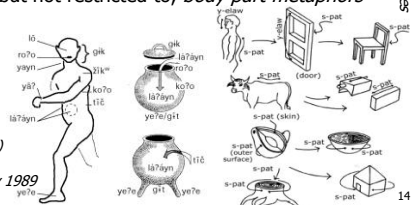


Figure 9. Meronyms in Ayoquesco Zapotec (left) and Tenejapa Tzeltal (adapted from MacLaury 1989 and Levinson 1994)

The MesoSpace project (cont.)

- spatial frames of reference
  - conceptual coordinate systems used to define orientation-dependent spatial descriptions

- Intrinsic → The ball is in front of the chair.
- Relative → The ball is to the right of the chair.
- Absolute → The ball is east of the chair.

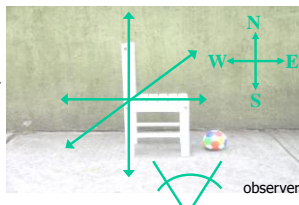


Figure 10. The three types of spatial FoRs distinguished in Levinson 1996

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### MesoSpace meronym tasks

- picture book
  - human, animal and plant body parts
  - a set of artifacts identified through pictures in the elicitation manual
    - some customary in MA culture
    - some Western, with parts commonly identified functionally in Spanish
      - especially where the Spanish labels for these deviate from the labels predicted by geometry
  - elicitation of part descriptors and locative descriptions
  - ran with 7 Yucatec speakers
    - six men and one woman in their thirties through sixties

MesoSpace meronym tasks (cont.)

- the Novel Objects aka "Chunches"



Figure 11. Some Novel Objects

- referential communication tasks targeting reference to parts and placement descriptions wrt. parts
  - in each trial, one participant has an object with bits of play dough attached to various parts in front of them
    - » and the other an identical copy of the object w/o the play dough
  - the first speaker instructs the second speaker to put the play dough on the correct parts, identifying the parts in the process
  - ran with five pairs of Yucatec speakers
    - » five men and five women in their teens through sixties

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### Yucatec

- the largest member of the Yucatecan branch of the Mayan language family
  - spoken by 759,000 people in the Mexican states of Campeche, Quintana Roo, and Yucatán
    - 2005 Census data show a decline by more than 40,000 speakers age five or older since 2000 (<http://www.inegi.gob.mx/.../ept.asp?t=mlen10&c=3337>)
  - and approximately 5,000 people in the Cayo District of Belize (Gordon Ed. 2005)
- polysynthetic, purely head-marking, VOS, split-intransitive
- the field site: Yaxley
  - a village of about 800 people in the municipal district of Felipe Carrillo Puerto in Quintana Roo



Figure 12. Approximate dialect regions of Yucatec and location of the field site

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### Findings

- Yucatec meronymy involves a critical distinction between three semi-autonomous subsystems
  - for the labeling of **surfaces**, **volumes**, and **curvature extremes** (edges, corners, tips, etc.)
    - volume meronyms, but not surface and 'extreme' meronyms – can possess other meronyms

volumes	surfaces	extremes
<i>koj</i> 'head'	<i>bonl</i> 'bottom'	<i>páanch</i> 'tip'
<i>ch'uur</i> 'trunk'	<i>ichil</i> 'inside'	<i>tu'k'</i> 'angle'; 'corner'
<i>if</i> 'anus'	<i>óok'</i> 'top'	<i>tséel</i> 'end'
<i>k'at</i> 'neck'	<i>páach</i> 'back'	
<i>áak'</i> 'hand; arm'	<i>tséel</i> 'front'	
<i>nak'</i> 'belly'	<i>tséel</i> 'side'	
<i>óok'</i> 'foot; leg'		
<i>xbak'</i> 'buttocks'		
<i>ts'ak'</i> 'ear'		

Table 1. Yucatec meronym classes

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Findings (cont.)

- volume meronyms as possessors – examples

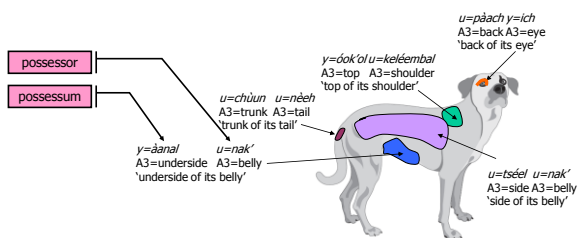


Figure 13. Parts of parts of Pach-pach the dog

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Findings (cont.)

– no surface/extreme meronyms as possessors except for *páach* 'back'

- (5.1) \*(T-in=bon-ah) **u=páach u=táan** (le=pèek'=o')  
 PRV-A1SG=paint-CMP(B3SG) A3=back A3=front DET=dog=D2  
 intended: '(I painted) the back of the front (of the dog)'
- (5.2) \*(T-in=bon-ah) **y=óok'ol u=tséel** (le=pèek'=o')  
 PRV-A1SG=paint-CMP(B3SG) A3=top A3=side DET=dog=D2  
 intended: '(I painted) the top of the side (of the dog)'
- (5.3) (T-in=bon-ah) **y=óok'ol u=páach** (le=pèek'=o')  
 PRV-A1SG=paint-CMP(B3SG) A3=top A3=back DET=dog=D2  
 '(I painted) the top of the back (of the dog)'

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Findings (cont.)

- animate NP/DPs cannot be possessors of surface/extreme meronyms at all
  - except for *pàach* 'back' (cf. (5.7))

- (5.4) \*(T-in=bon-ah) **u=táan** le=pèek'=o'  
 PRV-A1SG=paint-CMP(B3SG) A3=front DET=dog=D2  
 intended: '(I painted) the front of the dog'
- (5.5) \*(T-in=bon-ah) **u=tséel** le=pèek'=o'  
 PRV-A1SG=paint-CMP(B3SG) A3=side DET=dog=D2  
 intended: '(I painted) the side of the dog'
- (5.6) (T-in=bon-ah) **y=óok'ol** le=pèek'=o'  
 PRV-A1SG=paint-CMP(B3SG) A3=top DET=dog=D2  
 'I painted above the dog'  
**but not:** '(I painted) the top of the dog'
- (5.7) (T-in=bon-ah) **u=pàach** le=pèek'=o'  
 PRV-A1SG=paint-CMP(B3SG) A3=back DET=dog=D2  
 '(I painted) the back of the dog'

– so except for *pàach* 'back', **only volume meronyms can be body part terms**

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Findings (cont.)

- only the subsystems for surface and curvature extreme naming are fully productive
  - volume naming shares many traits with the algorithm described by Levinson
    - yet, it is much more restricted with unfamiliar objects than surface and 'extreme' labeling
    - and often explicitly metaphorical

Table 2. Yucatec meronym classes and their properties

	volumes	surfaces	extremes
possession of other meronyms	obscure	does not occur	does not occur
set	not sharply defined, possibly open	closed	closed
productivity	limited by convention	fully productive	fully productive
use depends on orientation	no	yes	no
possession by descriptors of multi-volume entities	unrestricted	restricted	unrestricted
projected region	topological	oriented region	topological

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Findings (cont.)

- conventional artifact meronyms – examples

– volume meronyms in blue; surface meronyms in red; extreme (= point/edge) meronyms in green; functional meronyms in orange

**Figure 14.** Máaskab 'machete'

**Figure 15.** Xamach 'canal'

**Figure 16.** P'úul 'jug'

Labels include: #y=óok'ol 'its top', #y=áanal 'its underside', u=pàach 'its back', y=óok 'its foot/leg', y=ich 'its eyes', u=xíkin 'its ears', u=táan 'its front', u=xíkin 'its end' (= u=tséel 'its side'), u=táan 'its front' (= y=óok'ol 'its top'), y=áanal 'its underside' (= u=pàach 'its back' (= y=it' 'its anus')), u=yeh 'its sharp edge', u=xíkin 'its ears', u=áanal 'its neck', u=xíkin 'its end', u=káal 'its neck', u=xíkin 'its end', u=pàach 'its back', u=it' 'its anus' (= y=áanal 'its underside'), u=it' 'its anus' (= y=áanal 'its underside'), u=xíkin 'its ears', u=xíkin 'its end', u=káal 'its neck', u=xíkin 'its end', u=pàach 'its back', u=tséel 'its side', u=pàach 'its back', u=éentrada-il 'its entrance' (= u=hóol 'its hole'), u=tséel 'its side' = u=pàach 'its back', u=púunta-il 'its tip' = u=tuk' 'its angle', u=tséel u=éentrada-il 'side of its entrance'

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Findings (cont.)

- the *Chunches* – single-volume objects
  - volume meronyms in blue; surface meronyms in red; extreme (= point/edge) meronyms in green; ad-hoc meronyms in orange

**Figure 17.** Meronyms assigned to Novel object 8

**Figure 18.** Meronyms assigned to Novel object 1

Labels include: y=óok'ol 'its top', u=tséel 'its side', u=tséel 'its side' = u=pàach 'its back', u=éentrada-il 'its entrance' (= u=hóol 'its hole'), u=tséel 'its side', ichil 'inside', u=púunta-il 'its tip' = u=tuk' 'its angle', u=tséel u=éentrada-il 'side of its entrance'

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Findings (cont.)

- the *Chunches* – multi-volume objects

– volume meronyms in blue; surface meronyms in red; extreme (= point/edge) meronyms in green; ad-hoc meronyms in orange

**Figure 19.** Meronyms assigned to Novel object 6

**Figure 20.** Meronyms assigned to Novel object 7

Labels include: ichil y=óok 'inside its legs', u=tséel y=óok 'side of its leg', u=púunta-il y=óok = y=áanal y=óok 'underside of its leg/foot', u=nak 'its belly', (u=bóola(-il) 'its sphere') y=áanal 'its underside', y=óok'ol 'its top', y=óok 'its foot/leg' = u=k'áb 'its arm/hand', u=néeh = u=ní'-o'b = u=koh-o'b 'its tail' 'its noses' 'its beaks /teeth', u=chan hóol-il = wóolis 'its little hole' 'round (thing)', wóolis 'round (thing)', u=ho'l 'its head', u=nak 'its belly', u=ho'l = le=bóola yáan y=áanal 'its head' 'the sphere at its underside', mehen bóola-s/wóolis 'small spheres/round (things)', y=óok'ol 'its top', u=pàach 'its back', u=che'-il 'its sticks', y=óok 'its foot/leg' = u=k'áb 'its arm/hand', y=áanal 'its underside'

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Findings (cont.)

- evidence for differences in productivity
    - between volume meronyms and other meronyms
    - assignment of volume meronyms frequently involved similes and hedges
- (5.8) *Le=chan bóola bëey kan-p'éel y=óok=a'*  
 DET=DIM sphere(B3SG) thus four-CL.IN(B3SG) A3=leg/foot=D2  
 'The little sphere is as if it had four legs (lit. four were its legs)'
- (5.9) *U=mehen ba'l-il-o'b dée mehen óok-o'b=o', ...*  
 A3=small thing-REL-PL of small leg/foot-PL=D2  
 'Its little leg-like thingies, ...'
- (5.10) *Ko'x a'l-ik u=k'áb*  
 HORT say-INC(B3SG) A3=arm(B3SG)  
 'Let's say (it's) his arm'
- there is no evidence whatever that the assignment of surface meronyms was considered metaphorical
- I expect the use of similes and hedges with surface meronyms to be anomalous - but didn't test this

Figure 21. Novel objects #6-7

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Findings (cont.)

- asked to name inanimate objects that have, e.g., 'heads' or 'bellies'
  - speakers quickly run out of examples
  - there is a great deal of variation in these judgments
    - contrasting with a striking uniformity in surface labeling
  - in contrast, surface and extreme meronyms are assigned to an indefinitely large set of entities

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Findings (cont.)

- interpretation of the productivity data
  - volume meronyms designate body parts
    - their use outside the body domain is metaphorical and conventional
  - surface and edge/point meronyms designate geometrical properties
    - they apply non-metaphorically to any arbitrary entity that has the relevant properties

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Findings (cont.)

- evidence for algorithmic assignment of Yucatec meronyms
  - surface and extreme meronyms are assigned independently of the object's overall structure
    - and they are assigned non-uniquely



Figure 22. Non-unique surface labeling: two sides of the same coin



Figure 23. Non-unique surface labeling: cross-section of an object with two 'backs'

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Findings (cont.)

- volume meronyms, too, are assigned independently of the object's overall structure
  - and they are likewise assigned non-uniquely
  - objects can have multiple 'heads'...
    - e.g., hills with multiple tops
    - the 'head' of a village is its entrance, or the first house one passes when entering the village proper
      - » and a village can have as many of those as it has roads leading into it
  - ...and certainly an arbitrary number of 'arms', 'legs', 'ears', etc.
  - in addition, volume terms, like surface terms, are assigned locally, not globally

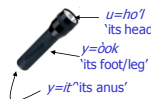


Figure 24. Local assignment of volume terms: flashlight

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Findings (cont.)

- discussion
  - meronym assignment is algorithmic and local
    - for surfaces, curvatures extremes, and volumes alike
  - yet, while the labeling of surfaces and edges/points is fully productive and non-metaphorical
    - the labeling of volume parts is conventional and appears to be explicitly metaphorical
  - Levinson's conjecture that algorithmic mapping is inherently non-metaphorical is thus invalid
  - local algorithmic mappings and global analogical mappings may be parts of a single process
    - Pérez Báez in press reports additional evidence for this hypothesis from Juchitán Zapotec

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## Conclusions

Conclusions (cont.)

- Yucatec, like other Mesoamerican languages, has a highly productive shape-based meronymy
- unlike (Ayoquesco) Zapotecan meronyms, not all Yucatec meronyms are body part terms
  - terms for volume parts are body part terms
  - terms for surfaces and curvature extremes have abstract geometrical meanings
- the assignment of Yucatec meronyms is local and algorithmic
  - like that of Tseltal meronyms
  - and unlike that of Zapotecan meronyms

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- local, algorithmic mapping is not necessarily non-metaphorical
  - surface and extreme meronyms appear to be assigned non-metaphorically
  - but the application of volume meronyms to objects appears to involve semantic transfer
- the meronymy of MA languages appears to operate on an object-centered view of geometry
  - that is alien to Indo-European languages
  - current research in the MesoSpace project investigates how this impacts spatial reference
    - in language and non-linguistic cognition

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