



## Overview

- research questions
- Yucatec
- findings I: picture book
- findings II: Chunches I
- conclusions

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## Research questions

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

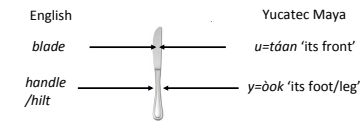


Figure 1. Categorizing parts by function vs. form

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Research questions (cont.)

- Indo-European languages likewise have a general-purpose meronymic system
  - the 'front'/'back'/'left'/'right'/'top'/'bottom' (FBLRTB) system
  - but these terms are generally assigned by function and/or presuppose canonical vertical orientation
    - e.g., none of them is readily applicable to a knife

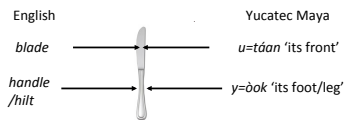


Figure 1. Categorizing parts by function vs. form

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Research questions (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)

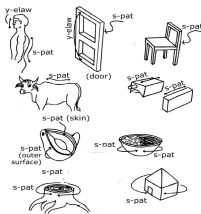


Figure 2. Productivity of MA meronyms: some uses of s=pat 'its back' in Tzeltal (Levinson 1994: 811)

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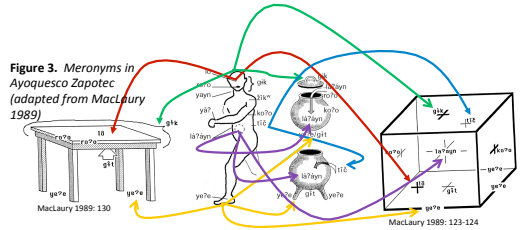
Research questions (cont.)

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

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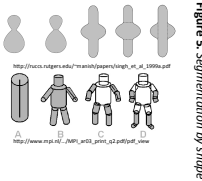
Research questions (cont.)

- 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



Research questions (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



Research questions (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

Research questions (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

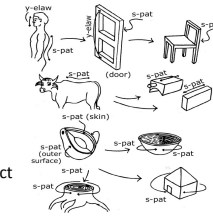


Figure 4. S-pat 'its back' realizations: Apparent local body part analogies in Tzeltal (Levinson 1994: 811)

Research questions (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

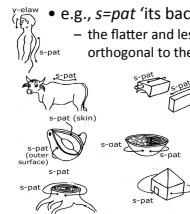


Figure 6. Generating the uses of s=pat 'its back' in Tzeltal (Levinson 1994: 811)

Meronymy in Mesoamerica (cont.)

- meronymy in spatial reference
  - in many Mesoamerican languages, meronyms are one of two major resources for reference to spatial regions
    - the other being geocentric terms such as 'uphill' and 'south'
      - the following examples from Juchiteco Zapotec and Yucatec Maya illustrate the first possibility

(1.1) Dxil'ba za ike yoo  
 raised.over cloud head house  
 'The cloud is over the house' (Pérez-Báez 2012: 128)

(1.2) ...h-tàal u=balak' y=òok'ol le=pak'o'  
 PRV-come(B3SG) A3=roll A3=top DET=brickwork=D2  
 '...it came rolling on the wall'

Research questions (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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Overview

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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=m1en10&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 7. Approximate object regions of Yucatec and location of the field site

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Yucatec (cont.)

- the data
  - picture book
    - pictures of humans, animals, and plants
    - a set of artifacts
      - 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 segmentation, part descriptors, and locative descriptions
  - ran with 7 Yucatec speakers
    - six men and one woman in their thirties through sixties

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Yucatec (cont.)

- the Novel Objects aka “Chunches”



Figure 8. 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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Overview

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Findings I: picture book

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

Table 1. Yucatec meronym classes

volumes	surfaces	extremes
<i>hoʔ</i> ‘head’	<i>ðanal</i> ‘underside’	<i>puunta</i> ‘tip’
<i>chũun</i> ‘trunk’	<i>ichil</i> ‘inside’	<i>tuʔk</i> ‘angle’, ‘corner’
<i>it</i> ‘anus’	<i>òokʼol</i> ‘top surface’	<i>xũul</i> ‘end’
<i>kàal</i> ‘neck’	<i>pàach</i> ‘back’	
<i>kʼab</i> ‘hand/arm’	<i>táan</i> ‘front’	
<i>nak</i> ‘belly’	<i>tséel</i> ‘side’	
<i>òok</i> ‘foot/leg’		
<i>xbakʼet</i> ‘buttocks’		
<i>xikin</i> ‘ear’		
...		

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Findings I: picture book (cont.)

- comparison to (Levinson’s treatment of) Tselatl
  - volume terms semantically correspond to Tselatl body part terms
    - which Levinson argues are algorithmically, non-metaphorically, and fully productively assigned in Tselatl
  - in contrast, surface and extreme terms correspond to what Levinson calls ‘locative relational nouns’
    - in Tselatl, body part terms have a distinct morphological property
      - they produce derived alienable stems in –VI
    - in Yucatec, many body part terms are strictly inalienable, as are extreme and surface terms – see Lehmann (2003: 77-87)

Table 2. Tselatl ‘locative relational nouns’ (Levinson 1994: 802)

<i>s=ba</i>	‘its top surface or edge’
<i>y=ghʼul</i>	‘its uppers, its uphill region’
<i>y=alen</i>	‘its downwards, its downhill/underneath region’
<i>y=amʼ</i>	‘its underneath’
<i>y=amʼ</i>	‘its inside’
<i>y=ʒʼal</i>	‘its bottom surface or edge’
<i>y=ʒʼal</i>	‘its right ahead of it, on X’s rightline’
<i>y=ʒʼal</i>	‘its midline, middle’
<i>y=ʒʼal</i>	‘its side, horizontal edge’

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Findings I: picture book (cont.)

- volume meronyms as possessors – examples

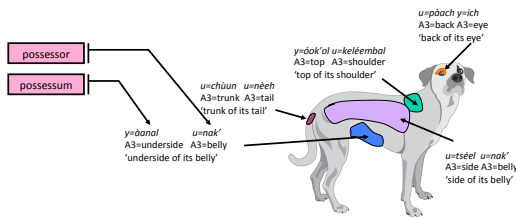


Figure 9. Parts of parts of Pach-pach the dog

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Findings I: picture book (cont.)

- no surface/extreme meronyms as possessors except for *pàach* ‘back’

- (5.1) \*(T-in=bon-ah) **u=pàach u=táan** (le=pèekʼ=oʼ)  
 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=òokʼol u=tséel** (le=pèekʼ=oʼ)  
 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=òokʼol u=pàach** (le=pèekʼ=oʼ)  
 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 I: picture book (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=pèekʼ=oʼ  
 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=pèekʼ=oʼ  
 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=òokʼol** le=pèekʼ=oʼ  
 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=pèekʼ=oʼ  
 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 I: picture book (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?	yes	no	no
Set	not sharply defined, possibly open	closed	closed
Productivity	limited	fully productive	fully productive
Orientation-dependence	no	yes	no
Possession by descriptors of multi-volume entities	unrestricted	restricted	unrestricted
Projected region	topological	oriented region	topological

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Findings I: picture book (cont.)

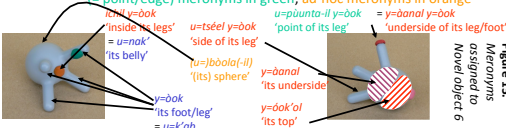

- the above classification is not exhaustive
- some further highly productive meronyms which I haven't been able to place
  - *hóol* 'hole', 'aperture'
    - like a volume term, it can possess surface terms and projects a topological region
    - but it isn't a body part term, is fully productive, and does not trigger hedges when applied to the Novel Objects
  - *ba'páach* 'surrounding envelope', 'environs'
    - largely a hyponym of *páach* 'back' – the kind of *páach* that surrounds the entire object
    - but *ba'páach* does not project an oriented region
  - *yàam* 'interstice'
    - a surface term in every other respect except it does not project an oriented spatial region

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Overview

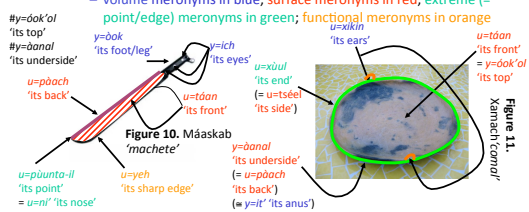
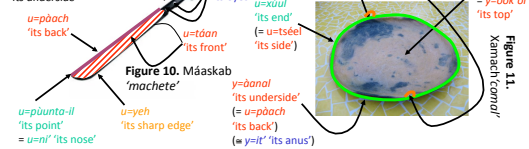
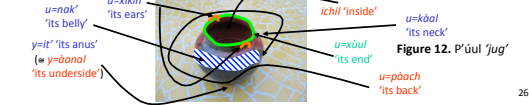
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Findings II: Churches (placement) (cont.)

- the *Churches* – multi-volume objects
    - volume meronyms in blue; surface meronyms in red; extreme (= point/edge) meronyms in green; ad-hoc meronyms in orange
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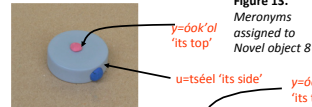
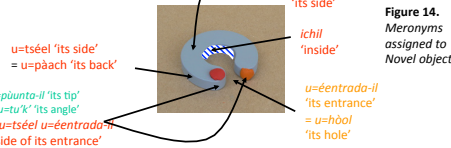
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Findings I: picture book (cont.)

- conventional artifact meronyms – examples
    - volume meronyms in blue; surface meronyms in red; extreme (= point/edge) meronyms in green; functional meronyms in orange
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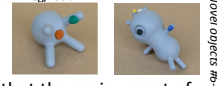
Findings II: Churches (placement)

- the *Churches* – single-volume objects
    - volume meronyms in blue; surface meronyms in red; extreme (= point/edge) meronyms in green; ad-hoc meronyms in orange
- 
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Findings II: Churches (placement) (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 bòola bëey kan-p'éeel y=òok=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 òok-o'b=a'*, ...  
 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'ab*  
 HORT say-INC(B3SG) A3=arm(B3SG)  
 'Let's say (it's) his arm'
- 

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Findings II: Churches (placement) (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 II: Churches (placement) (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 geometric properties
    - they apply non-metaphorically to any arbitrary entity that has the relevant properties

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Findings II: Churches (placement) (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 18. Non-unique surface labeling: two sides of the same coin



Figure 19. Non-unique surface labeling: cross-section of an object with two 'backs'

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Findings II: Churches (placement) (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 20. Local assignment of volume terms: flashlight

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Findings II: Churches (placement) (cont.)

- use of lexical meronyms
  - i.e., terms that lexicalize part-whole relations

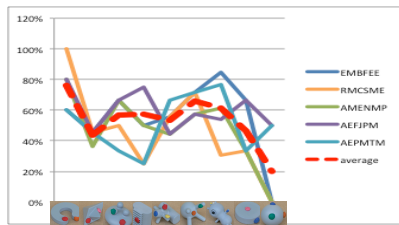


Figure 21. Percentage of parts labeled using lexical meronyms by object and dyad

- overall, the Yucatec speakers used lexical meronyms in reference to 54.7% of the parts

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Findings II: Churches (placement)

- an inventory of the types of strategies used
  - by the Yucatec participants to label the parts
  - geometrical lexical meronyms: inalienably possessed relational noun, can be possessed by a volume term
    - cannot be possessed by a person or animal (exception: *páach* 'back')
    - examples: 'front', 'side', 'top surface', 'bottom surface', 'tip', 'edge', 'hole', 'interstice', etc.
  - human/animal body part term: inalienably possessed relational noun, can possess a surface term
    - can be possessed by a person or animal and does not occur with hedges in that case
      - but may occur with hedges when applied to inanimate objects
    - examples: 'leg/food', 'arm/hand', 'head', 'tooth', 'nose'

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Findings II: Chunches (placement)

- plant body part term: inalienably possessed relational noun, can possess a surface term
  - can be possessed by a plant and does not occur with hedges in that case
    - but may occur with hedges when applied to inanimate objects
  - examples: 'trunk', 'bifurcation/crotch'
- function-based lexical meronyms: 'its entrance', 'its division' - mostly Spanish loans
- descriptors derived from shape terms
  - inalienably possessed relational noun derived from a noun or stative predicate describing shapes and/or surface textures
    - examples: 'its ridges', 'its grooved (part)', 'its crooked (part)', 'its smooth (part)', 'its rough side/thing', 'its smooth side/thing', 'its curved side/thing', 'its straight side/thing'

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Findings II: Chunches (placement)

- descriptors derived from dimensional or size terms
  - inalienably possessed relational noun derived from a stative predicate describing extension (along some dimension)
  - examples: 'its long/short thing', 'its thick/thin thing', 'its large/small thing', etc.
- descriptors derived from dispositionals via syntactic nominalization
  - examples: 'the standing one', 'the resting one', 'the one protruding'
- terms describing geometric figures: 'its triangle', 'its circle', 'its cross'
- artifact metaphors: 'the ball', 'the balloon', 'the marble', 'the rung/stepping stone'
- locative descriptions: e.g., 'where it's smooth'

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Findings II: Chunches (placement)

- distribution of these strategies
  - counting *pàach* 'back' as a surface = geo term

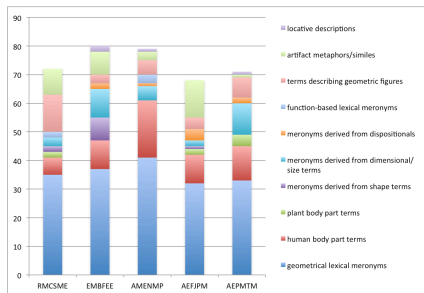


Figure 22. Frequency of strategy use by diachrony (pàach as geometrical term)

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Findings II: Chunches (placement)

- distribution of these strategies
  - counting *pàach* 'back' as a volume = body part term

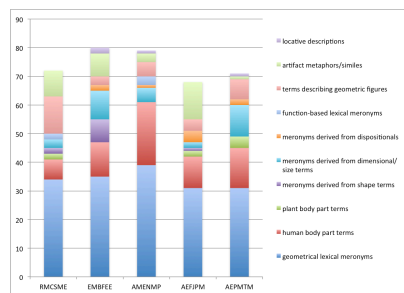


Figure 23. Frequency of strategy use by diachrony (pàach as body part term)

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Findings II: Chunches (placement) (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 2012 reports additional evidence for this hypothesis from Juchitán Zapotec

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Findings II: Chunches (placement) (cont.)

- comparisons
  - Yucatec vs. English
    - both surface/extreme and volume terms appear to be used more productively than in English
    - English has non-unique assignment of volume terms, but not of surface terms
      - Yucatec allows non-unique assignment of both
  - Yucatec vs. Levinson's account of Tzeltal
    - only geometric (surface/extreme) meronyms are assigned fully generatively in Yucatec
    - both body part terms and geometric meronyms appear to be assigned algorithmically in Yucatec
    - however, the assignment of body part terms to inanimate objects shows evidence of metaphoricity

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## Findings II: Churches (placement) (cont.)

- Yucatec vs. MacLaury's account of Ayoquesco Zapotec
  - Ayoquesco and some other Zapotec varieties appear to differ radically from both Mayan and Indo-European
    - in that they appear to lack geometric meronyms altogether, relying instead fully on body part terms for reference to parts and regions
  - global analogical mapping clearly plays a lesser role in Yucatec and Tzeltal than it does in Zapotec according to MacLaury
    - however, the precise role of analogical mapping calls for much more in-depth examination in all four languages

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## Conclusions

- 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 Tzeltal meronyms
  - and unlike that of Zapotecan meronyms according to MacLaury and Levinson

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## Conclusions (cont.)

- 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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## References

- Bohnemeyer, J. & Stolz, C. (2006). Spatial reference in Yucatec Maya: a survey. In S. C. Levinson & D. P. Wilkins (eds.), *Grammars of Space*. Cambridge: Cambridge University Press. 273-310.
- Campbell, L. 1979. Middle American languages. In L. Campbell & M. Mithun (eds.), *The languages of Native America: Historical and comparative assessment*. Austin, TX: University of Texas Press. 902-1000.
- Campbell, L., Kaufman, T., & T. C. Smith-Stark. 1986. Meso-America as a linguistic area. *Language* 62(3): 530-570.
- Gentner, D. 1983. Structure-mapping: A theoretical framework for analogy. *Cognitive Science* 7: 155-170.
- Gordon, R. G. Jr. 2005. *Ethnologue: Languages of the World*, Fifteenth Edition. Dallas, TX: SIL International. Online version: <http://www.ethnologue.com>.
- Heine, B. 1997. *Cognitive foundations of grammar*. Oxford: Oxford University Press.
- Jackendoff, R. S. 1983. *Semantics and cognition*. Cambridge, MA: MIT Press.
- Kaufman, T. 1973. Areal linguistics and Middle America. In T. A. Sebeok (ed.), *Current trends in linguistics. Vol. 11: Diachronic, areal, and typological linguistics* (H. M. Hoenigswald and R. E. Longacre, associate eds.). The Hague etc.: Mouton. 459-483.
- Landau, B. & R. S. Jackendoff. 1993. 'What' and 'where' in spatial language and spatial cognition. *Behavioral and Brain Sciences* 16: 217-265.
- Lehmann, C. 2003. *Possession in Yucatec Maya*. Second, revised edition. Arbeitspapiere des Seminars für Sprachwissenschaft der Universität Erfurt 10. Erfurt: Erfurt University.
- Levinson, S. C. 1994. Vision, shape, and linguistic description: Tzeltal body-part terminology and object description. In S. C. Levinson & J. B. Haviland (eds.), *Space in Mayan languages*. Special issue of *Linguistics* 32 (4): 791-856.
- Levinson, S. C. 2003. *Space in language and cognition*. Cambridge: Cambridge University Press.

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## References (cont.)

- Levy, P. 1992. Body-part prefixes in Papantla Totonac. In L. de León & S. C. Levinson (eds.), *Spatial description in Mesoamerican languages*. Special issue of *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 45 (6): 530-542.
- Li, P., & L. Gleitman. 2002. Turning the tables: Language and spatial reasoning. *Cognition* 83: 265-294.
- MacLaury, R. E. 1989. Zapotec body-part locatives: prototypes and metaphoric extensions. *International Journal of American Linguistics* 55: 119-154.
- Marr, D. 1982. *Vision*. New York: Freeman.
- Pérez-Báez, Gabriela 2012. Semantics of Body Part Terms in Juchiteco Locative Descriptions. In: Danielle Lillehaugen, Brook and Huey, Aaron, *Expressing Location in Zapotec*. Munich: LINCOM. 117-134.
- Piaget, J. & B. Inhelder. 1956. *The child's conception of space*. London: Routledge and Kegan Paul.
- Romero Méndez, R. 2008. *A descriptive grammar of Ayutla Mixe (Tukyo'm Ayuujk)*. Doctoral dissertation, University at Buffalo – SUNY.
- Sinha, C. and Jensen de López, K. 2000. Language, Culture and the Embodiment of Spatial Cognition. *Cognitive Linguistics* 11(1-2): 17-41.
- Slobin, D. I. 2003. Language and thought online. In D. Gentner & S. Goldin-Meadow (eds.), *Language in mind*. Cambridge, MA: MIT Press. 157-192.
- Smith-Stark, T. C. 1994. Mesoamerican calques. In C. MacKay & V. Vázquez (eds.), *Investigaciones lingüísticas en Mesoamérica*. Mexico City: Instituto de Investigaciones Filológicas, Universidad Nacional Autónoma de México. 15-50.
- Svorou, S. 1994. *The grammar of space*. Amsterdam, Philadelphia: John Benjamins.

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