Overview

- semantic typology
- spatial frames of reference
- crosslinguistic variation
- cognitive consequences
- tables turned and returned
- summary

Semantic typology

- categorization

Figure 1. *The spork dilemma*

http://karenjlloyd.com/blog/2009/01/08/extreme-close-up-wall-e/

- semantic categorization and language specificity

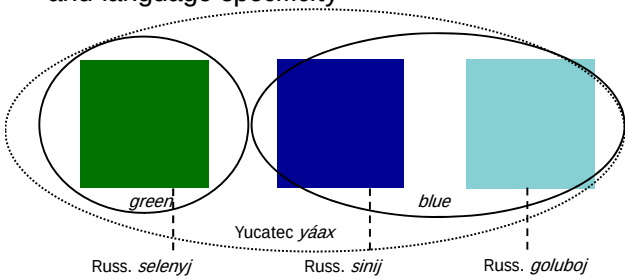

Figure 2. *Basic color terms in the "grue" domain*

- semantic typology: distribution

Figure 3. *Green and blue terms in WALS (Kay & Maffi 2008)*

- semantic typology: generalizations

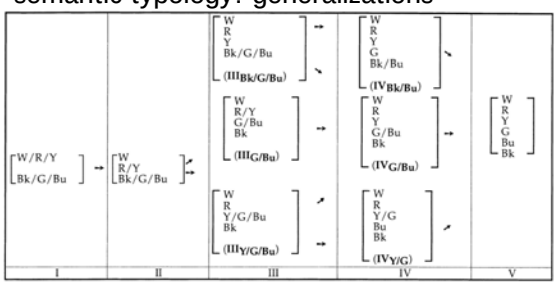

Figure 4. *Stage model of implicational generalizations, covering 83% (91/110) of the languages of the World Color Survey (Kay & Maffi 1999: 748)*

Prelude: Semantic typology (cont.)

- some recent studies
  - Pederson *et al.* 1998: spatial frames of reference and spatial categorization in 13 languages
  - Levinson, Meira, & L&C 2003; Khetarpal, Majid, & Regier 2009: semantic similarity of 'topological' spatial relators in 9 languages
  - Bohnemeyer, Eisenbeiß, & Narasimhan 2006: motion event categorization in 17 languages
  - Bohnemeyer *et al.* 2007: motion event segmentation in 18 languages
  - Regier, Kay, & Khetarpal 2007: semantic similarity of color terms in the 110 languages of the WCS
  - Bohnemeyer *et al.* 2008: argument structure of verbs of cutting and breaking in 17 languages
  - Majid, Boster, & Bowerman 2008: semantic similarity of verbs of cutting and breaking in 28 languages

Semantic typology (cont.)

- the big picture: culture vs. biology in cognition

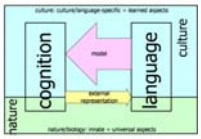

Figure 5. *The big picture according to Whorf*

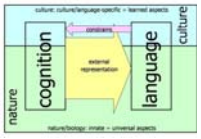

Figure 6. *The big picture according to the innatists*

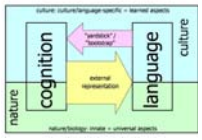

Figure 7. *The big picture according to neo-whorfians*

Semantic typology (cont.)

- current research: **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)
    - 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; N. H. Green; S. Hernández-Gómez)
  - **Juchitán Zapotec (G. Pérez Báez)**
  - Tarascan
    - Purepecha (A. Capistrán)
  - Totonacan
    - Huehuetla Tepehua (S. Smythe Kung)
  - Uto-Aztecan
    - Cora (V. Vázquez)
    - Pajapan Nawat (V. Peralta)

Figure 8. *MesoSpace field sites*

Semantic typology (cont.)

- 3 non-MA "controls"
  - **Seri (C. O'Meara)**
  - Mayangna (E. Benedicto, A. Eggleston in collaboration with the Mayangna Yulbarangyang Balna)
  - Mexican Spanish (R. Romero Méndez)
- 2 (interrelated) domains
  - **frames of reference** and **meronyms** (labels for entity parts)

Figure 9. The *MesoSpace team (minus V. Peralta and R. Tucker)*

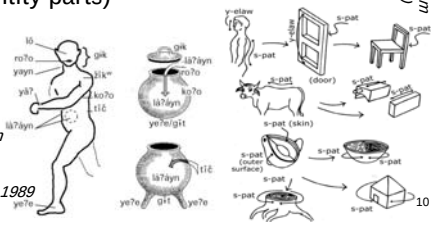

Figure 10. *Meronyms in Ayoquesco Zapotec (left) and Tenejapa Tseltal (adapted from MacLaury 1989 and Levinson 1994)*

Semantic typology (cont.)

- semantic typology: field work
  - **Yucatec** - the largest member of the Yucatecan branch of the Mayan language family
    - spoken by 759,000 people in the Mexican states of Campeche, Quintana Roo, and Yucatán
      - 2005 Census data show a decline by more than 40,000 speakers age five or older since 2000 (http://www.inegi.gob.mx/.../ept.asp?t=mlen10&c=3337)
    - and approximately 5,000 people in the Cayo District of Belize (Gordon Ed. 2005)
  - polysynthetic, purely head-marking, VOS, split-intransitive
  - the field site: Yaxley
    - a village of about 600 people in the municipal district of Felipe Carrillo Puerto in Quintana Roo

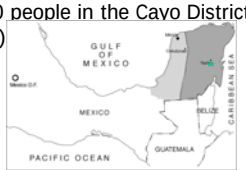

Figure 11. *Approximate dialect regions of Yucatec and location of the field site*

Semantic typology (cont.)

- semantic typology: field site

Semantic typology (cont.)

- want more info?
  - on the MesoSpace project
    - http://www.acsu.buffalo.edu/~jb77/Mesospace.htm
  - on semantic typology
    - http://www.acsu.buffalo.edu/~jb77/SemanticTypology.html
  - feel free to come and visit the **semantic typology lab**
    - meetings this semester Tuesdays 2:00 – 3:20pm in 617 Baldy
    - e-mail Randi Tucker (randituc@buffalo.edu) if you would like to be added to the mailing list

Overview

- semantic typology
- spatial frames of reference
- crosslinguistic variation
- cognitive consequences
- tables turned and returned
- summary

Spatial frames of reference

- two kinds of *place functions* (Jackendoff 1983)
  - i.e., functions from reference entities into regions
    - *topological* (Piaget & Inhelder) – perspective=frame-free
      - means in practice independent of the orientation of the ground, the observer, and the figure-ground array (the configuration)

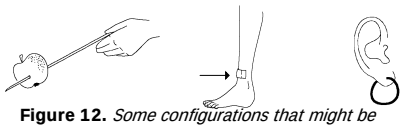

Figure 12. *Some configurations that might be described in terms of topological place functions*

(1.1) *The apple is on the skewer*
(1.2) *The band aid is on the shin*
(1.3) *The earring is in the ear (lobe)*

Spatial frames of reference (cont.)

- *projective* –framework-dependent
  - the place function returns a region defined in a coordinate system centered on the reference entity
  - the axes of the coordinate system are derived from an **anchor**
    - » in **intrinsic** frames, the anchor is the reference entity
    - » in **relative** frames, it is the body of an observer
    - » in **absolute** frames, it is some environmental entity/feature

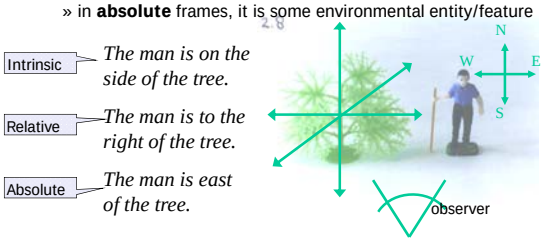

Figure 13. *The three types of spatial FoRs distinguished in Levinson 1996, 2003*

Spatial frames of reference (cont.)

- alternative classifications and subtypes

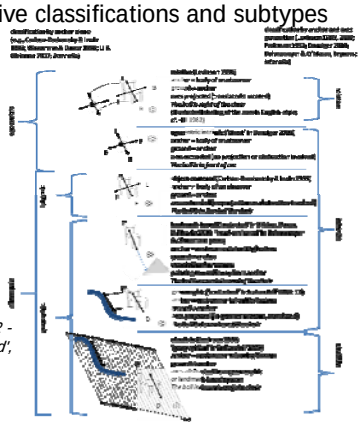

Figure 14. *Reference frame types and their classification (A - 'away from', B - 'back', D - 'downriver', F - 'front', L - 'left', R - 'right', T - 'toward', U - 'upriver'; Bohnemeyer & Levinson ms.)*

Overview

- semantic typology
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Crosslinguistic variation

- methods for studying frame preferences in language use
  - examine recorded narrative and conversation
  - videotape cultural events in which spatial orientation matters – house building, ceremonies,
    - etc.
  - domains
    - table-top space
    - visual space
    - geographic space
  - elicitation: 'interactive games' – referential communication tasks

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Crosslinguistic variation (cont.)

- referential communication tasks, with screened off 'Describer' and 'Matcher'
  - picture matching (Men & Tree, Ball & Chair)
  - object-to-picture matching (Farm-Animals)
  - model-to-object matching (Tinker Toys)
  - route description through model landscape

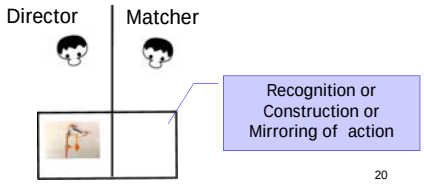

Figure 15. *Matching tasks*

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Crosslinguistic variation (cont.)

- example: the MesoSpace tool for studying frames in discourse - **Ball & Chair (B&C)**
  - 4 x 12 photographs of configurations of a ball and chair
  - participants match corresponding pix in two identical sets through referential communication

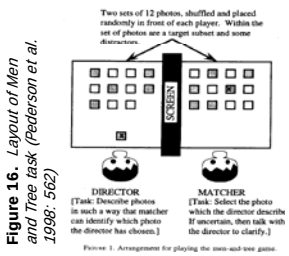

Figure 16. *Layout of Men and Tree task (Pederson et al. 1998: 562)*

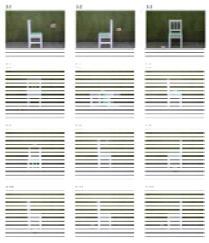

Figure 17. *Set 3 of Ball & Chair*

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Crosslinguistic variation (cont.)

- finding: a great deal of crosslinguistic variation
  - in terms of both availability and preferences

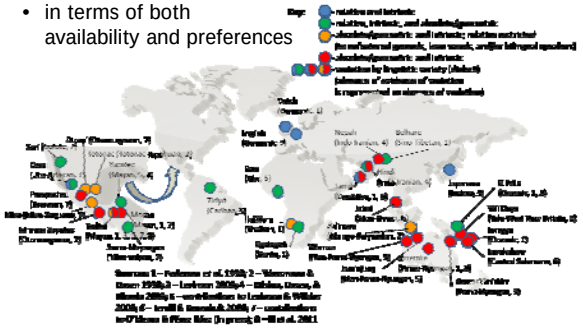

Figure 18. *Reference frame use in small-scale horizontal space across languages (Bohnemeyer & Levinson ms.)*

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Overview

- semantic typology
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Cognitive consequences

- predictions
  - difficult to translate a place functions from one frame 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

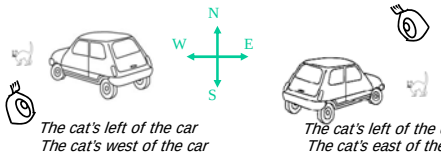

Figure 19. *Limits of recodability across FoRs*

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

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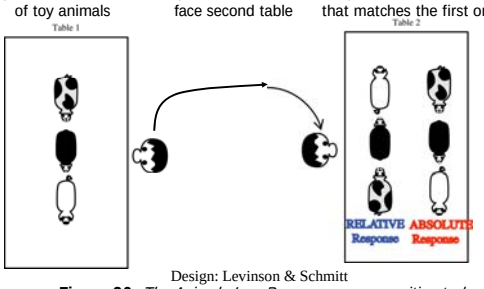
Cognitive consequences (cont.)

- 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 20. *The Animals-In-a-Row memory recognition task*

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Cognitive consequences (Cont.)

Recall Memory Task: Results (small sample)

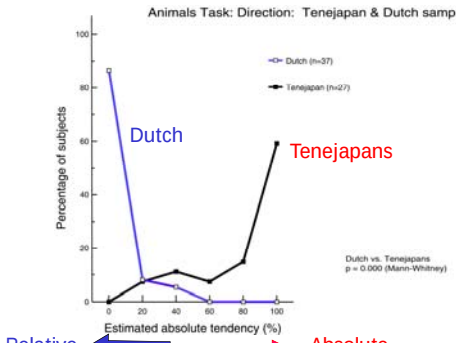

Figure 21. *Animals-in-a-Row in Pederson* et al. 1998: *– results – the small sample*

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Cognitive consequences (Cont.)

The large sample

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

Table 1. *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, Tzeltal, Longgu, Belhare, Tamil-Rural	*Prediction:* Non-verbal coding will be absolute	N= 99

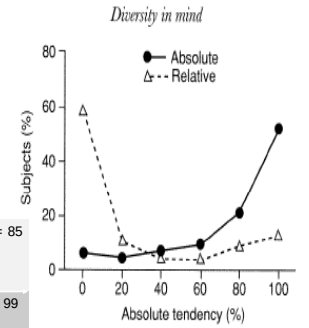

Figure 22. *Animals-in-a-Row results in Levinson (2003: 184): The sample corresponding to Table 3*

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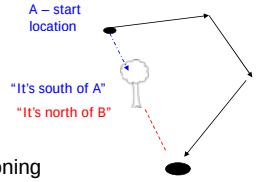
Cognitive consequences (cont.)

Further effects: Cognitive support for linguistic frames – predictions for absolute speakers

- must code all spatial memories in north/south terms, etc.
- therefore must know constantly where north/south (etc.) is
- must dead-reckon their current location:



dead-reckoning requires keeping track of direction *and* distance

Figure 23. *Dead reckoning*

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Cognitive consequences (Cont.)

Pointing experiments

method for testing dead-reckoning skills

- transport consultants to unfamiliar places with restricted visibility
- ask them to point to a range of places, far and near
- assess accuracy of the pointings using prismatic compass, GPS, maps
- test populations
  - Guugu Yimithirr – Cape York, Queensland (Levinson); Hai//om – Khoisan, Kalahari (Widlok); Tzeltal – Mayan, Mexico (Brown, Levinson); contrasted to three relative communities (Dutch, English, Japanese)

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Cognitive consequences (Cont.)

Results: Collective estimates – c. 10 subjects each over c. 20 locations (each normalized to 'north')

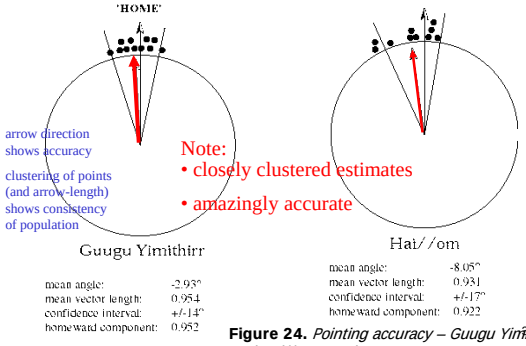

Figure 24. *Pointing accuracy – Guugu Yimithirr and Hai//om speakers*

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Cognitive consequences (cont.)

Tzeltal: collective agreement about location of 20 places

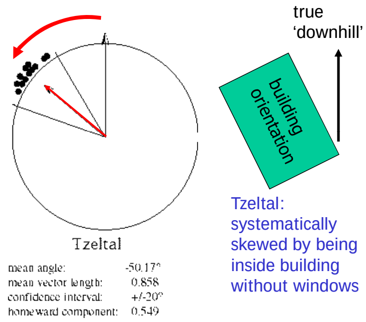

Figure 25. *Pointing experiments – Tzeltal speakers*

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Cognitive consequences (cont.)

Dutch and British English

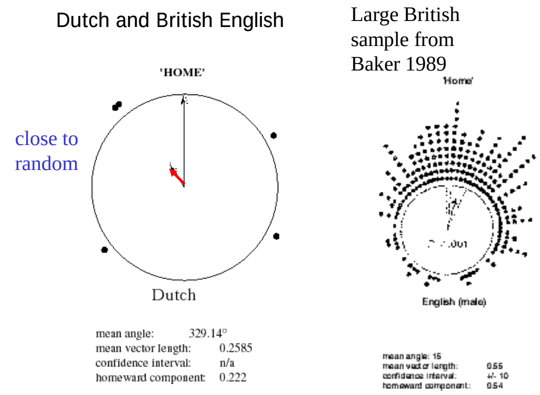

Figure 26. *Pointing experiments – Dutch and English speakers*

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Cognitive consequences (Cont.)

- new studies
  - primates show a preference for geocentric over egocentric frames in spatial memory
    - suggesting that the preference for egocentric frames in speakers of, e.g., English and Japanese is learned
      - not innate as had been claimed all the way back to Kant (1768)
    - Haun, D. B. M., Rapold, C., Call, J., Janzen, G., & Levinson, S. C. (2006)
  - children perform below chance when trained to use a frame type not habitual in their culture
    - cardinal direction terms (in small-scale space) for Dutch children, relative terms for Hai//om children
    - Haun, D. B. M., Rapold, C., Janzen, G., & Levinson, S. C. (2011)

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Cognitive consequences (Cont.)

- Hai//om children use absolute/geocentric frames even to memorize dance moves!
  - Haun & Rapold 2009, Haun 2011

Figure 27. *Dancing with the anthropologists*

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Overview

- semantic typology
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Tables turned & returned

- Li & Gleitman 2002: language is not the driving force
  - rather than evidence of language influencing cognition
    - the co-variation reported in Pederson et al. (etc.) is the result of cultural adaptations to environmental factors
    - in particular, topography, population density, infrastructure, literacy, and education

Figure 28. *Leila Gleitman* *(www.ipsi.upenn.edu/pwc/prowomen/lila-gleitman.gif)*

> "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)

Tables turned & returned (cont.)

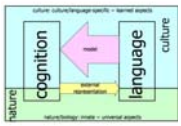

Figure 29. *The big picture according to Whorf*

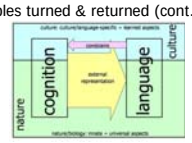

Figure 30. *The big picture according to the innatists*

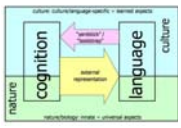

Figure 31. *The big picture according to neo-whorfians*

- Li & Gleitman's hypothesis
  - speakers of all languages have innate knowledge of all frame types and are capable of using them
  - there are cultural biases of frame use that are the result of environmental adaptions
  - these influence language use and internal cognition alike
- Li & Gleitman are ardent supporters of Figure 30
  - so how come they are so concerned about culture here?
- culture is arguably a straw man here
  - the point is to trivialize the differences Pederson *et al.* found as rather more shallow and easily mutable

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Tables turned & returned (cont.)

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

Table 2. *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
Guugu Yimithirr	Australia	Pama Nyungan			X	TRF, TS	R	H-G
Hai//om	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; StA = 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

Tables turned & returned (cont.)

- Li & Gleitman's test
  - American college students outdoors ⇒ ?absolute?
  - American college students indoors with a landmark cue (a toy duck pond!) ? ⇒ "absolute"
  - supposition: Maybe Levinson *et al.* tested their "absolute" subjects in the big outdoors
    - while their "relative" ones were tested indoors?
- Levinson *et al.*'s (2002) response
  - attempt a replication of Li & Gleitman's outdoor conditions
    - try to compare the Dutch data of Pederson *et al.* 1998
      - from six rotation experiments conducted indoors
      - which produced overwhelming evidence of consistent relative coding in all participants

Tables turned & returned (cont.)

- …to data from three rotation experiments conducted outdoors
  - in the center of Nijmegen University campus
  - with strong directional cues in the environment
- in the Animals-in-a-row task, unlike in Li & Gleitman's design…
  - but in line with Pederson *et al.* 1998
- …the participants had to choose three animals out of a set of four for the reproduction of the array
  - » so as to mask the purpose of the task
- results
  - overwhelmingly relative responses in the cognitive tasks
  - in the Animals-in-a-Row task, there is a small difference between outdoors and indoors condition
    - » in the direction of Li & Gleitman's findings
  - however the difference is insignificant
  - exclusively relative responses in the linguistic task

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Tables turned & returned (cont.)

- discussion
  - the discrepancy between the outdoors and indoors conditions in the Animals-in-a-Row task is probably due
    - » to more distractions in the outdoors condition
    - » memory errors in the relative FoR look like absolute responses
  - why was the difference significant in Li & Gleitman's data?
    - » Levinson *et al.* suggest that this was due to the greater transparency of Li & Gleitman's task
    - » participants were second-guessing the purpose of the experiment
    - » and therefore may have exploited available landmark cues in the outdoors condition

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Tables turned & returned (cont.)

- replicating Li & Gleitman's duck pond condition
  - this is based on a confusion of absolute FoRs and landmark-based intrinsic FoRs
  - Li & Gleitman manipulate the position of the toy duck pond on the replication table
  - the effect of this is that participants simply treat the toy pond as part of the array to be replicated
  - so they are merely being induced to code their responses intrinsically

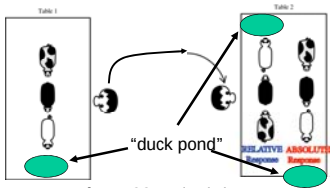

Figure 32. *Animals-in-a-Row under the "duck pond" condition*

- to test this, Levinson *et al.* redo Animals-in-a-Row with the "pond" added à la Li & Gleitman
  - in addition, in one condition, they use only three animals, as in Li & Gleitman's study
    - » while in another, they use four, as in Pederson *et al.* 1998

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Tables turned & returned (cont.)

– thus pitting environmental bias towards the intrinsic frame
  » against memory load bias towards the relative frame
  » since the latter is more customary among Dutch speakers
– hypothesis confirmed!
  » 3 animals -> predominantly intrinsic coding (i.e., tweaking by "duck pond")
  » 4 animals -> predominantly relative coding

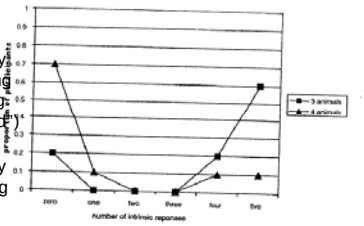

Figure 33. *Animals-in-a-Row plus "duck pond" with Dutch participants, three-vs.-four-animal conditions*

Tables turned & returned (cont.)

– to directly disambiguate between intrinsic and relative coding
  » Levinson *et al.* then replicate again, under 90 degree rotation

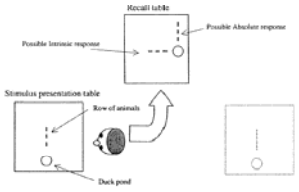

Figure 34. *Animals-in-a-Row: 90º vs. 180º rotation*

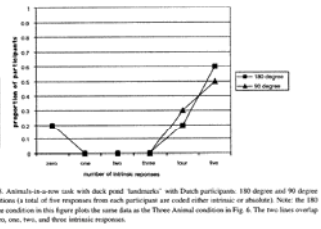

Figure 35. *The three types of spatial FoRs*

– hypothesis confirmed!
  » although there are a few responses that could be interpreted absolutely
  » the overwhelming majority of responses is clearly intrinsically coded

Tables turned & returned (cont.)

- conclusions to Li & Gleitman critique
  – Dutch and English speakers use two FoRs in their in linguistic tasks: the intrinsic and the relative
    - in the table-top space, that is!
  – they use only these two FoRs cognitively, for memory and inferences
    - again, in the same domain
  – the relative FoR is dominant over the intrinsic one for these populations
    - in general only ca. 25% of speakers will give an intrinsic description where a relative one is possible (Levelt)
  – contextual effects can trigger selection of the intrinsic FoR over the relative one

Tables turned & returned (cont.)

- deconstructing Li & Gleitman
  – an overemphasis on nativism
    - development of syntactic categories driven innately
    - development of semantic categories driven by labeling innate conceptual categories
  – this only works as long as the linguistic/conceptual categories in question are truly universal!
    - once crosslinguistic variation in semantic categories is accepted
      – relativistic effects actually aide language acquisition!
  – so what Li & Gleitman are really denying is deep variation in linguistic/conceptual categories!

Tables turned & returned (cont.)

- new work: Li et al. (in press)
  – claim: Tenejapans when given an appropriate task can be induced to memorize stuff in a relative FoR
  – problem from the get-go: *nobody said any population can't be made to learn a particular FoR*
    - no reason not to assume that the *possibility of learning to use* the three FoRs is innate
    - Levinson & colleagues' claims merely concern *preferences* for using particular FoRs in particular domains
      – and the cognitive consequences of these usage patterns
  – method (experiment I)
    - a variation of Brown & Levinson 1993
    - picture-to-picture matching
      – view a card with two dots
      – then rotate and select an identical copy on the demonstration table from out of a set of four differing in their orientation

Tables turned & returned (cont.)

- the participants hold the original card covered in a box
  – as they rotate
- two conditions
  – "egocentric": the box rotates w/ the participants
  – "geocentric": the participants maintain the orientation
    » of the box in the room

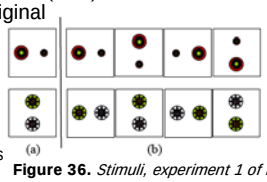

Figure 36. *Stimuli, experiment 1 of Li, Abarbanell, & Papafragou 2005, based on Brown & Levinson 1993*

– findings
  - 74% "correct" responses in the "geocentric" condition, 84.6% in the "egocentric" one
    – the difference is not significant
– LA&P's interpretation
  - "correct" responses in the "egocentric" condition require use of a relative FoR
  - therefore, the outcome shows that Tzeltal speakers are just as good at reasoning in absolute and relative FoRs

Tables turned & returned (cont.)

– deconstruction
  - the use of a left-right distinction with respect to the participants' own body is *intrinsic*, not relative
  - experimental bias: the task was easier to solve in the egocentric condition
    - since the participants could keep track of the ground – their own body - **propioceptively**

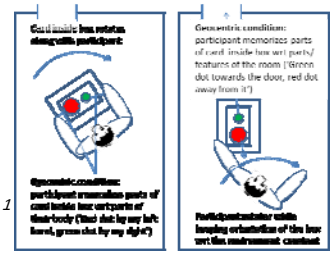

Figure 37. *Anchor points for spatial memory in Experiment 1 of Li et al. in press (Bohnemeyer & Levinson ms.)*

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Tables turned & returned (cont.)

- the debate on linguistic and nonlinguistic factors in frame use and the MesoSpace project
  – work in progress
  – pit language against environmental factors in both linguistic and nonlinguistic data
  – predictions
    - Li & Gleitman: participants will cluster according to literacy, education, topography, and population geography
      – native language and bilingualism in Spanish should not be strong determinants
    - Levinson & colleagues: participants will cluster primarily according to native language and bilingualism in Spanish
      – literacy, education, topography, and population geography should be weaker factors
  – stay tuned!

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Overview

- semantic typology
- spatial frames of reference
- crosslinguistic variation
- cognitive consequences
- tables turned and returned
- summary

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Summary

- semantic typology
  – the study of universals and crosslinguistic variation in linguistic categorization
- linguistic categorization – categorization of extra-linguistic reality in linguistic expressions
- Linguistic Relativity Hypothesis (LRH)
  – the hypothesis, derived from the writings of Benjamin Lee Whorf
    - that linguistic categories *determine* categorization
      – (strong formulation, often attributed to Whorf; not in line w/ available data)
    - that linguistic categories *influence* categorization
      – (weak formulation, compatible with current evidence; still controversial)

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Summary (cont.)

- spatial frames of reference (FoRs)
  – conceptual coordinate systems used to identify places, orientations, and directions
    - in discourse and in internal cognition
- the debate on linguistic vs. nonlinguistic factors
  – different populations prefer different FoRs for the same task and domain
  – population-specific preferences for particular types of FoRs in discourse and internal cognition align
  – Levinson (1996, 2003, *inter alia*), Pederson *et al.* 1998, etc.: language in the driver's seat
  – Li & Gleitman 2002; Li et al in press: variation across populations is the result of adaptations
    - to environmental factors that shape both language and cognition

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Summary (cont.)

- the MesoSpace project
  – a collaborative study of the semantic typology of space in 13 Mesoamerican (MA) languages
    - plus three non-Mesoamerican controls spoken in the same region
    - focusing on two domain, spatial FoRs and *meronymies*
    - with a view towards exploring their connection
      – and towards advancing the Levinson-Gleitman debate on two fronts
        » effects of variation in topography, ecology, modes of production/subsistence, education and literacy
        » the possible existence of purely linguistic factors influencing FoR selection – especially the availability of productive meronymies

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