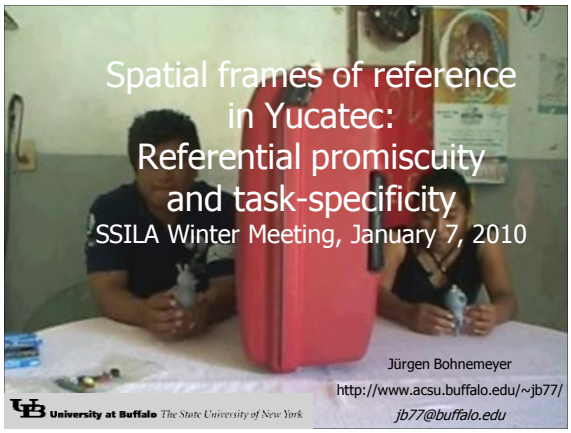

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The MesoSpace project

- NSF award #BCS-0723694 "Spatial language and cognition in Mesoamerica"
- 15 field workers
- 13 MA languages
  - Mayan
    - Chol (J.-J. Vázquez)
    - Q'anjob'al (E. Mateo Toledo)
    - **Tseltal (G. Polian)**
    - **Yucatec (J. Bohnemeyer)**
  - Mixe-Zoquean
    - **Ayutla Mixe (R. Romero Méndez)**
    - Soteapanec (S. Gutierrez Morales)
    - Tecpatán Zoque (R. Zavala Maldonado)
  - Oto-Manguean
    - **Otomí (E. Palancar; Néstor H. Green; Selene Hernández-Gómez)** 3
    - **Juchitán Zapotec (G. Pérez Báez)**
  - Tarascan
    - Purepecha (A. Capistrán)
  - Totonacan
    - Huehuetla Tepehua (S. Smythe Kung)
  - Uto-Aztecan
    - **Cora (V. Vázquez)**
    - Pajapan Nawat (V. Peralta)

Figure 1. *MesoSpace field sites*

The MesoSpace project (cont.)

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

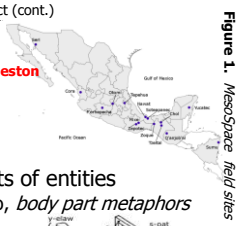

Figure 1. *MesoSpace field sites*

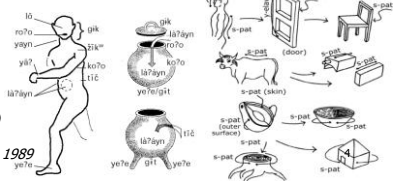

Figure 2. *Meronyms in Ayoquesco Zapotec (left) and Tenejapa Tseltal (adapted from MacLaury 1989 and Levinson 1994)*

The MesoSpace project (cont.)

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

Intrinsic — *The ball is in front of the chair.*

Relative — *The ball is to the right of the chair.*

Absolute — *The ball is east of the chair.*

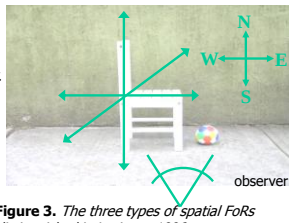

Figure 3. *The three types of spatial FoRs distinguished in Levinson 1996*

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The MesoSpace project (cont.)

- why MA
  - relative FoRs play a minor or no role
    - attested for Huave, Mopan, Olutec, Totonac, Tseltal, Tzotzil, and Yucatec
  - productive meronymies affording reference to arbitrary parts of arbitrary objects
    - attested in Mixtec, Purepecha, Totonac, Trique, Tseltal, Tzotzil, Yucatec, Zapotec
  - meronyms often are the primary lexical resource for spatial reference – few/no adpositions/case markers
    - including, e.g., in all of the above languages
  - the MA *sprachbund* and specifically the evidence for calquing of meronyms
    - cf. Kaufman 1973; Campbell 1979; Campbell, Kaufman, & Smith-Stark 1986; Smith-Stark 1994

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The MesoSpace project (cont.)

- the overarching hypothesis we are testing: the **meronymy-allocentrism pattern**
  - *the availability of productive geometric meronym systems disfavors the use of relative FoRs*
  - if this hypothesis is confirmed, meronymy is the first purely linguistic factor influencing FoR selection
  - this linguistic factor could then be pitted against ecological and cultural factors
    - in particular, the cultural uniformity and topographic/ecological diversity of the MA area
  - the goal: advance the **Levinson-Gleitman debate**
    - about possible linguistic and cultural factors influencing spatial cognition – see Appendix!

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Frames of reference in language and cognition

- background: spatial frames of reference (FoRs)

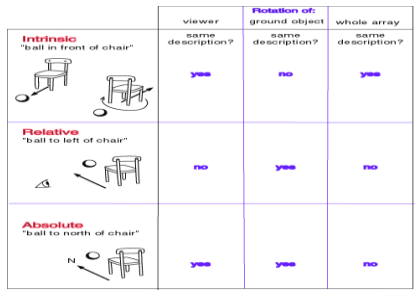

Figure 4. *Levinson's (1996) classification of FoRs*

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Frames of reference in language and cognition (cont.)

- surprise, surprise: cross-linguistic variation!

Table 1. *Distribution of the three types of spatial FoRs*

	Intrinsic	Absolute	Relative
Mopan (Mayan)	+	—	—
Guugu Yimithirr (Australian P-N)	—	+	—
Tseltal (Mayan) Hai//om (Khoisan)	+	+	—
Japanese English *	+	—	+
Yucatec (Mayan) Kalagadi (Bantu)	+	+	+

- primary differences not in lexicon, but in domains of usage
- e.g. English: cardinal directions mostly in geographic space only!
- Tseltal etc.: *no* uses of relative FoR *z-e-r-o! nada! rien!*
- intrinsic occurs alone
- absolute occurs alone
- relative implies Intrinsic

But see Gilles Polian on Tseltal momentarily!

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Frames of reference in language and cognition (cont.)

- predicted effects on internal cognition
  - it's difficult to translate a locative relation from one FoR into another
    - suppose you memorize the cat as being *left* of the car
      - it's difficult to talk about this in terms of cardinal directions later
        - » unless you happen to also memorize where you were with respect to the car in cardinal terms

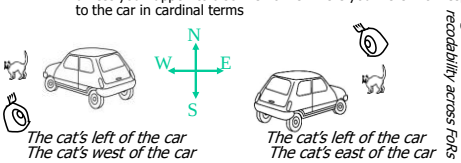

Figure 5. *Limits of recoadability across FoRs*

- so people remember everything they might want to talk about in a FoR appropriate to their language

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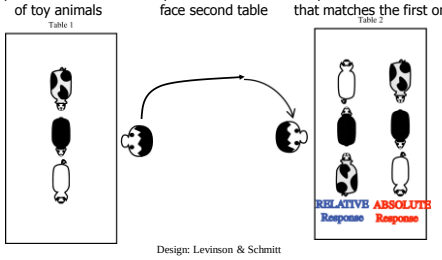
Frames of reference in language and cognition (cont.)

- observed effects
  - experiment: recall memory under 180° rotation
    - *Animals in a Row* task
      - note this is just one out of a battery of experiments!

step I: memorize a row of toy animals | step II: rotate 180° to face second table | step III: choose the row that matches the first one



Design: Levinson & Schmitt

Figure 6. *The Animals-In-a-Row memory recognition task*

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– results: the large sample

Scholars involved:
Eric Pederson, Kyoko Inoue, Sotaro Kita, David Wilkins, Thomas Widlok, Penelope Brown, Steve Levinson, Balthasar Bickel, Debby Hill …

Table 2. *Animals-in-a-Row in Levinson 2003: the large sample*

Linguistically Relative	English, Dutch, Japanese, Tamil-Urban	*Prediction:* Non-verbal coding will be relative	N = 85
Linguistically Absolute	Arrernte, Hai//om, Tseltal, Longgu, Belhare, Tamil-Rural	*Prediction:* Non-verbal coding will be absolute	N= 99

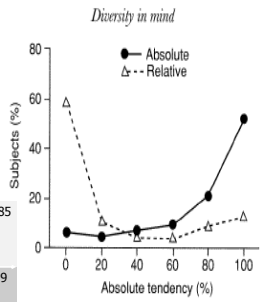

Figure 7. *Animals-in-a-Row results in Levinson (2003: 184): The sample corresponding to Table 3*

- further evidence
  - additional recall memory experiments on color chips rather than toy animals
  - additional recall memory experiments on paths rather than static configurations ("maze" tasks)
  - experiments on transitivity inferences under rotation
    - linguistically relative populations prefer relative solutions on all these tasks
      - while linguistically absolute ones prefer absolute solutions
  - experiments on "dead reckoning" skills
    - measured by the accuracy of pointing to a familiar location after having been brought to an unfamiliar one
    - linguistically absolute populations are shown to have far superior dead reckoning skills to those of relative ones
- Levinson et al.'s interpretation: Whorfian effect!

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FoRs in Yucatec discourse

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

Figure 8. *Approximate dialect regions of Yucatec and location of the field site*

- MesoSpace tools for studying FoRs
  - the Ball & Chair (B&C) pictures
    - 4 x 12 photographs of configurations of a ball and chair to be matched in referential communication

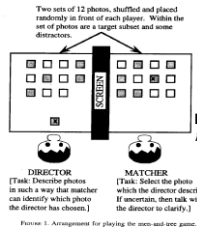

Figure 9. *Layout of Men and Tree task (Pederson et al. 1998: 562)*

Figure 10. *Two Ball & Chair pictures, featuring an intrinsic contrast*

– 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

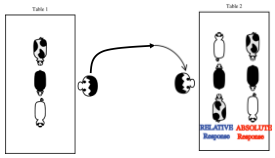

Figure 11. *Layout of the AIAR memory recognition task*

» 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

- FoRs in discourse: Ball & Chair
  - all five pairs of speakers used the relative FoR
    - though not necessarily the terms for 'left' and 'right'

(3.1) Ti'=pek-kun-a'n
PREP=supported.as.if.fallen.down-CAUS-RES(B3
hun-p'éel chan=bòo
tu=tséel=e'
one-CL.IN DIM=ball=D4
PREP:A3=side=D3
'There lies a little ball, **on its side**.' [AME &

Figure 12. *Ball & Chair 2.11*

Figure 13. *Ball & Chair 3.12*

  - only the two all-male dyads used absolute FoRs in the horizontal
    - with cardinal direction terms
      - the mixed-gender dyad used this once

(3.2) Te'l **chik'in**=o' náats'
te=lu'm=o'

  - 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 as predicted by previous work and in line with the meronymy-allocentrism pattern

Figure 12. *Ball & Chair 2.11*

(3.3) (continuation of (3.1))
Tu=tséel=i',
tu=pàach
PREP:A3=side=D4 well
PREP:A3=back
te'l tu'x k-u=nak-tal
máak=o'
DADV where IMPF-A3=lean-INCH.DIS
person=D2
'On its side, well, **behind** the seat (lit. where a person leans against)' [AME & NMP 2.11]

  - all speakers even produced intrinsic uses of terms for vertical relations
    - in contexts where the same terms would not be applicable in the absolute gravitational vertical

(3.4) Le=bòola=o', **y=àanal** te'l
tu'x k-u=kutal
DET=ball=D2 A3=under DADV where IMPF-
A3=sit:INCH.DIS
máak=o', kóoh-ol
tu=chan ba'l-il (...)
person=D2 hit\MIDDLE-INC PREP:A3=DET-
thing-REL
'The ball, **under** there where a person sits,
(it's) touching (the chair's) thing (...)' [EMB & F

Figure 14. *Ball & Chair 3.6*

    - so the **Principle of Canonic Orientation** (Levelt 1984, 1996) is not an absolute constraint
      - unlike in Dutch and English

  - for the task of orienting the Chair
    - intrinsic FoRs in a narrow sense play no role here
    - the most important type of FoR is the *direct* (Danziger in press), where anchor and ground is the observer's body
      - » this, however, *is* treated as intrinsic reference in Levinson 1996)

(3.5) Tu'x k-u=nak-tal
máa
where (B3SG) IMPF-A3=lean.against-INCH
person=D2
estée **ta=frènte**
HESIT PREP:A2=front turn\MIDDLE-INC(B3SG)
'The back (lit. where one leans against),
uh, it's turned towards your front.'

Figure 15. *Ball & Chair 2.5*

- use of cardinal direction terms *could* be a "genderlect" phenomenon in Yucatec
  - Bohnemeyer & Stolz 2006, Le Guen ms., and the present study all find a strong gender bias

- ***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

(3.6) T-u=**tséel**, te=x-**ts'íik**
te-estée-le=**chik'in**=o'
PREP-A3=**side** PREP:DET=F-**left**
PREP:DET-HESIT-DET=**west**=D2
hun-p'éel bòola
ch'uy-k'ah-a'n (...)
one-CL.IN ball
EXIST(B3SG)=D4 hang-MIDDLE-RES(B3SG)
'On (the Chair's) side, on th the
west,
there is a ball, it is suspended (...)'

Figure 16. *Ball & Chair 2.2*

- predictions for New Animals task

Figure 17. *Number of descriptions by strategy in the Yucatec Ball & Chair data (5 x 2 speakers; (fine-grained coding)*

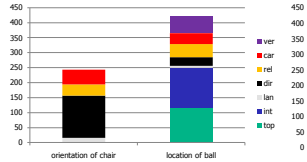

Figure 18. *Number of descriptions by strategy in the Yucatec Ball & Chair data (5 x 2 speakers; (coarse-grained coding)*

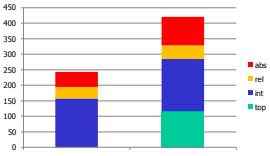

Table 3. *Coding the B&C responses*

Finegrained clasificación	**Levinson 1996**
ver - vertical relators interpreted wrt. the Earth' field of gravity	*abs* –absolute FoRs
car – cardinal relators	
rel – relative FoRs (anchor = observer's body; external ground)	*rel* – relative FoRs
dir – direct FoRs (anchor = ground= observer's body)	*int* – intrinsic FoRs
lan – landmark-based FoRs (anchor is an entity distinct from both ground and observer's body)	
int – intrinsic FoRs (anchor = ground; ground ≠ observer's body)	
top – topological relators (interpreted independently of FoRs)	*top* – topological relators

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FoRs in the memory of Yucatec speakers

- FoRs in recall memory: New Animals

Table 4 - *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	3	0	0	1	4
≥ 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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FoRs in the memory of Yucatec speakers (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 5 - *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	2	2	1	24
≥ 30	male (N=5)	17	4	4	3	2	30
	female (N=5)	14	8	3	5	0	30
Total		55 (37.3%)	18 (19%)	10 (10.4%)	10 (10.4%)	3 (3.1 %)	96

FoRs in the memory of Yucatec speakers (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
- there is no obvious effect of age or gender

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Discussion

- 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
- even so
  - the apparent discrepancy between the linguistic and nonlinguistic data calls for an explanation

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Discussion (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 predicts a strong gender effect in the non-linguistic data
      - » comparable to that in the linguistic data
      - contrary to fact

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Discussion (cont.)

- comparing Yucatec to Mopan (Danziger 2001)
  - Mopan is a close cousin of Yucatec from the same branch of the Mayan language family
  - in discourse, Mopan speakers use **exclusively intrinsic** FoRs
  - Animals-in–a-Row: original protocol
    - of four participants "A, B, C, D"
      - B, C, and D used a unidirectional coding strategy
      - A and C changed the axis of the array of animals
  - Animals-in-Row: Danziger's first modified protocol

"I now altered the protocol, and started asking explicitly that consultants pay attention to the orientation of the animals. In the absence of any direct way of expressing this in Mopan I asked consultants, in the initial instruction, to pay attention to the identity of the animals (horse, pig, cow) and also to notice *tub'a tun-cha'an* [where they are looking]." (Danziger 2001: 212)

Discussion (cont.)

    - of 17 participants who performed under this protocol
      - nine produced an absolute response pattern and three a relative one
  - Animals-in-Row: Danziger's third protocol

"Fearing that the instructions, and particularly the word *tub'a* [where] were too environmentally oriented, I enlisted twelve more consultants to solve the problem when asked to pay attention to [how] (Mopan *b'ikij*) the animals were looking." (Danziger 2001: 212)

    - of 12 participants who performed under this protocol
      - nine produced an absolute response pattern and none a relative one
  - Route-Completion task
    - one of the tasks mentioned above that involve motion paths rather than static spatial configurations
      - here, too, Danziger had to modify the protocol in order to get codable results
    - of 16 participants, nine now went with a relative response pattern and five with an absolute one

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Discussion (cont.)

  - making sense of these findings
    - Mopan speakers' preferences for absolute or relative response patterns in the experiments are **task-specific**
    - they do not appear to represent established cultural practices of spatial cognition
    - intrinsic reference, however, is "supported" by language and therefore presumably inculcated in the speakers
      - besides, it may be a cognitive universal anyway
    - the relative and absolute response patterns are compatible with the participants using intrinsic FoRs
- interpreting the Yucatec data through the prism of the Mopan evidence
  - intrinsic FoRs (including direct ones) are the most important FoRs in Yucatec discourse
    - just as in Mopan, although unlike in Mopan, they're not the *only* type of FoR used in discourse

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Discussion (cont.)

  - the frequency of mixed, unidirectional, and non-aligned responses *could* be a reflex of intrinsic use
    - although only one single response occurred that altered the axis of the array – during a practice trial
  - suppose, then, that Yucatecans, just like Mopans, are intrinsic thinkers...
    - in terms of the practice of spatial reference that is most strongly inculcated
  - ... but most of them were pushed towards an absolute pattern by their interpretation of the task
    - I did not tell them to pay particular attention to the direction in which the animals were facing
    - however, during the practice trial(s), I would correct responses that changed the order of the animals
      - or that had different animals facing in different directions
      - this may have tipped some of the participants off

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Conclusions

- all types of frames of reference (FoRs) occur regularly in Yucatec discourse
  - including in the table top domain
- use of cardinal direction terms is restricted to adult males
- referential promiscuity
  - FoR selection in Yucatec is highly variable both across and within speakers
  - all speakers frequently combine multiple FoRs in a single spatial description
- intrinsic and direct FoRs dominate in discourse with all speakers

  - even terms for relations in the vertical are regularly used intrinsically
    - suggesting that the Principle of Canonical Orientation is no more than a tendency in Yucatec
- the relatively minor role of relative FoRs is as predicted
  - in line with the hypothetical meronymy-allocentrism pattern
- most speakers prefer an absolute strategy in the New Animals recall task
  - this preference may be the product, not of a deep cultural bias, but of a task-specific effect
  - a comparison to Danziger's (2001) observations with Mopan speakers supports this conjecture

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Appendix I: The Levinson-Gleitman debate

- Li & Gleitman 2002: culture, rather than language, as the driving force
  - rather than evidence of language influencing cognition
    - the co-variation reported in Pederson et al. (etc.) is the result of cultural biases and predilections
    - different cultures adapt to different topographies and differences in "social cohesion"
    - as a result, different populations prefer different FoRs in both discourse and internal cognition

"Perhaps it is the habitual linguistic practice in these communities that determines the relevant modes of thought, as Levinson seems to imply in the quotation above. On the other hand, it could be that cultural differences in modes of thought render certain linguistic usages handier than others, and thus influence their prominence and frequency of use. Perhaps both such mechanisms are at work with, in Whorf's words, 'language and culture constantly influencing each other'." (Li & Gleitman 2002: 268)

Appendix I: The Levinson-Gleitman debate (cont.)

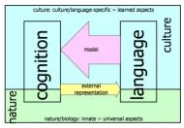

Figure A1. *The big picture according to Whorf*

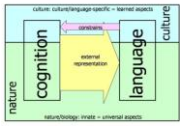

Figure A2. *The big picture according to the innatists*

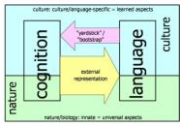

Figure A3. *The big picture according to neo-whorfians*

- Li & Gleitman's background assumptions
  - Li & Gleitman are ardent supporters of Figure 18
    - so how come they are so concerned about culture here?
  - Li & Gleitman want to disabuse us of the idea that language could play a formative role in cognition
  - accordingly, they claim that variation in linguistic categorization is itself culturally determined

Appendix I: The Levinson-Gleitman debate (cont.)

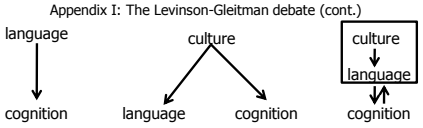

Figure A4. *Levinson's position according to Li & Gleitman*

Figure A5. *Li & Gleitman's position*

Figure A6. *The actual neo-Whorfian position*

- Li & Gleitman's hypothesis
  - independently of language, people have innate knowledge of the 3 FoRs and are capable of using them
  - there are cultural biases of FoR use that have to do with the environment and modes of production
  - these influence language use and internal cognition alike
  - culture is arguably a straw man here
    - the real point is to trivialize the differences Pederson *et al.* found as rather more shallow and easily mutable

Appendix I: The Levinson-Gleitman debate (cont.)

- thus, as Majid *et al.* 2004 point out, there is no evidence of ecology or modes of production predicting FoR bias

Table A1. *Frames of reference and ecological determinism (Majid et al. 2004: 112)*

Language	Country	Family	Linguistic frame of reference			Ecological zone or zones	Dwelling	Subsistence mode
			Intrinsic	Relative	Absolute			
Arrernte	Australia	Pama Nyungan	x		X	D	R	H-G
Balinese	Indonesia	Austronesian	x	x	X	T	R	StA
Belhare	Nepal	Tibeto-Burman	x	x	X	H SubT, A	R	StA
Dutch	Netherlands	Indo-European	x	X	(x)	Temp	U	I
English	UK, USA, etc.	Indo-European	x	X	(x)	Temp	U	I
Ewe	Ghana	Niger-Congo	X	X	X	SubT	R	StA
Gaugu								
Yimithirr	Australia	Pama Nyungan			X	TRF, TS	R	H-G
Hairom	Namibia	Khoisan	x	(x)	X	D	R	H-G
Jaminjung	Australia	Jaminjungan	X	(x)	(x)	S, T	R	H-G
Japanese	Japan	Isolate	x	X	(x)	Temp	U	I
Kgalagadi	Botswana	Bantu	X	X	X	T St	R	StA
Kilivila	Papua New Guinea	Austronesian	X	X	X	deN	R	ShA
Longgu	Solomons	Austronesian	x	(x)	X	TRF	R	ShA
Mopan	Belize	Mayan	X		(x)	TRF	R	ShA
Tamil	India	Dravidian	x	X	X	S	U + R	StA
Tiriyó	Brazil	Cariban	X	X	X	TRF	R	H, StA
Totonac	Mexico	Totonacan	X		(x)	Temp	R	ShA
Tzeltal	Mexico	Mayan	x		X	SubT, A	R	ShA
Warwa	Australia	Nyulnyulan	x		X	D	R	H-G
Yukatek	Mexico	Mayan	X	X	x	TRF	R	ShA

Frame of reference: x indicates that the corresponding FoR is used by a language. (x) indicates that the FoR is only used in restricted circumstances, i.e. not in table-top space. X indicates the preferred FoR for describing spatial relationships between small-scale, manipulable objects (e.g. as in Figure 1). Ecological zone: A = alpine; D = desert; deN = denuded tropical rain forest; H = humid; S = savannah; SubT = subtropical; St = steppe; T = tropical; TRF = tropical rain forest; Temp = temperate. Dwelling: R = rural; U = urban. Subsistence mode: H = hunting; H-G = hunter-gatherer; ShA = shifting agriculture; StA = stable agriculture; I = industrial. Data sources: Refs [13,20] and Levinson, S.C. and Wilkins, D. *Grammars of Space* (unpublished).

– one possible exception: literacy – but see Levinson 2003

Appendix I: The Levinson-Gleitman debate (cont.)

- Li & Gleitman's experiments
  - American college students outdoors ⇒ ?absolute?
    - supposition: Maybe Levinson *et al.* tested their "absolute" subjects in the big outdoors
      - while their "relative" ones were tested indoors?
    - Levinson *et al.* (2002) fail to replicate this with Dutch college students
    - the use of local landmarks such as buildings instantiates intrinsic, not absolute, FoRs on Levinson's classification
      - however such landmark-based FoRs do share important logical properties with absolute FoRs!
  - American college students indoors with a landmark cue (a toy duck pond!) ⇒ ?absolute?
    - Levinson *et al.* (2002) show
      - participants' performance under this condition involves memorizing the array *intrinsically* wrt. the toy pond
  - bottom line: Li & Gleitman failed to demonstrate that American college students use absolute FoRs
    - in table top space

Appendix I: The Levinson-Gleitman debate (cont.)

- new work: Li, Abarbanell, & Papafragou 2005
  - claim: Tenejapans when given an appropriate task can be induced to memorize stuff in a relative FoR
  - method (experiment I)
    - picture-to-picture matching: view a card with two dots
      - then rotate and select an identical copy on a second table
    - the participants rotate holding the original card in a box
    - "egocentric" condition: the box rotates w/ the participants
    - "geocentric" condition: the participants maintain the orientation of the box in the room
  - findings: no significant difference b/w conditions
  - LA&P's interpretation
    - "correct" responses in the "egocentric" condition require use of a relative FoR
      - therefore, the outcome shows that Tseltal speakers are just as good at reasoning in absolute and relative FoRs

Appendix I: The Levinson-Gleitman debate (cont.)

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    - "correct" responses in the "egocentric" condition require use of a relative FoR
      - therefore, the outcome shows that Tseltal speakers are just as good at reasoning in absolute and relative FoRs

Appendix I: The Levinson-Gleitman debate (cont.)

– deconstruction
  - the use of one's own body as both 'anchor' of a FoR and referential ground involves *intrinsic*, not relative, FoRs
    - it is only the projection onto an external ground that makes egocentric reference *relative* in Levinson 1996
    - Danziger (in press) proposes the term *direct* for the intrinsic use of the observer's body as ground
  - of course, LA&P's "geocentric" condition likewise involved an intrinsic FoR, not an absolute one, as they thought

– bottom line
  - just as Li & Gleitman failed to show that American college students use absolute FoRs in table top space...
  - ...so LA&P failed to show that Tenejapans use relative FoRs

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Appendix II: FoRs – the fine-grained picture

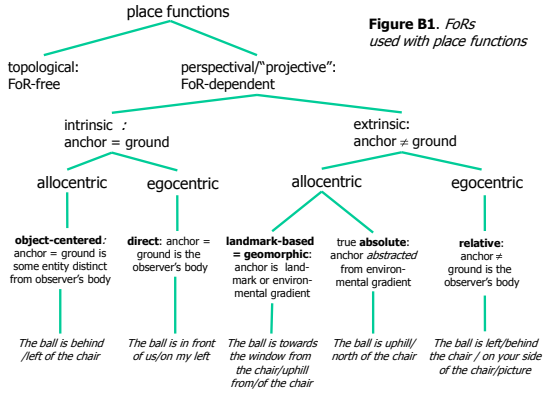

Figure B1. *FoRs used with place functions*

Appendix II: FoRs – the fine-grained picture (cont.)

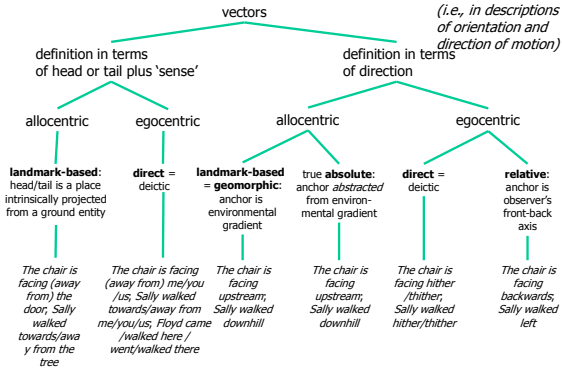

Figure B2. *FoRs used with "vectors" (i.e., in descriptions of orientation and direction of motion)*