

Annual Report for Period: 11/2007 - 10/2008

Principal Investigator: Bohnemeyer, Juergen .

Organization: SUNY Buffalo

Submitted By:

Bohnemeyer, Juergen - Principal Investigator

Title:

Spatial Language and Cognition in Mesoamerica

Submitted on: 10/26/2008

Award ID: 0723694

Project Participants

Senior Personnel

Name: Bohnemeyer, Juergen

Worked for more than 160 Hours: Yes

Contribution to Project:

Name: Benedicto, Elena

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on the Sumu.

Name: Capistrán, Alejandra

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Purepecha (Taraasco).

Name: Gutierrez Morales, Salome

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Soteapanec (Sierra Popoluca).

Name: Mateo-Toledo, Eladio

Worked for more than 160 Hours: No

Contribution to Project:

Will conduct fieldwork on Q'anjob'al.

Name: Palancar, Enrique

Worked for more than 160 Hours: No

Contribution to Project:

Will conduct fieldwork on OtomÝ.

Name: Peralta, ValentÍn

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Pajapan Nawat.

Name: Polian, Gilles

Worked for more than 160 Hours: No

Contribution to Project:

Will conduct fieldwork on Tzeltal.

Name: Smythe-Kung, Susan

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Huehuetla Tepehua.

Name: Vázquez, Juan Jesús

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Chol.

Name: Vázquez, Verónica

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Cora.

Name: Zavala, Roberto

Worked for more than 160 Hours: Yes

Contribution to Project:

Conducted fieldwork on Tecpatán Zoque.

Post-doc

Graduate Student

Name: O'Meara, Carolyn

Worked for more than 160 Hours: Yes

Contribution to Project:

Research assistant for project from August 2008 - May 2009. Will conduct fieldwork on Seri.

Name: Pérez Béz, Gabriela

Worked for more than 160 Hours: Yes

Contribution to Project:

Research assistant for project from March 28, 2008 - August 29, 2008. Will conduct fieldwork on Zapotec.

Name: Romero Méndez, Rodrigo

Worked for more than 160 Hours: Yes

Contribution to Project:

Research assistant for project from November 1, 2007 - March 26, 2008. Will conduct fieldwork on Ayutla Mixe and Mexican Spanish.

Undergraduate Student

Technician, Programmer

Other Participant

Research Experience for Undergraduates

Organizational Partners

Max Planck Institute For Psycholinguistics

The Max Planck Institute for Psycholinguistics hosted Juergen Bohnemeyer and Carolyn O'Meara for a meeting which focused on the development and piloting of the tasks used in the project.

CIESAS Sureste

CIESAS Sureste in San Cristobal de las Casas, Mexico, hosted the project's training workshop June 2-7, 2008.

Spatial Intelligence and Learning Center

SILC will provide MesoSpace with advice on aspects of quantitative research methodology. MesoSpace will provide SILC with data on which to base follow-up experimental research. The PI presented his preliminary Yucatec findings to a SILC audience at Northwestern University on October 6. Talks about a possible future personnel exchange are underway. SILC is an NSF Science of Learning Center.

Other Collaborators or Contacts

Dr. Penelope Brown, researcher in the Language Acquisition Group at the Max Planck Institute for Psycholinguistics, participated in discussion related to the design of the stimuli and the experimental procedure for the project tasks during the meeting at the Max Planck Institute for Psycholinguistics in March 2008. She provided her expertise and experience in spatial language and cognition of Tzeltal.

Dr. Niclas Burenhult, research fellow in the Language and Cognition Group at the Max Planck Institute for Psycholinguistics, participated in discussion related to the design of the stimuli and the experimental procedure for the project tasks during the meeting at the Max Planck Institute for Psycholinguistics in March 2008.

Dr. Eve Danziger from the Department of Anthropology at the University of Virginia participated in discussions regarding the design and development of the stimuli and the piloting process. She also participated in the project workshop which took place in June 2008. She provided expertise in experimental design, as well as her knowledge of spatial language and cognition of Mopan Mayan speakers.

Dr. Dedre Gentner, professor in the Northwestern University Psychology Department, is a Co-PI on the Spatial Intelligence and Learning Center (SILC) NSF Science of Learning Center grant. Gentner has provided feedback on the PI's Yucatec findings and agreed to collaborate with the MesoSpace project on questions of quantitative research methodology and possible follow-up experimental studies further exploring possible cognitive implications of the MesoSpace findings regarding spatial reference in discourse.

Dr. Olivier Le Guen, a post-doctoral researcher at the Max Planck Institute for Psycholinguistics who works on Yucatec Maya, participated in discussion related to the design of the stimuli and the experimental procedure for the project tasks during the meeting at the Max Planck Institute for Psycholinguistics in March 2008.

Dr. Stephen C. Levinson, the current managing director of the Max Planck Institute for Psycholinguistics (MPI) and the head of the Language and Cognition Group at the MPI, contributed significantly to the design and implementation of the stimuli used in the project during the meeting that was held at the MPI in March 2008.

Dr. Paulette Levy, professor at the National University of Mexico (UNAM), participated in the project workshop which took place in June 2008 by sharing her expertise of spatial semantics of Totonac.

Dr. David Mark, professor in the Department of Geography at the University at Buffalo, attended numerous lab meetings during which he helped in the development and piloting of the stimuli used in the project.

Dr. Eric Pederson, Chair of the Linguistics Department at the University of Oregon, participated in discussions regarding the design and development of the stimuli and the piloting process. Eric provided assistance in the design process of the new tasks used in the project.

Dr. Mark Sicoli, a post-doctoral researcher at the Max Planck Institute for Psycholinguistics who works on Zapotec, participated in discussion related to the design of the stimuli and the experimental procedure for the project tasks during the meeting at the Max Planck Institute for Psycholinguistics in March 2008.

Dr. Angela Terrill, research fellow at the Centre for Language Studies at Radboud University in Nijmegen, participated in discussion related to the design of the stimuli and the experimental procedure for the project tasks during the meeting at the Max Planck Institute for Psycholinguistics in March 2008.

Activities and Findings

Research and Education Activities: (See PDF version submitted by PI at the end of the report)

Project personnel in Buffalo has held weekly meetings in conjunction with the newly instituted semantic typology lab. Through the end of May, these meetings were dedicated primarily to discussions of experimental design and stimulus development. The Max Planck Institute for

Psycholinguistics in Nijmegen, The Netherlands, hosted a brainstorming workshop on March 11 to provide further feedback. The workshop was attended by more than half a dozen members of the Language and Cognition research group at the MPI and by Carolyn O'Meara and the PI for MesoSpace. O'Meara spent a month as a visitor at the Max Planck Institute on the institute's invitation to discuss MesoSpace design issues and aspects of her own dissertation project (NSF Award #0553965) with the MPI researchers.

The result of these efforts is a battery of tasks and stimuli:

- (i) The Novel Objects stimuli, consisting of nine objects of novel shape which do not resemble any artifacts or living creatures known in Mesoamerican or Euro-American culture. There are two tasks associated with these objects. The first targets labels for object parts (meronyms); the second looks at the way that speakers make reference to locations defined with respect to the objects. Both tasks are realized as referential communication tasks: during each trial, one participant produces descriptions that make reference to the parts of the objects or the projected locations and the other identifies the part of location referred to from a contrast set. The participants are forced to rely as much as possible on language for this task by preventing them from sharing attention through a screen placed between them. 20 sets of the Novel Objects were produced out of plastic.
- (ii) Picture books, realized as part of the Field Manual, featuring images of humans and various animals, plants, and Western and Mesoamerican artifacts. These were designed for single-participant elicitation tasks targeting descriptors of the parts of the featured entities and locative descriptions employing these parts as referential grounds.
- (iii) The Ball & Chair photographs, comprising four sets of twelve photographs each of different spatial configurations of a ball and a chair. These are to be used in a picture-to-picture matching referential communication task inducing speakers to make explicit the spatial configurations in the pictures so as to distinguish them. The goal of this tool is to study preferences for the use of particular spatial frames of reference in tabletop space. Ball & Chair (B&C) evolved out of the Men & Tree (M&T) matching games, designed by Eve Danziger and Eric Pederson and released with the very first field manual of what was then the Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics in November 1992. B&C improves on M&T in a number of respects. M&T effectively suppresses intrinsic choices; B&C is designed for the study of the selection among all types of spatial FoRs. People and trees are not particularly good as figures and grounds. Trees often lack a canonical 'orienting' (i.e., front-back) axis - the tree of M&T certainly did. And the toy men were more featured than the tree. B&C has many more pictures that show canonical figure-ground asymmetry and simultaneously force FoR selection for disambiguation. Another complication that B&C avoids is the use of pictures of toys - representations of representations, which makes it hard for the participants to consistently operate within the same scale.
- (iv) The New Animals task, requiring participants to commit arrays of farm animal toys located on a table to memory and then to reproduce the arrays on a different table after turning 180 degrees. This task is designed to study preferences for frames of reference in recall memory to see whether these preferences align with those in discourse. New Animals is modeled closely on the Animals In A Row task originally released as part of the July 1993 'Cognition and Space Kit' of what was then the Cognitive Anthropology Research Group at the Max Planck Institute for Psycholinguistics.

The RAs - in particular Gabriela Perez Baez - played a leading role in the design and manufacturing (or, in the case of the New Animals, procurement) of the stimuli. Prototypes of the stimuli and tasks were piloted in April with 52 undergraduate students of the University at Buffalo Linguistics Department.

A 92-page field manual was created - edited by Perez Baez and written by the PI with input from a large number of team members and external collaborators - which provides a protocol for how to carry out each of the studies along with background information about the aims of each study and instructions for preliminary processing and analysis of the data. A PDF copy of the field manual can be downloaded from the project web site, created by Rodrigo Romero Mendez:

<http://www.acsu.buffalo.edu/~jb77/Mesospace.htm>

The website offers information about the project and the project members and allows for the dissemination of documents relevant to the project. The PDF copy of the field manual can be found at the following URL (the file is about 30MB in size!):

<http://www.acsu.buffalo.edu/~jb77/MesoSpaceManual2008.pdf>

A week-long training workshop was hosted by the Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS) Sureste in San Cristobal de las Casas, Chiapas, June 2-7. The workshop was organized by the Buffalo MesoSpace team and by Roberto Zavala Maldonado and Magdalena Aguilar Zuñiga for CIESAS Sureste. All project members attended, along with some of their students and Dr. Eve Danziger (University of Virginia) and Dr. Paulette Levy (Universidad Nacional Autónoma de México) as external collaborators. The workshop

was dedicated to theoretical and practical instruction in carrying out the MesoSpace tasks, but also yielded important last-minute adjustments and clarifications of the protocols.

To date, six of the 15 collaborating field workers have completed their field trips. The attached document provides information about where and when these expeditions were conducted and how many participants were recruited for each task. The remaining field trips will be carried out by February 2009. The analysis of the data collected so far has begun, but only the PI has presented preliminary findings from his field language to an outside audience (see below).

Findings: (See PDF version submitted by PI at the end of the report)

The only findings to be reported at this stage of the project come from fieldwork conducted by the PI, Juergen Bohnemeyer. The data collected from other project members will be analyzed beginning in January up until the second MesoSpace workshop, scheduled for September 2009.

The spatial language and cognition in Mesoamerica project (MesoSpace) set out to examine the correlations between two typologically unusual traits of spatial language in the Mesoamerican (MA) area: the highly productive use of 'meronymic' terminologies for object parts and spatial regions based primarily on object geometry and the striking preference for allocentric over egocentric (observer-based) frames of reference. Yucatec, like Tzeltal (Levinson 1994) and Ayoquesco Zapotec (MacLaury 1989) - and unlike Indo-European languages such as English and Spanish - has a productive strategy for labeling object parts on the basis of their shape and position in the object's axial structure. MacLaury describes meronymic labeling in the Zapotec system as based on a global analogical mapping of the structure of the human body into that of the object. This mapping is orientation-sensitive: the human body is mapped onto the object so that the highest part becomes the metaphorical 'head' and the lowest part the 'buttocks' or 'feet', depending on its shape. The assignment of 'front', 'back', and 'side' terms appears to depend both on the shapes of the parts of the object and on the perspective of the observer. In contrast, the Tzeltal system described by Levinson is in first approximation orientation-free. Levinson argues that Tzeltal meronym assignment is not metaphorical at all. Rather, it is based on an algorithm that operates directly on the output of visual processing and governs the assignment of body part and object part terms alike. The Yucatec system combines traits of Tzeltal and Zapotec meronymy, but is best described as a third type of system. Yucatec meronymy involves a critical distinction between three semi-autonomous subsystems which does not appear to exist in the other two languages: there are subsystems for the labeling of surfaces, volumes, and curvature extremes (edges, corners, tips, etc.). Evidence from a referential communication task involving 'novel' objects culturally unfamiliar to Mayan people and Westerners alike shows that only the subsystems for surface and curvature extreme naming are fully productive. Volume naming shares many traits with the algorithm described by Levinson: volume meronyms are assigned independently of the object's canonical or actual orientation, independently of its overall structure except for the determination of the largest volume (a flashlight can be viewed as a 'leg' with a 'head' on one end and an 'asshole' on the other), and non-uniquely (objects can have multiple 'heads' etc.). Yet, strikingly, volume labeling is not only much more restricted with unfamiliar objects compared to surface and 'extreme' labeling, but is also frequently explicitly metaphorical, which surface and extreme labeling never is. Surface labeling, unlike volume and extreme labeling, is orientation-dependent. The assignment of 'top' and 'bottom' surfaces depends on the object's canonical orientation, not on its actual orientation, as in Zapotec. The evidence from Yucatec supports the view that global analogical mapping as in Zapotec and assignment based on shape-analytical algorithms as in Tzeltal are not incompatible, contrary to Levinson 1994. Additional data supports the hypothesis that productive shape-based meronymies favor the use of intrinsic (or, more generally, allocentric) frames of reference. This evidence comes from a second referential communication task, one involving four sets of 12 pictures each featuring a ball in various locations vis-a-vis a chair. The frame of reference Yucatec speakers use most frequently when describing the location of the ball in order to distinguish and match the pictures is the intrinsic frame of reference. This confirms a conjecture in Bohnemeyer & Stolz 2006. This preference for the intrinsic frame can be argued to follow from the fact that (a) the terms used for reference to oriented regions are based transparently on meronyms and (b) these meronyms are applied fully productively to arbitrary objects on the basis of their geometry. Thus, at least for Yucatec, a case can be made that the selection of frames of reference in discourse is governed by purely linguistic, rather than cultural, factors, contra Li & Gleitman 2002. This has important implications for the ongoing controversy over the evidence for a crosslinguistic alignment in frames of reference selection for linguistic and nonlinguistic tasks (Pederson et al. 1998, Levinson et al. 2002).

The PI presented a first overview of his Yucatec findings at a brown bag lecture at Northwestern University attended by students and members of the NSF-funded Spatial Intelligence and Learning Center (<http://spatiallearning.org/>) on October 6. The handout of this presentation is attached.

Training and Development:

The research assistants for the project participated in weekly lab meetings and helped the PI design and pilot the MesoSpace stimuli and tasks. This afforded them first-hand experience in various aspects of research methodology. One of the assistants, Gabriela Perez Baez, also designed and created the prototypes for the Novel Objects stimulus.

During the training workshop, hosted by CIESAS Sureste in San Cristobal de las Casas, Chiapas, Mexico, June 2-7, project members convened

to discuss the goals of the project and also gained hands-on experience regarding how to run the tasks relevant to the project.

The field trips provide the MesoSpace researchers with practical experience in the research methodology of semantic typology - collecting data on linguistic categorization with nonverbal stimuli instantiating the cells of an etic grid and performing semantic and pragmatic analyzes to get at language-specific intensions of semantic categories. For a majority of the members of the team (which includes six graduate students and two researchers who defended their dissertations within the last year) this is the first exposure they have had to this approach.

One of the University at Buffalo students collaborating on the project, Carolyn O'Meara, spent a month as a visitor of the Max Planck Institute for Psycholinguistics in March, acting as a liaison between MesoSpace and the Language and Cognition research group and simultaneously presenting and discussing her dissertation research (NSF dissertation improvement award #0553965). The stay afforded her an opportunity to familiarize herself with some of the ongoing research activities at the Max Planck Institute for Psycholinguistics.

Outreach Activities:

The University at Buffalo NewsCenter put a press release about the project on its web site:

<http://www.buffalo.edu/news/9130>

Journal Publications

Books or Other One-time Publications

Web/Internet Site

URL(s):

<http://www.acsu.buffalo.edu/~jb77/Mesospace.htm>

Description:

Other Specific Products

Product Type:

Field Manual

Product Description:

This product is the 2008 Field Manual for the project. It was designed as a resource for project members regarding the objectives of the project and it provides guidelines on how to run the tasks and analyze the data.

Sharing Information:

The 2008 Field Manual is available on the project website:

<http://www.acsu.buffalo.edu/~jb77/MesoSpaceManual2008.pdf>

Contributions

Contributions within Discipline:

MesoSpace is the first large-scale collaborative project in semantic typology not based at the Max Planck Institute for Psycholinguistics since the World Color Survey of the 1970s. It is breaking new ground by demonstrating to the field the potential of such efforts. It is also the first to apply methods of semantic typology to the study of a sprachbund or language area.

The Ball & Chair (B&C) stimulus and task represent a considerable improvement over the current standard tool for assessments of frames-of-reference biases across languages, the Men & Tree (M&T) stimulus set developed at the Max Planck Institute for Psycholinguistics. M&T effectively suppresses intrinsic choices; B&C is designed for the study of the selection among all types of spatial FoRs. B&C has many more pictures that show canonical figure-ground asymmetry and simultaneously force FoR selection for disambiguation. Another complication

that B&C avoids is the use of pictures of toys - representations of representations, which makes it harder for the participants to consistently operate within the same scale.

The Novel Objects stimulus kit is the first of its kind produced in large enough quantities to be used in large-scale comparative research targeting similarities and differences of meronymy across languages. The PI's Yucatec data suggests that this stimulus kit and the tasks developed around it serve its designated purpose quite well.

The finding that Yucatec has a productive geometric meronymy like Tenejapa Tzeltal and Ayoquesco Zapotec supports the hypothesis that such meronymies are an areal feature of Mesoamerican languages. At the same time, Yucatec meronymy has traits not attested in the previously studied systems. In particular, the division into subsystems for volumes, surfaces, and curvature extremes seems to be unique and indicates that there are more than those previously recognized two types of productive geometric meronymies. Levinson's (1994) non-metaphorical analysis of Tzeltal meronymy is supported by the finding that the (fully productive) surface terms of Yucatec are not (used as) body part terms (with the exception of *_pÓach_* 'back'). At the same time, however, even though volume labeling in Yucatec has all the signature traits of the algorithm Levinson described for Tzeltal, it is not fully productive and frequently involves hedges and similes, suggesting algorithmic mapping is not necessarily non-metaphorical.

Previous research has painted a picture of Yucatec as a 'referentially promiscuous' language with the intrinsic frame of reference (FoR) being the dominant one for all speakers. The B&C data confirm that all three types of FoRs of the Levinson classification (Levinson 1996) are used commonly and frequently in table top space.

Speakers routinely switch between FoRs or combine multiple FoRs in their descriptions. In terms of the distribution over speakers, the relative FoR is more widespread than the use of the cardinal directions; the latter are mostly restricted to (adult or older adolescent) male speakers. And the intrinsic FoR is the most important FoR for expressing place functions among all speakers.

Finally, and most importantly, the Yucatec data support the central hypothesis of MesoSpace: productive geometrical meronymy aligns w/ dominance of the intrinsic FoR. This puts the project on track towards discovering the first ever unimpeachable purely linguistic determinant of FoR selection. If corroborated by the data from the other languages, this would have important implications for the Gleitman-Levinson controversy over language in particular vs. culture in general as the driving force behind the alignment of FoR selection in discourse and internal cognition.

Contributions to Other Disciplines:

The PI's emerging findings regarding Yucatec meronymy have important potential implications for the theory of analogical domain mappings in cognition. The potential for follow-up work on possible cognitive consequences of the different mapping strategies found in Ayoquesco Zapotec (MacLaury 1989), Tenejapa Tzeltal (Levinson 1994), and Yucatec are currently being explored.

The hypothesis that productive geometrical meronymies favor the use of allocentric (non-observer-dependent) over egocentric (observer-dependent) frames of reference ties in with one of the foundational questions of cognitive science, the language-and-thought complex. If confirmed, the meronymy-allocentrism pattern would suggest that the availability of productive geometrical meronymies is a purely linguistic factor driving biases in frames-of-reference usage in language and internal cognition. The PI's Yucatec data appear to support the hypothesis.

Contributions to Human Resource Development:

The project contributes to the training and academic advancement of six graduate students and two junior scholars who defended their dissertations within the year since MesoSpace was launched. Five of these are Guatemalan or Mexican citizens; four of them are native speakers of indigenous languages; and three of them are women. In all, six of the 15 members of the MesoSpace team are women and nine are citizens of Mexico or Guatemala.

Contributions to Resources for Research and Education:

The project has inspired intensive collaboration between the University at Buffalo, the Max Planck Institute for Psycholinguistics, the Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS) Sureste, and the NSF-funded Spatial Intelligence and Learning Center.

Contributions Beyond Science and Engineering:

Special Requirements

Special reporting requirements: None

Change in Objectives or Scope: None

Animal, Human Subjects, Biohazards: None

Categories for which nothing is reported:

Any Journal

Any Book

Contributions: To Any Beyond Science and Engineering

Researcher	Language	Field site	Duration of stay	Participants per task				
				Picture book elicitation		Novel Objects matching tasks		Ball & Chair
								New Animals
				Part ident.	Local- ization	Part ident.	Local- ization	
Jürgen Bohnemeyer	Yucatec Maya	Yaxley, Quintana Roo, Mexico	6/8/8- 7/29/8	7	3	5 x 2	5 x 2	5 x 2 18
Alejandra Captistrán	P'orhépecha	Santa Fe de la Laguna, Municipio de Quiroga, Michoacán	8/31/8 - 9/13/8	6	6	5 x 2	5 x 2	5 x 2 19
Susan Smythe Kung	Huehuetla Tepehua	Huehuetla, Hidalgo, Mexico	6/13/8 - 7/24/8	4	10	5 x 2	5 x 2	5 x 2 25
Juan Jesús Vázquez	Chol	Tila, Chiapas, Mexico	6/20/8 - 7/10/8	10	5	7 x 2	7 x 2	3 x 2 10
Salome Gutierrez Morales	Soteapanec	Soteapan, Veracruz, Mexico	7/19/8 - 8/12/8	6	6	5 x 2	5 x 2	5 x 2 16
Elena Benedicto	Sumu/ Mayangna	Rosita, Nicaragua	6/11/8 - 7/15/8	4	4	5 x 2	4 x 2	5 x 2 10

Volumes, surfaces, and extreme points

Meronymy and object-centered geometry in Yucatec Maya

Field report, Northwestern University & SILC
6 October 2008

Jürgen Bohnemeyer, SUNY at Buffalo

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Overview

MesoSpace

- Yucatec
- meronymy: background
- meronymy: tools and tasks
- meronymy: findings
- spatial FoRs: tools and tasks
- spatial FoRs: findings
- conclusions
- appendix I: assigning surfaces
- appendix II: projection
- appendix III: coding the B&C data

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MesoSpace

- 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. Gutiérrez Morales)
 - Tecpatán Zoque (R. Zavala Maldonado)
 - Oto-Manguean
 - Otomí (E. Palancar)



3

3 controls

- Seri (C. O'Meara)
- Sumu (E. Benedicto)
- Mexican Spanish (R. Romero Méndez)

2 (interrelated) domains

- **meronyms** – labels for parts of entities
 - including, but not restricted to, *body part metaphors*

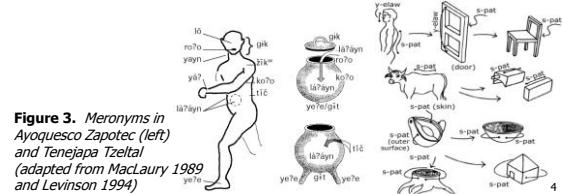


Figure 2. MesoSpace

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MesoSpace (Cont.)

– spatial frames of reference

- conceptual coordinate systems used to define orientation-dependent place functions (Jackendoff 1983)

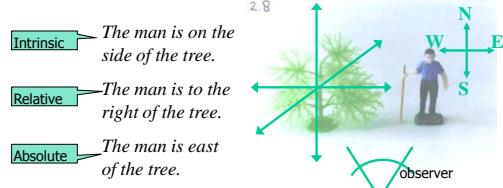


Figure 4. The three types of spatial FoRs distinguished in Levinson 1996

– why MA

– productive meronymies

- attested in Mixtec, Purepecha, Totonac, Trique, Tzeltal, Tzotzil, Yucatec, Zapotec

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MesoSpace (Cont.)

- meronymy as the primary lexical resource for spatial reference – few/no adpositions/case markers
 - including, e.g., in all of the above languages
- egocentric FoRs play a minor or no role
 - attested for Huave, Mopan, Olutec, Totonac, Tzeltal, Tzotzil, and Yucatec
- the MA *sprachbund* and specifically the evidence for calquing of meronyms
 - cf. Kaufman 1973; Campbell 1979; Campbell, Kaufman, & Smith-Stark 1986; Smith-Stark 1994
- the cultural uniformity and topographic and ecological diversity of the MA area
 - to distinguish between possible linguistic and cultural factors influencing spatial cognition
 - in response to Li & Gleitman 2002

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MesoSpace (Cont.)

- 2 big research questions
 - does the availability of productive geometrical meronym systems bias FoR selection?
 - **hypothesis:** meronymies favor the use of allocentric (intrinsic, geomorphic, or absolute) over egocentric FoRs
 - does a possible effect of meronym terminology on FoR use extend to non-linguistic cognition?
 - **hypothesis:** speakers of languages w/ productive meronymies tend to be allocentric thinkers
- oodles of smaller research questions
 - how much spatial information is represented in language?
 - to what extent do languages differ in the expression of geometrical and functional object structure?

MesoSpace (Cont.)

- do languages borrow from one another, not just metaphors (-> calques), but entire semantic frames
 - such as domain mapping strategies and reference frames
- is there variation in the role the human and animal body plays as a conceptual model
 - of the structure of objects across languages?
- do speakers of all languages employ the same conceptual processes
 - in mapping the structure of the body into that of objects?

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MesoSpace (Cont.)

- timeline
 - winter 2007/8 – design of stimuli and tasks
 - spring 2008 – stimulus production and piloting at UB
 - June 2-7, 2008 – training workshop in San Cristóbal
 - June thru winter 2008/9 – field trips
 - our budget only provides for one field trip per researcher
 - spring 2009 – data processing and analysis
 - June 2009 – analysis workshop in San Cristóbal
 - June 2009 thru April 2011: dissemination of results and follow-up proposal

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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?l=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



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Overview

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Meronymy: background

- semantic transfer from body parts to object parts and spatial relations may be a universal
 - cf. Svorou 1994; Heine 1997
- what makes MA meronyms special
 - morphosyntactically: their use as spatial relators
 - i.e., in expressions of **place functions** (Jackendoff 1983)
 - semantically: their applicability to arbitrary objects on the basis of geometrical properties
- morphosyntactic properties of MA meronyms
 - two varieties
 - in Mayan and Oto-Manguean languages, meronyms tend to be lexicalized as **relational nouns**
 - depending on the language, these may be **inalienable**
 - » see examples below

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Meronymy: background (cont.)

- in Totonacan and Mixe-Zoquean, meronyms constitute a special closed class of roots

– these most commonly surface incorporated into verbs and require derivational morphology to form nouns
 – cf., e.g., Levy 1992 on Papantla Totonac and Romero Méndez 2008 on Ayutla Mixe

- in all MA languages, meronyms are the most important lexical resource for coding place functions

- MA languages have no locative cases and, depending on the language, no or very few adpositions
- when realized as relational nouns, meronyms are used in locative/motion descriptions as follows
 - they are possessed by the **ground-denoting nominal** (the noun referring to the entity serving as reference point)
 - the resulting possessed nominal either *is* the **ground phrase** (the phrase denoting the place projected from the ground object)
 - » or combines with a semantically pale adposition to form it

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Meronymy: background (cont.)

- the following examples from Juchiteco Zapotec illustrate the first possibility
 - » the possessed nominal headed by the meronym *is* the ground phrase
- (3.1) a. **ike**(=be*)
head=3
'his/her head' / 'on him/her' (Pérez-Báez in press: 4)
b. **nuu*** **sambre*ru i^Ake=be***
EXIST hat head=3
'The hat is on his head' (Pérez-Báez p.c.)
c. **Dxil'ba za ike** **yoo**
raised.cloud head house
'The cloud is over the house' (Pérez-Báez in press: 11)
- in Yucatec, both constructions exist
 - » some meronyms head the ground phrase (e.g., *óok'o'top'* in (3.2), others combine with the generic preposition *t'* (e.g., *ts'u'core*)
- (3.2) ...h-tál u=bala^k **y=óok'o'l** le=pak'=o'
PRV-come(B3SG) A3=roll A.3=top DET=brickwork=D2
'...it came rolling on the wall'

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Meronymy: background (cont.)

- (3.3) H-**óok** le=chan xóot'+che'
PRV-enter(B3SG) DET=DIM cut+wood
tu=**ts'u'** le=chiina=o'
PREP:A3=core DET=orange=D2
'The little cut piece of wood entered in the interior of the orange'

- as a result, the encoding of place functions in intrinsic and relative frames of reference

- necessarily involves reference to body/object parts in MA
 - either directly or indirectly, via "normalization" – see Appendix II
- in contrast, expressions of (non-vertical) absolute place functions do not involve meronyms
 - but rather expressions of cardinal directions or environmental gradients

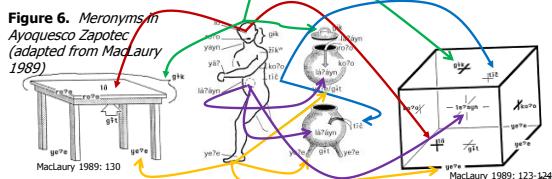
• semantic properties of MA meronyms

- productivity and generality: meronymies affording reference to arbitrary parts of arbitrary objects

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Meronymy: background (cont.)

- how does this work – what makes this productivity and regularity possible?
 - two proposals – **global analogies** (MacLauray) vs. **shape-analytical algorithms** (Levinson)
- MacLauray 1989 argues Ayoquesco Zapotec meronymy to operate on global analogical mapping
 - Ayoquesco has a set of seven body part terms that are freely extended to non-human bodies and inanimates



Meronymy: background (cont.)

- according to MacLauray, these are global analogical domain mappings from the geometry of the human body
 - into that of the animal or plant body or object
 - as described by **Structure Mapping Theory** (Gentner 1983)
 - accounts of meronymy in other Oto-Manguean languages have made similar assumptions and are compatible with MacLauray's
 - » cf., e.g., Sinha & Jensen de López 2000 and Pérez-Báez in press for other Zapotecan varieties

- Levinson 1994 rejects global analogical mapping for Tenejapan Tzeltal on the basis of three properties

- all parts are named non-uniquely
 - so any object can have an arbitrary number of 'legs', 'heads', 'backs', etc.
- parts are named in first approximation 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.

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Meronymy: background (cont.)

- the place of the labeled part in the structure of the object varies across classes of objects
- Levinson instead proposes an algorithm
 - that starts from the visual analysis of the outline of the object
 - segmenting it into volumes based on curvature discontinuities
 - and assigning axes to these volumes that generate them as generalized cones
 - » following Marr's (1982) theory of shape recognition
 - the parts on the ends of the axes of each volume are then labeled on the basis of their shape
 - the algorithm accounts for the meaning of body part terms as much as for their uses with inanimate objects
 - which on Levinson's analysis are non-metaphorical
 - e.g., the 'buttocks' are really the less convex end of the generating axis of the main volume

Figure 7. Apparent local body-part analogies in Zefal (Levinson 1994: 811)

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Meronymy: background (cont.)

• research questions about meronymy

- 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

- MesoSpace
- Yucatec
- meronymy: background
- **meronymy: tools and tasks**
- meronymy: findings
- spatial FoRs: tools and tasks
- spatial FoRs: findings
- conclusions
- appendix I: assigning surfaces
- appendix II: projection
- appendix III: coding the B&C data

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Tools and tasks (cont.)

• a set of plastic objects of unfamiliar shapes



Figure 8. Some Novel Objects

- task I: referential communication; reference to parts
 - in each trial, one participant has an object with stickers attached to various parts in front of them
 - » while the other has an identical copy of the object w/o the stickers
 - the first speaker instructs the second speaker to put the stickers on the correct parts, identifying the parts in the process
 - to be carried out with five pairs of speakers
- task II: referential communication; placement wrt. parts
 - one participant per trial describes the location of color chips on, in, under, or near salient parts of each object
 - » so that the other can place a chip in the corresponding location wrt. their copy of the object
 - to be conducted with five pairs of speakers per language
 - the data will be analyzed both for the meronyms and for FoRs

Meronymy: Tools and tasks (cont.)

• Yucatec participants

- Picture book tasks: 7 speakers
 - six men and one woman in their thirties through sixties
- Novel objects tasks: 5 pairs of speakers
 - five men and five women in their teens through sixties
 - two all-male dyads, two all-female dyads, and one married couple

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Meronymy: 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 set	occurs not sharply defined, possibly open	does not occur closed	does not occur 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	"bubble space"	oriented-region	"bubble space"

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Meronymy: Findings (cont.)

- in contrast, surface meronyms were used liberally in reference to all *Chunches*
- assignment of volume meronyms frequently involved similes and hedges

(5.11) *Ko'x a'l-ik u=k'ab*
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
- asked to name inanimate objects that have, e.g., 'heads' or 'bellies'
– speakers quickly ran out of examples

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Meronymy: 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>hal' = pool 'head'</i>	<i>čanul 'button'</i>	<i>p'ul'na 'tip'</i>
<i>čitun 'trunk'</i>	<i>ichil 'inside'</i>	<i>tu'k' 'corner'</i>
<i>č'e 'anus'</i>	<i>čok'ol 'top'</i>	<i>x'ul' 'end'</i>
<i>čhal' 'neck'</i>	<i>p'aach 'back'</i>	*
<i>č'eč 'hand/arm'</i>	<i>č'eč 'front'</i>	*
<i>nak' 'belly'</i>	<i>tséel' 'side'</i>	*
<i>čök' 'foot/leg'</i>		*
<i>xbak'et 'buttocks'</i>		*
<i>čak' 'ear'</i>		*
...		

Table 1. Yucatec meronym classes²⁶

Meronymy: Findings (cont.)

- volume meronyms are not nearly as productive as surface meronyms
 - during the *Novel Objects* sessions, body part terms played only a relatively minor role
 - except for *p'aach* 'back'
 - objects 3 and 5-7 were said to have 'legs'
 - and 7 in addition for some speakers also has 'arms' and even a 'belly' and a 'head'
 - although the latter two assignments seem to be based on a local comparison to bottle gourds

Figure 9. Novel objects 3, 5-7;
bottle gourd



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Meronymy: Findings (cont.)

- there is a great deal of variation in these judgments
 - contrasting with a striking uniformity in surface labeling
- at the same time, there are important parallels to the algorithm Levinson proposed for Tzeltal
 - volume meronyms are assigned independently of the object's overall structure
 - e.g., a flashlight can be viewed as a 'leg' with a 'head' on one end and an 'anus' on the other
 - volume meronyms are 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'

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Figure 10.
Chunché #7

Meronymy: Findings (cont.)

- in contrast, surface meronyms were used liberally in reference to all *Chunches*
- assignment of volume meronyms frequently involved similes and hedges

(5.11) *Ko'x a'l-ik u=k'ab*
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
- asked to name inanimate objects that have, e.g., 'heads' or 'bellies'
– speakers quickly ran out of examples

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Meronymy: Findings (cont.)

- the evidence from volume meronyms suggests
 - that a shape-analytical algorithm as described by Levinson is not necessarily non-metaphorical
 - shape-analytical algorithmic mapping may be merely a *different kind* of metaphorical mapping
- surface meronyms are assigned fully productively
 - but, except for *pàach* 'back', cannot be assigned to humans or animals
 - but only to parts of their bodies – suggesting **surface meronyms are not body part terms**
 - the assignment of surface meronyms is likewise algorithmic, but based on a distinct algorithm
 - see the Appendix for details

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Meronymy: Findings (cont.)

- only surface meronyms project spatial regions that can be referenced in intrinsic or relative FoRs
- volumes and extremes only occur as arguments of topological (i.e., orientation-free) place functions



Figure 11. Chunché #1

Figure 12. A Birdseye view of Chunché #1 and its projected spatial regions

Table 7. Surface meronyms and the expression of place functions

surface meronym	preferred construction for reference to projected region	gloss	preferred FoR for reference to regions	available alternative FoR
<i>anq'ol</i> 'bottom'	<i>anq'ol</i> /NP/	'below'	absolute	intrinsic
<i>ichil</i> 'inside'	<i>ichil</i> /lit/ /NP/	'in(side)'	topological	intrinsic
<i>dóok'ol</i> 'top'	<i>dóok'ol</i> /NP/	'on/above'	absolute	intrinsic
<i>pàach</i> 'back'	<i>pàach il i'</i> /NP/	'behind/out side'	intrinsic	relative
<i>man</i> 'front'	<i>man il i'</i> /NP/	'in front of'	intrinsic	relative
<i>tséel</i> 'side'	<i>tséel il</i> /NP/	'beside'	intrinsic	relative

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Spatial FoRs: Tools and tasks (cont.)

- recall memory task: New Animals
 - a near-identical replication of the Animals In A Row (AIAR) design
 - of Levinson 1996 and Pederson *et al.* 1998

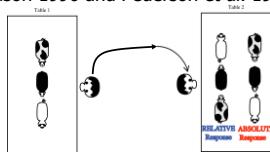


Figure 15. Layout of the AIAR memory recognition task

- minor differences: the toy animals used; the number of trials; ...

- big drawback: no intrinsic response pattern
 - during pilots in Buffalo, we tried to engineer one
 - but all our attempts would push *all* participants towards using intrinsic FoRs

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Spatial FoRs: Tools and tasks (cont.)

- Yucatec participants

- Ball & Chair: 5 pairs of speakers

- five men and five women in their teens through sixties
 - these are the same participants who also did the two Novel Objects (aka Chunches) tasks
 - all participants completed the Novel Objects tasks before doing B&C

- New Animals: 18 speakers

- eight male speakers in their teens thru sixties and ten female speakers in their teens thru forties
- two of the male speakers' responses were excluded from analysis because of high error rates
 - these two produced wrong-animal or wrong-order responses in at least 50% of the trials
- 7 of the 18 participants also did some of the other tasks
 - all of these did New Animals before any of the other tasks

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Figure 13. Layout of Men and Tree task (Pederson et al. 1998: 362)

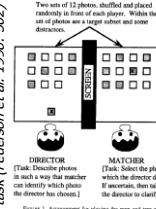


Figure 13. Layout of Men and Tree task (Pederson et al. 1998: 362)



Figure 14. Two Ball & Chair pictures, featuring an intrinsic contrast

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Spatial FoRs: Findings (cont.)

- when the direct is lumped with the intrinsic
 - as per Levinson's (1996) typology – see Appendix III
- the intrinsic can be considered the dominant FoR for this task

Figure 16. Response type frequencies in the Yucatec Ball & Chair data (fine-grained coding)

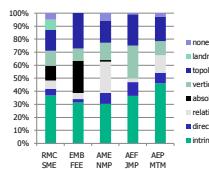
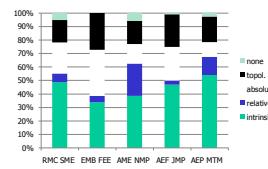


Figure 17. Response type frequencies in the Yucatec Ball & Chair data (course-grained coding)



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Spatial FoRs: Findings (cont.)

- “referential promiscuity”**
 - use of all types of FoRs in table-top space is customary in the community
 - all adult speakers are extremely versatile and switching between different FoRs
 - and combining multiple FoRs in a single description
- (7.1) T-u=**tséel**, te=x-**ts’ik** te-estée-le=**chik’ín=o’**
PREP-A3=**side** PREP-DET=F-left PREP-DET+HESIT-DET=**west=D2**
 hun-p’éel bòbla yàan-e’, ch’uy-k’ah-a’n (...)
one-CL-IN ball EXIST(B3SG)=D4 hang-MIDDLE-RES(B3SG)
'On (the Chair's) side, on the left in the, uh, the west,
there is a ball, it is suspended (...)'
- predictions for New Animals task**
 - no clear predictions
 - neither the relative nor the absolute FoR is linguistically dominant



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Spatial FoRs: Findings

FoRs in discourse: Ball & Chair

- all five pairs of speakers used the relative FoR
 - but not necessarily the terms for 'left' and 'right'; see below
- whereas only the first two dyads - the all-male dyads - used the absolute FoR
 - the third pair used it once
- this is in line with previous reports (Bohnemeyer & Stoltz 2006; Le Guen ms.)
- for the task of locating the Ball vis-à-vis the Chair, the intrinsic FoR is the most important
 - for all five pairs of speakers
 - this is likewise as predicted by previous work

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Spatial FoRs: Findings (cont.)

- for the task of orienting the Chair ...
 - where the intrinsic FoR plays for obvious reasons no role
 - except in the guise of landmark-based and direct reference
» which are considered intrinsic in Levinson's typology)
- ...the five dyads are pretty much all over the place
 - the all-male dyads use absolute, landmark-based, and direct frames
 - with the married couple, the relative FoR dominates
 - the all-female dyads relied predominantly on the direct
- the use of cardinal direction terms *could* be a “genderlect” phenomenon in Yucatec
 - Bohnemeyer & Stoltz 2006, Le Guen ms., and the present study all find a strong gender bias
 - however, there is no evidence that the use of cardinal direction terms is *interpreted* as expressing masculinity

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Spatial FoRs: Findings (cont.)

FoRs in recall memory: New Animals

Table 5 - Cross-tabulation of participants ($N = 16$) by age group, gender, and predominant response type (at least three trials have to instantiate a particular type in order for that type to qualify as the predominant type for the participant; “mixed” means there was no dominant type)

Age-group	Gender	Predominant response type				Total
		absolute	relative	unidirectional	mixed	
≤ 30	male	1	1	0	0	2
	female	0	0	0	1	1
≥ 30	male	3	0	2	0	5
	female	2	1	1	1	5
Total		9 (56.3%)	2 (12.5%)	3 (18.8%)	2 (12.5%)	16

Interpreting the response types

- the “absolute” response type is produced by absolute, geocentric, and landmark-based FoRs
 - and by coincidence

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Spatial FoRs: Findings (cont.)

- "relative" responses are produced by relative and direct FoRs - and by coincidence
- intrinsic FoRs (in the narrow sense) are compatible with both response types
- "unidirectional" means the participant lined the animals up in the same direction in every trial

Table 6 - Break down by trial. Unidirectional responders' responses are mixed in as "absolute" or "relative" since they are not manifest at the trial level

Age group	Gender	Responses in individual trials					Total
		"absolute"	"relative"	non-aligned	wrong order	wrong animal	
<30	Male (N=2)	7	5	0	0	0	12
	Female (N=4)	17	1	3	2	1	24
≥30	Male (N=5)	17	4	4	3	2	30
	Female (N=5)	14	8	2	5	0	30
Total		55 (57.3%)	18 (19%)	10 (10.4%)	10 (%)	3 (3.1%)	96

Spatial FoRs: Findings (cont.)

- non-aligned responses are "relative" in terms of facing direction and "absolute" in terms of order
 - or vice versa
 - each variant occurred five times
- the frequency of mixed, unidirectional, and non-aligned responses *could* be a reflex of intrinsic use
- there is no obvious effect of age or gender
- the "relative" response type is more marked and the "absolute" one more frequent
 - and widespread
 - than the B&C data predict on a Whorfian account
- but: there are arguably no clear "Whorfian" predictions for Yucatec
 - due to its "referential promiscuity" and the role of the intrinsic FoR

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Spatial FoRs: Findings (cont.)

- Le Guen (ms.) finds the same discrepancy
 - based on evidence from a battery of tasks
 - conducted with a substantially larger population of participants (57)
 - he points out that the cardinal directions play a role in ritual practice and horticulture
 - that isn't quite reflected in their use in everyday linguistic interactions
 - however, this does not explain the uniformity of the responses across the adult population
 - Le Guen's account predict a strong gender effect in the non-linguistic data
 - » comparable to that in the linguistic data
 - contrary to fact

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Spatial FoRs: Background (cont.)

- making sense of the meronymy-allocentrism hypothesis
 - productive geometrical meronymies *afford* the consistent use of intrinsic frames of reference
 - b/c the ability to consistently use intrinsic FoRs entails the ability to consistently reference object geometry
 - and/or object function
 - using relative FoRs in a language like Yucatec means assigning meronyms egocentrically
 - thus overriding the geometry of the object
 - this is always possible in Yucatec (contrary to Bohnemeyer & Stolz 2006!) - but always dispreferred
 - it seems that the availability of a productive geometrical meronymy boosts the salience of intrinsic interpretations
 - this may well be a *Thinking-for-Speaking* effect (Slobin 2003)

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Spatial FoRs: Background (cont.)

- in contrast, productive meronymies do not affect the use of absolute FoRs
 - because geomorphic and absolute systems do not use meronyms and thus do not create a potential for clashes

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Conclusions

- Yucatec has a productive geometric meronymy
 - like Tenejapa Tzeltal and Ayoquesco Zapotec
 - supporting the hypothesis that such meronymies are an areal feature of Mesoamerican languages
- novelty value – Yucatec meronymy has traits not attested in previously studied systems
 - in particular, the division into subsystems for volumes, surfaces, and curvature extremes
- good news and bad news for Levinson's (1994) non-metaphorical analysis
 - good news: the (fully productive) surface terms are not (used as) body part terms
 - with the exception of *pāach* 'back'

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Conclusions (cont.)

- bad news: volume labeling has all the signature traits of the algorithm Levinson described for Tzeltal
 - and yet is not fully productive and frequently involves hedges and similes
 - suggesting algorithmic mapping is not necessarily non-metaphorical
- referential promiscuity and the dominance of the intrinsic FoR
 - the Ball & Chair data confirm
 - all three types of FoRs of the Levinson classification are used commonly and frequently in table top space
 - speakers routinely switch between FoRs or combine multiple FoRs in their descriptions
 - in terms of distribution over speakers, the relative FoR is more widespread than the use of the cardinal directions
 - the latter are mostly restricted to (adult or older adolescent) male speakers

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Conclusions (cont.)

- the intrinsic FoR is the most important FoR for expressing place functions among all speakers
- mixed news for the Whorfian interpretation of the results of Pederson et al.
 - good news: "relative" responses play a minor role in recall memory as the relative FoR does in discourse
 - not-so-good news: "absolute" responses far more pervasive than what seems predicted linguistically
 - but: no clear predictions anyway, due to "referential promiscuity" and the salience of the intrinsic FoR
- confirmed: productive geometrical meronymy aligns w/ dominance of the intrinsic FoR

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Appendix I: Assigning surfaces

- the assignment of surface meronyms appears to be likewise based on a Levinsonian algorithm
 - if a volume has only a single surface, that surface is its 'back'
 - the entire skin of an avocado is its 'back'
 - as is the bark of a tree
 - there is a separate term that means 'peel' or 'bark'
 - » which remains applicable even when the peel/bark is no longer attached to the fruit/tree, which 'back' of course does not
 - the outer surface of baskets and jugs are their 'backs'
 - if a volume has two surfaces, one convex and one planar or less convex
 - think of a cylinder - ignoring its circular surfaces at the 'ends' for the moment - that has been "squashed" on one side
 - » or cut in half parallel to the generating axis
 - the more convex side is the 'back' and the less convex one the 'front'

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Appendix I: Assigning surfaces (cont.)

- if a volume has two surfaces and an edge
 - like a table top, a piece of paper, a coin, the body of a hammock, etc.
- there are a number of possible solutions
 - if both surfaces are flat, both can be 'fronts'
 - alternatively, if the object has a canonical vertical orientation, one surface can be the 'top' and the other the 'bottom'
- in the case of flat curved objects like a comal, a hammock, or a spoon
 - the convex side is the 'back' or the 'bottom'
 - and the concave side can be the 'front', the 'top', or the 'inside'
- the hammock can be said to have an 'inside' and a 'bottom'

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Appendix I: Assigning surfaces (cont.)

- the spoon an 'inside' and a 'back'
- and the comal a 'front' and a 'bottom' or 'back'
- there is variation in judgments here
 - some prefer one solution or the other, others consider multiple solutions equally acceptable
- if a volume has two flat and one convex surfaces
 - a cylinder, or for example the first of the *Chunches*
 - the convex surface is the 'back' and the planar surfaces are 'top' and 'bottom'
 - if the volume is canonically oriented in the vertical such that the two surfaces wind up in the appropriate places
 - and 'sides' otherwise
- 'sides' are assigned by the remainder principle



Figure A1.
Chunche #1

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Appendix I: Assigning surfaces (cont.)

- reference to parts does not seem to depend much on the object's *actual* orientation at all
- for parts - unlike for projected regions - there is no uniqueness requirement
 - in principle, an object can have an arbitrary number of 'backs', 'fronts', and so on
 - an example of an object with two 'backs' is a cylinder squashed along the generating axis
 - at opposite sides so that the two resulting convex surfaces are more salient than the two concave ones
 - sort of the inverse of the fourth of the *Chunches*
 - if the two convex surfaces are roughly symmetrical, they are both 'backs'



Figure A2.
Cross-section of an object with two 'backs'

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Appendix II: Projection

- next up: the role meronyms play in reference to spatial **regions**
 - in the expression of the kind of **place functions** (Jackendoff 1983)
 - whose interpretation depends on **spatial frames of reference** (FoRs)
 - i.e., place functions that map referential or **ground objects** into "quadrants" of coordinate systems defined with respect to them
 - as opposed to orientation-free "**topological**" (Piaget & Imhäuser 1956) place functions
- how does the shape and the labeling of projected regions interact with the meronymy?
 - consider for an introductory example again the first of the *Chunches*

Figure A4.
Chunche #1

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Appendix II: Projection (cont.)

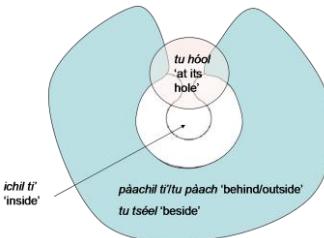


Figure A5. A Birdseye view of Chunche #1 and its projected spatial regions

- the entire convex outside surface is both the 'back' (*pàach*) and the 'side' (*tséel*) of the object
 - so the entire region represented by the blue shape in the figure can be referred to
 - » either as *pàach-il t'i* '(NP) back-REL PREP (NP) 'behind/outside (NP)',
 - » *t-u=pàach (NP) PREP-A3=back (NP)* 'behind/outside (NP)',
 - or *t-u=tséel (NP) PREP-A3=side (NP)* 'beside (NP)'

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Appendix II: Projection (cont.)

- the aperture can be labeled with a variety of more or less ad-hoc volume meronyms
 - including for example *hóol*'hole' (from the verb root *hóo* 'perforate')
- if this volume meronym heads the complement of the generic preposition *ti'*
 - the resulting ground phrase *ti'-u=hóol (NP)* PREP-A3=hole (NP) describes a region defined by proximity to the opening
 - a "bubble space"
- bubble spaces**
- the construction *ti' POSS=N_M (NP)...*
 - where *ti'* or *t-* is the generic preposition and *N_M* the meronym
 - is available for all meronyms (except for *ich(l)* 'in(side)')
 - not just the volume meronyms
- it does not distinguish between projected regions and surface contact

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Appendix II: Projection (cont.)

- for example *t-u=pàach* can be used both for a mosquito in the air behind a person and for one sitting on their back feeding
- but for volume and "extreme" meronyms, this construction is the only one available
 - whereas all the surface meronyms except for *tséel*'side' have alternative constructions
 - which are preferred for reference to projected regions
- I do not think that there are separate "logics" for the projection of oriented regions and "bubble spaces"
- I suspect this distinction is simply an artifact of the same "logic" interacting with the distinct geometrical properties of surfaces vs. volumes and "extremes"

• implications

- surface meronyms are *the* lexical resource for reference to "oriented regions" in Yucatec

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Appendix II: Projection (cont.)

- the expressions in the second column of the table below are the only or the most frequent expression
 - of the meanings represented in the middle column
- this groups Yucatec together with Tzeltal and Zapotec and distinguishes it from Spanish and English and other European languages
 - where orientation-dependent place functions are expressed by adpositions that may etymologically relate to meronyms
 - but do not synchronically involve them

Table A1. Surface meronyms and the expression of place functions

surface meronym	preferred construction for reference to projected region	gloss	preferred FoR for reference to regions	available alternative FoR
<i>dahal</i> 'bottom'	= <i>táan</i> (NP)	'below'	'absolute'	intrinsic
<i>ich(l) inside'</i>	= <i>ich(l) ti'</i> (NP)	'in(side)'	topological	
<i>óok'o' top'</i>	= <i>óok'o' t-</i> (NP)	'on/above'	'absolute'	intrinsic
<i>pàach</i> 'back'	= <i>pàach-lí ti'</i> (NP)	'behind/out, side'	'behind/out, intrinsic'	relative
<i>táan</i> 'front'	= <i>táan-i'lé</i> (NP)	'in front of' 'on'	intrinsic*	relative*
<i>tséel</i> 'side'	* <i>ti'-u=tséel</i> (NP)	'beside'	intrinsic*	relative*

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Appendix II: Projection (cont.)

- both interpretations are available with the "general purpose" construction *tu=pàach*
- whereas the specific surface meronym construction *pàach-lí ti'* only permits the interpretation familiar from European languages

- in the case of objects that have a canonically horizontal *táan*'front'
 - such as tables, altars, chairs, comales, and many more
 - t-u=táan* is used for surface contact
 - but the region geometrically projected from the surface is exclusively referred to using *óok'o'*'top'
 - if the object has an intrinsic horizontal front *part* in addition to the horizontal surface (e.g., altars)
 - táan-lí ti'* will refer to that region
 - otherwise, *táan-lí ti'* is used relatively
- both of these exceptions follow the same rationale
 - the region above the object in canonical orientation is always designated by *óok'o'*
 - whether or not there is a corresponding 'top' surface

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Appendix II: Projection (cont.)

- something similar happens in the horizontal
 - humans and animals project an intrinsic front region designated by *táan-il ti'*
 - the region in which they face in canonical orientation
 - even though they lack a part that can be identified as *u=táan* 'their front'
- so there is a sense in which projection relies on a "fixed armatures" logic
 - similar to what Levinson (2003) attributes to Zapotec
- however
 - the Yucatec system relies on fixed armatures only for projection, not for part labeling
 - the regions projected geometrically from parts named by using *pàach* 'back' or *tséel*'side' are "normalized"
 - in the vertical but not in the horizontal - as per the horseshoe example

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Projection (cont.)

- the "fixed armatures" of Yucatec are still intrinsic
 - in the sense that they only depend on the object's canonical orientation, not on its actual one
 - the vertical terms *dok'ol*'top' and *áana*'bottom' are used intrinsically in reference to projected regions in Yucatec
 - » although the absolute use based on the object's actual orientation in the Earth's gravitational field appears to be the preferred one
- the \$64,000 question
 - does the availability of a productive shape-based meronymy favor the use of the intrinsic FoR?
 - for Yucatec, the case can be made
 - the terms used for reference to oriented regions are based transparently on meronyms
 - and these meronyms are applied fully productively to arbitrary objects on the basis of their geometry.
 - the "normalization" of the front and back regions does not reduce the validity of this analysis

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Appendix II: Projection (cont.)

- » since it only applies to exceptional cases which are themselves defined in geometrical terms
- the apparent predominantly absolute use of the terms for the top and bottom regions only strengthens the case
 - » since the use of these terms is *not* based on the geometry of the object
 - » *any* object has 'top' and 'bottom' *regions* regardless of whether it has a 'top' part, a 'head' part, or neither
 - » as in the case of containers of liquids

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Appendix III: Coding the B&C data

- **absolute** - exclusively for the cardinal direction terms
- **direct** - (Danziger in press)
 - for descriptions in which the body of speaker/addressee serve as both "anchor" and ground
 - e.g., 'in your direction' or 'on your left', referring to the side of the picture closest to the addressee's left hand
- **intrinsic** – the design of B&C makes it generally possible to distinguish intrinsic from relative uses
 - however, cases in which the same term can describe the same configuration intrinsically and relatively exist
 - e.g., if the Ball is at the intrinsic back of the Chair while the Chair is turned with its front towards the observer
 - » it's impossible to tell whether 'behind the Chair' is used intrinsically or relatively
 - I coded such responses as intrinsic

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Appendix III: Coding the B&C data (cont.)

- **landmark-based** – ad hoc landmarks used as points of reference
 - the fan, window, me, the volleyball *cancha* outside
 - a special case of intrinsic reference in Levinson 1996
 - however, if the landmark is the "anchor" but not the ground
 - » e.g., if a landmark is used to locate the Ball wrt. the Chair
 - then landmark-based systems do in fact pattern with absolute systems in terms of their logical ("rotational") properties
- **relative** - the most frequent use of the relative FoR was not with 'left' and 'right'
 - but with 'front', 'back', and 'side'
 - the distinction between direct and relative uses of 'left' and 'right' is subtle

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Appendix III: Coding the B&C data (cont.)

- **topological** - i.e., no FoR involved
- **vertical** - apparently all Yucatec speakers use 'top'/above' and 'bottom'/below' intrinsically
 - as well as with respect to the gravitational vertical
 - I coded the first type of use as 'intrinsic' and the second as 'vertical'
 - in Levinson's typology, the gravitational vertical is an absolute FoR
 - I treat it as a category apart since it clearly does not pattern with other absolute FoRs in terms of its cross-linguistic distribution

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