Image Schema Workshop
With a special focus on Force Dynamics

Joint Ontology Workshop

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COLLEGE OF
ARTS AND SCIENCES

CASE WESTERN RESERVE
UNIVERSITY

Agenda

- Overview of Image Schema Theory in Cognitive Linguistics & Cognitive Science

- Special focus on Force Dynamics as a basic semantic category underlying language structure and function

- Analysis of Force Dynamics in the study of political discourse

- Participatory analysis of Force Dynamics in the study of political discourse

- Time Permitting: Discussion of force dynamics in the development of top and domain ontologies

Schemas, Images, & Image Schemas

- Kantian "schemas"

- Mental imagery

- Image schemas
  - They result from a process of "perceptual analysis," wherein the imagery becomes schematized

Schemas, Images, & Image Schemas

- Definition
  - Images schemas are pre-conceptual and primitive patterns based in sensory perception and embodied experience that enable and constrain conceptualization and reasoning. (Johnson, 1987: 30)

- Typology
  - CONTAINER; BALANCE; COMPULSION; BLOCKAGE; COUNTERFORCE; REMOVAL; ENABLEMENT; ATTRACTION; MASS-COUNT; PATH; LINK; CENTER-PERIPHERY; CYCLE; NEAR-FAR; SCALE; PART-WHOLE; MERGING; SPLITTING; FULL-EMPTY; MATCHING; SUPERIMPOSITION; ITERATION; CONTACT; PROCESS; SURFACE; OBJECT; COLLECTION

Schemas, Images, & Image Schemas

- Image schema transformations
  - *Path-focus to end-point focus*
  - *Multiplex-to-mass*
  - *Trajectory*
  - *Superimposition*

  - *Extrusion*

Image Schemas in Cognitive Linguistics

- Polysemy of individual words and constructions
    - *P^w éihve'e* ('Giving') in Cora (Casad, 1998)
    - *Put* in metaphoric usages (Pauwels, 1995)
    - *Straight* (Cienki, 1998)
    - *Upp* & *ner* in Swedish (Ekberg, 1995)

Image Schemas in Cognitive Linguistics

- Literary and Textual Analysis
  - Metaphor and the invariance principle (Turner, 1992)
    - *Kingdoms are clay*

  - The Poetics of Robert Frost & Emily Dickenson (Freeman, 2002)
    - Frost emphasizes PATH and BALANCE
      - The PATH schema for emphasizing uncertainty
        - "Two roads diverged in a yellow wood /And sorry I could not travel both/ And be one traveler"
    - Dickenson emphasizes CONTAINER and CYCLE
      - the CONTAINER schema has two forms: closed and open.
        - Closed = Death: "Doom is the House without the Door" (F710, J475).
        - Open = Life: "Grand go the Years – in the Crescent – above them –"

Image Schemas in Cognitive Linguistics

- Psycholinguistics
  - Experiments with *Stand* (Gibbs, et. al., 1994)
    1. After a period of standing up and related motions, subjects were read descriptions of 12 different image schemas related to standing and asked to rate the relevance of each image schema to their own experience
       - Results: **5** primary image schemas
         - BALANCE; VERTICALITY; CENTER-PERIPHERY; RESISTANCE; LINK
    2. Subjects asked to judge similarity of 35 different senses of *stand* and sort them into 5 groups.
       - Results: subjects did not separate physical senses of *stand* from nonphysical senses
         - e.g., grouping *stand at attention* with *stand the test of time*

Image Schemas in Cognitive Linguistics

- Psycholinguistics
  - Experiments with *Stand* (Gibbs, et. al., 1994)
  3. After a period of standing up and related motions, subjects were read descriptions of the 5 image schemas, shown as list of the 32 senses of *stand* and asked to rate the relevance of each image schema to each sense.
     - Experimenters used responses to construct an Image Schema Profile for each of the 32 senses of stand.
       - *It stands to reason* & *The matter now stands*
         - LINK; BALANCE; CENTER-PERIPHERY; RESISTANCE; VERTICALITY
       - *Don't stand for such treatment* & *To stand against great odds*
         - VERTICALITY & BALANCE for singular intentional agents
         - VERTICALITY & OTHER for collective subjects

Image Schemas in Cognitive Linguistics

- Psycholinguistics
  - Experiments with *Stand* (Gibbs, et. al., 1994)
    - In both instances, VERTICALITY was rated the least relevant of the two senses
    - Data showing VERTICALITY as the primary image schema correlated with expressions not typically associated with this schema
      - *The barometer stands at 30 degrees*
  - Subjects did not sort by context, suggesting that similarity of situation did not factor as a primary means of categorizing these instances

Image Schemas in Cognitive Linguistics

- **Cognitive Development & Language Acquisition** (Gibbs & Colston, 1995)
  - Transformations of LANDMARK—LINKAGE—REMOVAL OF BLOCKAGE—LANDMARK subtend a 4.5 year-old's demonstration of object permanence
  - The authors argue that 3.5 year-olds do not demonstrate such a capacity
    - Development of the **notion** of object permanence can be tracked by the development and control of several different image schemas and the transformations between them.

  - Infant detection of motion events (Mandler, 1992)
    - At 3-4 months, infants distinguish between caused-motion and self-motion
      - Infants enjoy a well developed TRAJECTOR – PATH schema transformation
        - Caused-motion: the end-point of one trajector becomes the starting-point for another
        - Self-motion: absence of this trajectory transformation

Image Schemas in Cognitive Linguistics

- **Cognitive Development & Language Acquisition**
  - Synaesthesia (Wagner 1981)
    - Paired perceptual events sharing no physical features or history of co-occurrence
      - Visual markings and musical tones
    - 1-year olds looked longer at dotted lines than solid lines when stimulus was paired with a pulsing tone and vice versa
    - 1-year olds looked longer at downward arrows when paired with descending tones than with ascending tones

Image Schemas in Cognitive Linguistics

- Cognitive Development & Language Acquisition
  - Role of material culture in language acquisition (Jensen de Lopez & Sinha, 2000)
    - Comparison of English-acquiring; Danish-acquiring, and Zapotec-acquiring children
      - Acquisition of locatives
        - *In* & *Under* in English & Danish
        - *Stomach* in Zapotec
      - English and Danish children show a bias for *in* as a "good" example of containment
      - Zapotec children did not show a bias for *in* as a "good" example of containment

      - It is not only bodily experience that drives the linguistic construction of space, but material culture
        - Zapotec children live in a world of relatively few artifacts with highly specialize functions
        - They make use of a small set of artifacts in more flexible ways
          - Baskets (for placing things <u>in</u> or <u>covering</u> things up)

Image Schemas and Computation

- **Dimensions of Computational Modeling**
  - **Neural Theory of Language Project** (Bailey, et.al., 1997)
    - Execution schema (x-schema)
      - Dropping an object
        - Drop-schema + Fall-schema
          - Drop: Control transitions: start → ongoing → finish → done
            - Simulation of start: agent supporting object withdraws support
          - Fall: Control transitions: start → ongoing → finish → done
            - Simulation: removal of support triggers beginning of Fall-schema followed by the decreasing height of object on a vertical gradient
    - Feature structures (f-structs)
      - Representations of possible outcomes for x-schema
        - Binds with instances of Drop-schema to form inferences:
          - Object will either bounce or break or some combination thereof
  - X-schema for Dropping an object exploit basic notions of RESTRAINT REMOVAL; SOURCE-PATH-GOAL; MOMENTUM; VERTICALITY

Image Schemas and Computation

- Dimensions of Computational Modeling
  - Regier's model of spatial relation categories in English, Russian, & Mixtec

  - Program parses animated scenes of schematic trajector & landmark relations ad judges each one as a poor or excellent example of English *through*, Russian *iz-pod*, or Mixtec *sini*

  - Model includes specification of a beginning point, and end-point, and an inferred trajectory between them.

Image Schemas and Computation

- Dimensions of Computational Modeling
  - Regier's model of spatial relation categories in English, Russian, & Mixtec

  - Computationally, the program matches a "current buffer" with discrete snapshots of the trajector/landmark regions in a "motion buffer"
    - Motion buffer is an element with three sub-representations, each of which matches the image schematic components of SOURCE-PATH-GOAL

  - Based on the Gestalt principle of Apparent Motion

Force Dynamics

- TYPOLOGY

CONTAINER	NEAR-FAR
BALANCE	SCALE/VERTICALITY
COMPULSION	PART-WHOLE
BLOCKAGE	MERGING
COUNTERFORCE	SPLITTING
REMOVAL	FULL-EMPTY
ENABLEMENT	MATCHING
ATTRACTION	SUPERIMPOSITION
MASS-COUNT	ITERATION
PATH	CONTACT
LINK	PROCESS
CENTER-PERIPHERY	SURFACE
CYCLE	OBJECT
	COLLECTION

Leonard Talmy's
Conceptual Structuring System

- Open-class & closed-class forms
  - There is a *qualitative* distinction between the lexical and grammatical subsystems
    - Open class provides richly detailed meanings
    - Closed class provides schematic meaning
  - Together each encode and externalize distinct but equally important aspects of a particular scene that comprises a **Cognitive Representation**

Force Dynamic Properties

Force Entities

Intrinsic Force Tendency

Agonist

Antagonist
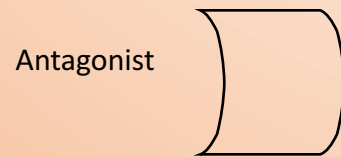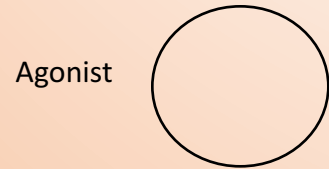
Rest   ●

Resultant of Force Interaction

Balance of Strengths

Action: _____>_____

Stronger Entity: +
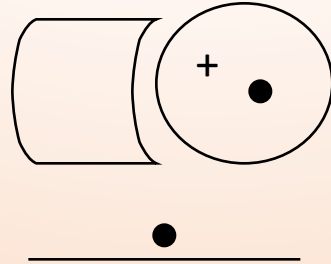Weaker Entity: --

Rest: _____●_____

Steady-State Patterns
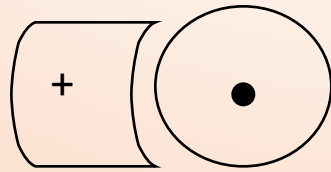
Causative

- *The golfer's putt made the ball roll into the hole.*
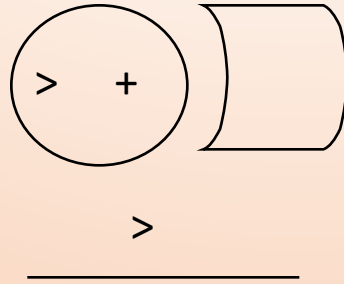- *High unemployment made the budget deficit rise.*

Steady-State Patterns

Static (strong) Despite

- *The shed kept standing despite the gale force winds.*
- *Unemployment remains high, even though company profits hit record highs in most sectors.*
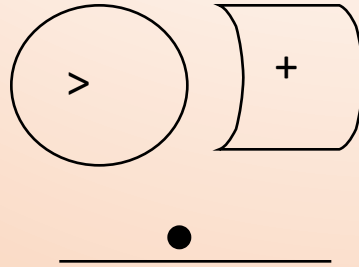
Steady-State Patterns

Dynamic (weak) Despite

- *The golfer's putt kept rolling despite the wet grass on the 17th green*
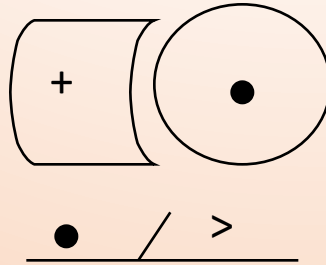- *Unemployment keeps rising despite record company profits in most sectors.*

Steady-State Patterns

Causative Hindrance

- *The ball stayed on the slope because of the stiff grass.*
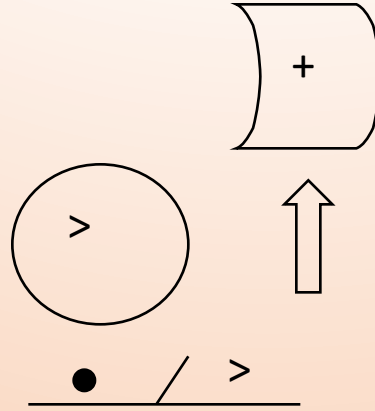- *Unemployment stayed high because of continued market volatility.*

Shifting Patterns

Onset Causation

- *The putter's hitting it made the ball roll into the hole.*
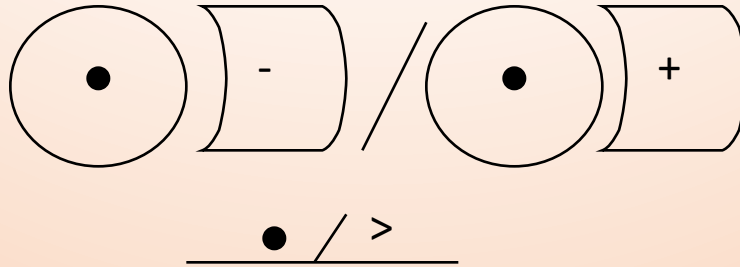- *The corruption in subprime mortgage lending made the credit markets collapse in 2008.*

Shifting Patterns

Onset Letting

• *The plug's coming loose* let the water drain from the tank.
• *The repeal of the Glass-Steagall Act* let depository banks act like investment banks

Shifting Patterns

$$\odot \ominus / \odot \ominus^+$$

$$\bullet \ / \ >$$

Shifting Balance of Strength

- *The crashing of the twelve-foot waves of Lake Superior against the hull finally overwhelmed the Edmund Fitzgerald.*
- *The careless issuing of credit default swaps and other derivatives finally overburdened the credit markets.*

Shifting Patterns
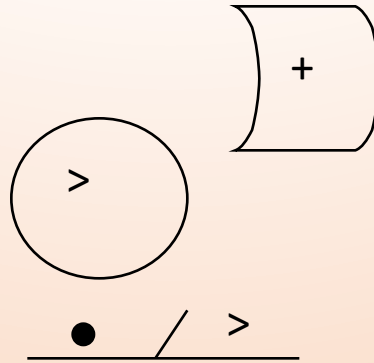
Extended Letting

- *The plug's staying loose let the water drain from the tank.*
- *A decade of The Gramm-Leach-Bliley Act let depository banks take excessive financial risks.*

Force Dynamics: Rhetoric, Argumentation, & Construal

- Consider a few passages from Abraham Lincoln's *Second Inaugural Address* (March, 1865)
  - "Both parties deprecated war, but one of them would *make* war rather than let the nation survive, and the other would *accept* war rather than let it perish, and the war came."

- Four FD Patterns
  1. Causative
  2. Causative Hindrance (negative Onset Letting)
  3. Dynamic (weak) Despite (Shifting Balance)
  4. Causative Hindrance (negative Onset Letting)

Force Dynamics: Rhetoric, Argumentation, & Construal

- Consider a few passages from Abraham Lincoln's *Second Inaugural Address* (March, 1865)
    - "To strengthen, perpetuate, and extend this interest was the object for which insurgents would rend the Union even by war, while Government claimed no right to more than to restrict the territorial enlargement of it."
        - "this Interest" = institution of Slavery
    - FD Patterns
        1. Onset Causation
        2. Onset Causation
        3. Causative Hindrance

FD Exercise

- Analyze the paragraph on the next slide for Force Dynamic patterns.

- The paragraph comes from President Harry Truman's *Memoirs*, recounting his decision to send US troops to Korea after the invasion of the Republic of Korea (South Korea) by the Democratic People's Republic of Korea (North Korea):

- For each sentence, try to identify the AGO/ANT and their corresponding intrinsic force tendency and relative strength, and the resultant force interaction. Then try to identify the specific force dynamic pattern, be it steady-state or shifting

From Harry Truman's *Memoirs*: the invasion of South Korea by North Korea

[1] In my generation this was not the first occasion when the <u>strong attacked the weak</u>.

[2] I recalled some <u>earlier instances: Manchuria, Ethiopia, Austria</u>.

[3] I remembered how each time that the <u>democracies failed to act</u> it had <u>encouraged aggressors to keep going</u> ahead.

[4] <u>Communism was acting in Korea</u> just as <u>Hitler, Mussolini, and the Japanese had acted ten, fifteen, and twenty years</u> earlier.

[5] I felt certain that if <u>South Korea was allowed to fall</u>, <u>communist leaders would be emboldened to override nations</u> closer to our own shores.

…

[8] It was clear to me that the foundations and principles of the United Nations were at stake <u>unless this unprovoked attack on Korea could be stopped</u>.

From Harry Truman's *Memoirs*: the invasion of South Korea by North Korea

[1] Causative: AGO = "weak" ; ANT = "strong"; FT = stasis; Res = motion
- Implicature: ANT = DPRK; AGO = KR

[2]. Causative: AGO = "Manchuria, Ethiopia, Austria"; ANT = implicit; FT= stasis; Res= motion
- Implicature: ANT = Mao Zhedong; Mussolini; Hitler

[3]. - Causative Hindrance (+Onset Letting); AGO = unnamed; ANT = "democracies"; FT= motion; Res = motion / Dynamic Despite: AGO = "aggressor" (weaker); FT; = motion; Res =motion

[4] Onset Causation: AGO = "Communism"; ANT = "Korea" ; FT = motion; Res = motion / AGO = "Hitler, Mussolini, Japanese"; ANT = "ten, fifteen, twenty years"; FT = motion; Res = motion
- Implicature: ANT = Europe, Africa, Asia, (by temporal reference)

[5] Onset Letting: AGO = "South Korea"; ANT = unnamed; FT =motion; Res = motion
- Implicature: ANT = United States and allies

[8] Onset Causation /Causative Hindrance: AGO = "Korea"; ANT = unnamed; FT = stasis; Res = stasis
- Implicature: ANT = DPRK & Communists; balance of strength: + US & Allies

References

Bailey, David, Jerome Feldman, Srini Narayanan, and George Lakoff. 1997. Modeling embodied lexical development: Neural theory of language publications. http://www.icsi.berkeley.edu/NTL/papers/cogsci97.pdf. Accessed February 8, 2001.

Boers, Frank, and Murielle Demecheleer. 1997. A few metaphorical models in (Western) economic discourse. In Wolf-Andreas Liebert, Gisela Redeker, and Linda Waugh, eds., *Discourse and perspective in cognitive linguistics* 115–29. Amsterdam: John Benjamins.

Casad, Eugene H. 1998. Lots of ways to GIVE in Cora. In John Newman, ed., *The linguistics of giving* 135–74. Amsterdam: John Benjamins.

Cienki, Alan. 1997. Some properties and groupings of image schemas. In Marjolijn Verspoor, Kee Dong Lee, and Eve Sweetser, eds., *Lexical and syntactical constructions and the construction of meaning* 3–15. Amsterdam: John Benjamins.

Cienki, Alan. 1998. STRAIGHT: An image schema and its metaphorical extensions. *Cognitive Linguistics* 9: 107–49.

D'Andrade, Roy. 1995. *The development of cognitive anthropology*. Cambridge: Cambridge University Press.

Delbecque, Nicole. 1995. Towards a cognitive account of the use of the prepositions *por* and *para* in Spanish. In Eugene H. Casad, ed., *Cognitive linguistics in the Redwoods: The expansion of a new paradigm in linguistics* 249–318. Berlin: Mouton de Gruyter.

Dewell, Robert B. 1994. *Over* again: Image schema transformations in semantic analysis. *Cognitive Linguistics* 5: 351–80.

Ekberg, Lena. 1995. The mental manipulation of the vertical axis: How to go from "up" to "out" or from "above" to "behind." In Marjolijn Verspoor, Kee Dong Lee, and Eve Sweetser, eds., *Lexical and syntactical constructions and the construction of meaning* 69–88. Amsterdam: John Benjamins.

Freeman, Margaret H. 1995. Metaphor making meaning: Dickinson's conceptual universe. *Journal of Pragmatics* 24: 643–66.

Freeman, Margaret H. 2002. Momentary stays, exploding forces: A cognitive linguistic approach to the poetics of Emily Dickinson and Robert Frost. *Journal of English Linguistics* 30: 73–90.

Gibbs, Raymond W., Jr. 1994. *The poetics of mind: Figurative thought, language, and understanding*. Cambridge: Cambridge University Press.

Gibbs, Raymond W., Jr, Dinara Beitel, Michael Harrington, and Paul Sanders. 1994. Taking a stand on the meaning of *stand*: Bodily experience as motivation for polysemy. *Journal of Semantics* 11: 231–51.

Gibbs, Raymond W., Jr., and Herbert L. Colston. 1995. The cognitive psychological reality of image schemas and their transformations. *Cognitive Linguistics* 6: 347–78.

Jackendoff, Ray. 1996. The architecture of the linguistic-spatial interface. In Paul Bloom, Mary A. Peterson, Lynn Nadel, and Merrill F. Garrett, eds., *Language and space* 1–30. Cambridge, MA: MIT Press.

Johnson, Mark. 1987. *The body in the mind: The bodily basis of meaning, imagination, and reason*. Chicago: University of Chicago Press.

Johnson, Mark. 1993. *Moral imagination: Implications of cognitive science for ethics*. Chicago: University of Chicago Press.

Kant, Immanuel. [1781] 1990. *Critique of pure reason*. Translated by J. M. D. Meiklejohn. Buffalo, NY: Prometheus Books.

Kemmer, Suzanne, and Michael Barlow. 2000. Introduction. In Suzanne Kemmer and Michael Barlow, eds., *Usage-based models of language* vii–xxviii. Stanford, CA: CSLI Publications.

Kreitzer, Anatol. 1997. Multiple levels of schematization: A study in the conceptualization of space. *Cognitive Linguistics* 8: 291–325.

Krzeszowski, Tomasz P. 1993. The axiological parameter in preconceptual image schemata. In Richard Geiger and Brygida Rudzka-Ostyn, eds., *Conceptualization and mental processing in language* 307–29. Berlin: Mouton de Gruyter.

Lakoff, George. 1987. *Women, fire, and dangerous things: What categories reveal about the mind.* Chicago: University of Chicago Press.

Lakoff, George, and Mark Johnson. 1980. *Metaphors we live by.* Chicago: University of Chicago Press.

Lakoff, George, and Rafael Núñez. 2000. *Where mathematics comes from: How the embodied mind brings mathematics into being.* New York: Basic Books.

Lakoff, George, and Mark Turner. 1989. *More than cool reason: A field guide to poetic metaphor.* Chicago: University of Chicago Press.

Langacker, Ronald W. 1987. *Foundations of cognitive grammar.* Vol. 1, *Theoretical prerequisites.* Stanford, CA: Stanford University Press.

Serra-Borneto, Carlo. 1995b. *Liegen* and *stehen* in German: A study of horizontality and verticality. In Eugene H. Casad, ed., *Cognitive linguistics in the Redwoods: The expansion of a new paradigm in linguistics* 459–505. Berlin: Mouton de Gruyter.

Sinha, Chris, and Kristine Jensen de López. 2000. Language, culture, and the embodiment of spatial cognition. *Cognitive Linguistics* 11: 17–41.

Smith, Michael B. 1999. From instrument irrealis: Motivating some grammaticalized senses of the Russian instrumental. In Katarzyna Dziwirek, Herbert Coats, and Cynthia M. Vakareliyska, eds., *Annual workshop on formal approaches to Slavic linguistics*. Vol. 7, *The Seattle meeting 1998* 413–33. Ann Arbor: Michigan Slavic Publications.

Smith, Michael B. 2002. The polysemy of German *es*: Iconicity and the notion of conceptual distance. *Cognitive Linguistics* 13: 67–112.

Talmy, Leonard. 1983. How language structures space. In Herbert L. Pick, Jr., and Linda P. Acredolo, eds., *Spatial orientation: Theory, research, and application* 225–82. New York: Plenum Press.

Turner, Mark. 1987. *Death is the mother of beauty: Mind, metaphor, criticism*. Chicago: University of Chicago Press.

Turner, Mark. 1991. *Reading minds: The study of English in the age of cognitive science*. Princeton, NJ: Princeton University Press.

Turner, Mark. 1992. Language is a virus. *Poetics Today* 13: 725–36.

Verspoor, Marjolijn. 1995. Predicate adjuncts and subjectification. In Marjolijn Verspoor, Kee Dong, and Eve Sweetser, eds., *Lexical and syntactical constructions and the construction of meaning: Proceedings of the bi-annual ICLA meeting in Albuquerque, July 1995* 433–49. Amsterdam: John Benjamins.

Langacker, Ronald W. 1991. *Foundations of cognitive grammar*. Vol. 2, *Descriptive application*. Stanford, CA: Stanford University Press.

Mandler, Jean. 1992. How to build a baby: II. Conceptual primitives. *Psychological Review* 99: 597–604.

Matsumoto, Yo. 1995. From attribution/purpose to cause: Image schema and grammaticalization of some cause markers in Japanese. In Marjolijn Verspoor, Kee Dong Lee, and Eve Sweetser, eds., *Lexical and syntactical constructions and the construction of meaning* 287–307. Amsterdam: John Benjamins.

Narayanan, Srini. 1999. Moving right along: A computational model of metaphoric reasoning about events. *Proceedings of the National Conference on Artificial Intelligence (AAAI-99)* 121–28. Menlo Park, CA: AAAI Press.

Palmer, Gary B. 1996. *Toward a theory of cultural linguistics*. Austin: University of Texas Press.

Pauwels, Paul. 1995. Levels of metaphorization: The case of *put*. In Louis Goossens, ed., *By word of mouth: Metaphor, metonymy and linguistic action in a cognitive perspective* 125–58. Amsterdam: John Benjamins.

Regier, Terry. 1996. A model of the human capacity for categorizing spatial relations. *Cognitive Linguistics* 6: 63–88.

Rhee, Seongha. 2002. Semantic changes of English prepositions against a grammaticalization perspective. *Language Research* 38: 563–83.

Romaine, Suzanne. 1996. War and peace in the global greenhouse: Metaphors we live and die by. *Metaphor and Symbolic Activity* 1996: 175–94.

Serra-Borneto, Carlo. 1995a. Two-way prepositions in German: Image and constraints. In Marjolijn Verspoor, Kee Dong Lee, and Eve Sweetser, eds., *Lexical and syntactical constructions and the construction of meaning* 187–204. Amsterdam: John Benjamins.

Wagner, Susan, Ellen Winner, Diane Cicchetti, and Howard Gardner. 1981. Metaphorical mappings in human infants. *Child Development* 52: 728–31.

Watters, James K. 1995. Frames and the semantics of applicatives in Tepehua. In Eugene H. Casad, ed., *Cognitive linguistics in the Redwoods: The expansion of a new paradigm in linguistics* 971–96. Berlin: Mouton de Gruyter.

Williams, Darrell. 1992. English comparative compounds with OVER, UNDER and OUT. *Proceedings of the Eastern States Conference on Linguistics* 9: 272–81.